

**PRIME ENGINEERING & TESTING
CONSULTANTS (PVT.) LIMITED.**

**REPORT OF
ENVIRONMENTAL IMPACT
ASSESSMENT(EIA)
OF DERA GHAZI KHAN NORTHERN
BYPASS (20KM)**

MARCH 2023

SUBMITTED BY

SGS

**ENVIRONMENTAL SERVICES
SGS PAKISTAN (PVT.) LTD.**

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Acronyms

ANSI	American National Standards Institute
APHA	American Public Health Association
BHU	Basic Health Unit
BOD	Biological Oxygen Demand
CBD	Convention on Biological Diversity
COD	Chemical Oxygen Demand
CMS	Conservation of Migratory Species of Wild Animals
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPD	Environment Protection Department
ERP	Emergency Response Plan
HSE	Health, Safety and Environment
hr	Hour
HSSE	Health Safety Security and Environmental Management
IUCN	International Union of Conservation for Nature
kg	Kilogram
Km²	Square Kilometre
m	Meter
mg/kg	Milligram per Kilogram
mg/l	Milligram per Litre
mg/m³	Milligram per Cubic Meter
MW	Mega Watt
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NFPA	National Fire Protection Association

NCS	National Conservation Strategy
NGO's	Non-Governmental Organizations
OSHA	Occupational Safety and Health Administration of the United States
PEPA	Pakistan Environmental Protection Act 1997
PEPC	Pakistan Environmental Protection Council
PEQS	Punjab Environmental Quality Standards
PM	Particulate Matter
PPE's	Personal Protective Equipment
ppm	Parts per Million
ROW	Right of Way.
sq km	Square Kilometer
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WHO	World Health Organization

Executive Summary

National Highway Authority (NHA) being the proponent of this project is planning for construction of Dera Ghazi Khan bypass. The proposed alignment starts from approximately 98 Km of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 kms. Approximately 8.7 Kms is passing through sandy area and remaining length after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed.

The objectives planned for achievement are following but not limited to:

- The construction of the said bypass will provide a better road facility for the inhabitants of a lesser developed area of Dera Ghazi Khan and remove the grievances of people of southern Punjab.
- 4-Lane dual carriageway bypass will provide uninterrupted traffic flow resolution and result in ultimate reduction of cost of all suppliers and cost of living index.
- Problem of traffic blockage and congestion in Dera Ghazi Khan City will be solved.
- Time saving of passengers and reduction in accident of traffic user will be possible.
- Provision of employment opportunities during and after the construction of the project thus alleviating the poverty of the area.
- Vehicle operating cost will be reduced.

Prime Engineering & Testing Consultant (Lead Consultant) has been assigned to prepare a complete feasibility of the project; including the preparation of the EIA of the said project to be submitted by them to NHA. Prime Engineering consulted SGS for the preparation of EIA of the proposed project. This report presents the EIA

process and its findings, project alternatives, project impacts, and mitigation measures to be implemented during the execution of the proposed activities.

Details of the project is given below:

ES.1 Title of the Project

The proposed project to which this Environmental Impact Assessment (EIA) relates is entitled as “EIA for Construction of Dera Ghazi Khan Northern Bypass (20km)”. DG Khan northern bypass has been designed for 4-Lane dual carriageway bypass.

ES.2 Project Location

The proposed alignment starts from approximately Km 98 of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms. Approximately 8.7 Kms is passing through sandy area and remaining length after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed. A key map showing the location of the project area is shown in Figure 1.1.

ES.3 Name of Organization Preparing the Report

To comply with Pakistan Environmental Regulations as conceived in the Punjab Environmental Protection (Amendment) Act (PEPA) 2012, Prime Engineering & Testing Consultants (Pvt.) Ltd. entrusted SGS Pakistan (Pvt.) Ltd. with the assignment of carrying out an EIA Study of the proposed project.

ES.4 A Brief Outline of the Proposal

The proposed project is Construction of DG Khan Northern Bypass. The proposed alignment starts from approximately Km 98 of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms. Approximately 8.7 kms is passing through sandy area and remaining length

after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed.

The proposed project has been designed for 4-Lane within the Right-of-Way (ROW). The facility shall be classified as 4-Lane (dual carriageway) rural arterial as per AASHTO standard classification. The proposed project road shall by-pass the villages or town in order to minimize acquisition of built up area and relocation of locals.

The length of proposed project is 20 kms. The materials to be used in construction of this project would include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement etc. Almost all these raw materials are mostly locally available along the alignment.

ES.5 Assessment Methodology

This study has been conducted using standard environmental assessment methodology, in accordance with national and international environmental guidelines. The study evaluates the proposed project according to the environmental assessment requirements of the Pakistan Initial Environmental Examination and Environmental Impact Assessment Review Regulations 2000.

ES.6 Proposed Project Activities

The proposed project is designed for 100 km/hr speed facility. It is envisaged that the Project shall be constructed as 4-Lane dual carriageway. Culverts shall be constructed over cross drainage works. Road furniture comprising of lane markings, traffic signs, guard rails and reflectors shall be provided. Proper intersections shall be designed where required. The length of highway shall be around 20 km. The materials to be used in construction of this Highway would include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement etc. Almost all these raw materials are mostly locally available along the alignment.

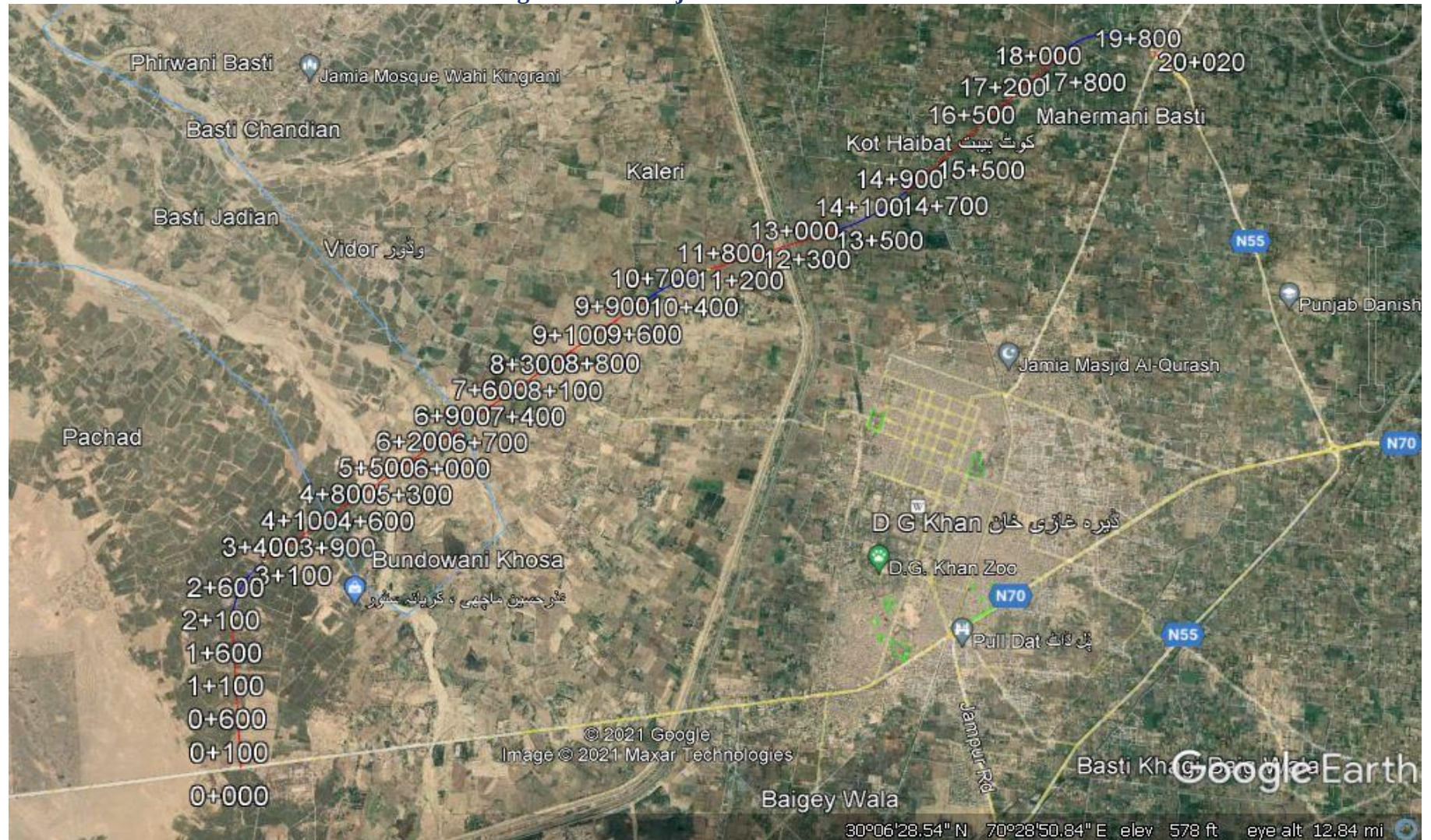
ES.7 Purpose and Scope of the Study

The purpose of this EIA is to evaluate the activities associated with the proposed project according to the Pakistan Initial Environmental Examination and Environmental Impact Assessment Review Regulations 2000 and international environmental guidelines. **Chapter 2** outlines the applicable statutory environmental requirements and guidelines. As per Sub Part 2 of Part D (Transport) of Schedule II: any provincial highways or major road with a total cost of Rs. 50 million and above shall require filing of an EIA. Hence, the proposed project requires EIA to be submitted in EPA for Environmental Approval.

The specific objectives of this EIA are to:

- Assess the existing conditions in the project area and develop a baseline of its current environmental and socioeconomic conditions.
- Assess the proposed activities of the project to identify their potential impact, evaluate these effects, and determine their significance.
- To propose mitigation measures that would help the Project Proponent in conducting the operation in an environmental sustainable manner; and
- To develop an Environmental Management and Monitoring Plan that would assist the Project Proponent in the effective implementation of the recommendations of the EIA.

Figure ES-1: Project Location



ES.8 Description of the Environment

Topography

The Dera Ghazi Khan is located in a strip between the river Indus and the Koh-Suleman range of mountains separating it from the Baluchistan Province. It is surrounded by Dera Ismail Khan on the North and Rajanpur on its South. Indus river flows on the East across which lie the districts of Muzafargarh and Layyah. Loralai and Dera Bugti districts of Baluchistan Province lies on the West separated by the Koh-Suleman range of mountains.

D.G. Khan is one of the most progressive looking districts of Punjab with literacy rate of 48% amongst school going children. Schools are providing computing facilities to students. The people are industrious and talented.

Water Resources

Indus river is one of the longest rivers in the world, with a length of some 2,000 miles (3,200 km). Its total drainage area is about 450,000 square miles (1,165,000 square km), of which 175,000 square miles (453,000 square km) lie in the ranges and foothills of the Himalayas, the Hindu Kush, and the Karakoram Range; the rest is in the semiarid plains of Pakistan. River Indus is flowing in the east of DG Khan..

Climate

The climate of district is hot in summer and cold in winter. The climate is almost uniform throughout the district except hilly portion which has severe winter and a mild summer. Except the hilly track, land of D.G. Khan is plain. The temperature here averages 32 °C. The average annual rainfall is 104 mm.

Floral Attributes of the Project Area

Based upon observations during the field visit; many species of plants were directly observed in the project area. The number of anthropogenic activities in the area is very high. Major crops in the project area are wheat, peanut, sugarcane, and maize.

There is no protected area, wetlands or wildlife sanctuary inside the proposed project, however some forest has been observed in the proximity of the area.

Faunal Attributes of the Project Area

Based upon observations during the field visit many species of birds were directly observed in the project area. Most common species include Quail, Black Drongo, Brown Partridge, Egret, House Crow, Pigeon and Duck etc. All these species are also commonly found in other ecological zones of the country. Dense vegetation provides living shelter to the mammals like Cats, Goats, Sheep, Cow, Buffalo, Horse etc. All these species are commonly found in the project areas as well as in country and no significant threat can be expected from any activity.

ES.9 Socioeconomic Environment

A detailed socioeconomic survey was carried out in and around the project area. The purpose of the survey was to enumerate, evaluate and assess the existing social, cultural and economic conditions and to determine the community's requirements.

During field visit consultation was done along the proposed highway alignment. Population at and near vicinity of the proposed project area was consulted in order to get socioeconomic profile of the area. The average household size of the consulted population was found 6 persons per household.

The land in the project area mostly private land owned by locals comprising small and big landowners. The land required for the proposed alignment will be bought by the Government of Pakistan and proper compensation will be provided to locals as per laws of Government of Pakistan.

The majority of the area's population depends mainly on agriculture and livestock rearing for its livelihood, small business is also a source of earning. A number of people are employed in the education, irrigation, police, roads departments and Pakistan army. People also work in industries present at different locations in the vicinity of proposed project area.

Health facilities are available in the project site. In case of emergency, the patients visit District Government Hospitals present in city. There are several government and private schools in the city. For higher education, people consider moving to major cities like Multan, Lahore and Islamabad.

Agriculture is one of the most important economic activities in the project area. The land is suitable for irrigated agriculture and is capable of producing good yields of wheat, corn, sugarcane and maize. Livestock consists primarily of buffalos, sheep, cows, goats and donkeys. Livestock is the most important asset of the poor and the livestock they own is their major buffer against poverty.

ES.10 Potential Project Impact and Mitigation

The potential impacts associated with the proposed project construction and operation activities included: loss of vegetation and habitat; soil erosion due to earthwork, vehicle movement; soil contamination; increase in water consumption, air pollution from vehicle, generator exhausts and fuel combustion, waste generation, noise and disturbance; increased pressure on the wildlife of the area.

The physical scarring caused by clearing and levelling during project site construction activities could lead to alteration of soil quality by removal of topsoil, losses of plant cover and limited soil erosion induced by disturbance to native soil. Water will be required during proposed project activities. Water will be procured from nearest canals and it is also under consideration to use ground water which is of 80-100ft depth for construction camps.

Estimate demand in water resources to meet the requirements would be fulfilled from surface water sources crossing the alignment. Groundwater is also available in the majority of the area at 80-100 feet below the surface level. A water management plan will be developed. The plan will also include strategies to minimize water use (and therefore volume of discharge) and maintain reserves.

Surface water quality may deteriorate if pollutants are mixed with surface runoff during rain and carried to water resources in the vicinity. The impermeable septic tank will prevent untreated sewage from polluting soil. Sewage from the camp will

go into an impermeable septic tank. The impermeable septic tank will prevent untreated sewage from polluting surface water.

The ambient air quality of the area can be affected by exhaust emissions from the generators, vehicles and combustion of biomass. The pollutants can seriously impair human health and ecological environment and other materials. The emissions include sulphur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, and particulates. The emission levels depend on the type and size of activity, the type and quality of fuel and the manner in which it is burned.

A significant impact will be interpreted if the concentration of pollutants in the ambient air exceeds the PEQS or recognised international guidelines for ambient air quality guidelines. To reduce the impact on air quality, cleaner fuels (less 1% Sulphur content) will be preferred to procure. Monitoring of Ambient air parameters and emissions should be carried out on to ensure compliance with the PEQS.

National Highway Authority will implement a thorough waste management plan to ensure that any impact resulting from waste generation and management shall be minimal. The recyclable waste will be sold to waste contractors, as per waste management plan. No hazardous chemical will be uncontrollably discharged into the environment. A waste management plan will be developed and implemented by considering the best technological and environmental options and will apply the “Reduce, Re-use, Recycle” hierarchy thereby minimizing the overall fuel consumption.

Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a waste tracking register. Audits of the waste disposal contractors and waste disposal facilities will be undertaken on a regular basis to ensure the implementation of waste handling and disposal procedures.

Noise has the potential to cause an impact to nearby communities and working personnel. To avoid the impact of noise, it will be ensured that generators, vehicles

and other potentially noisy equipment used are in good condition. All on-site personnel will use required personal protective equipment (PPE) in high noise areas that will be clearly marked

To mitigate the project's impacts on the already stressed biological resources of the area, following measures will be incorporated into its design;

- Clearing of vegetation will be kept to an absolute minimum.
- Local wood for fuel will not be used during project activities.
- A 'no-hunting, no-trapping, no-harassing' policy will be strictly enforced.
- All the wastes will be properly handled, stored and disposed through implementation of an effective waste management plan.
- Reforestation activities will be followed.

A summary of potential impacts and proposed mitigation measures is provided in Table ES-1.

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Table ES-1: Summary of Impacts and Mitigation Measures

Environmental Aspects	Potential Impact	Recommended Mitigation Measures
Geology and Soils	Soil erosion, loss of topsoil, fuel and oil spills/contamination	❑ Avoid unnecessary vegetation clearing. ❑ Locate campsite in existing clearings and levelled areas. ❑ Avoid off-road travel. ❑ Maintain vehicle speeds. ❑ Avoid cluster vegetation clearing. ❑ Avoid and control major spills.
Water Resources	Depletion of ground water table due to over exploitation, contamination of water resources by the spillage of fuel, oil and chemicals	❑ Estimate demand in water resources to meet the requirements would be fulfilled from surface water sources crossing the alignment. Groundwater is also available in the majority of the area at 80-100 feet below the surface level. ❑ Fuels and lubricants will be stored in areas with impervious layers to prevent spills and contamination of soil and groundwater. ❑ All types of solid and liquid wastes will be handled as per waste management plan.
Air Quality	Vehicular emission, dust, combustion emission, GHG Emissions, Ozone depletion	❑ Properly tuning and maintain equipment to minimize air emissions. ❑ Use of cleaner fuels for combustion (less than 1% Sulphur content) ❑ Monitoring of stack air parameters (PM₁₀, SO₂, and NO_x) emissions should be carried out on quarterly basis to ensure compliance with the PEQS.

Environmental Aspects	Potential Impact	Recommended Mitigation Measures
		❑ No use of equipment and material containing asbestos, poly-chlorinated biphenyls (PCBs), and ozone depleting substances (ODSs).
Noise	Impacts at nearest community, Disturbance to the wildlife.	❑ All on-site personnel will use required personal protective equipment (PPE) in high noise areas that will be clearly marked. ❑ Restrict movement of project vehicles and personnel within work areas. ❑ Apply proper engineering control to noise producing sources like generator (Canopy and muffler will be installed to reduce the noise impact on the surrounding). ❑ Ensure that generators, vehicles and other potentially noisy equipment used are in good condition.
Waste Discharges	<u>Liquid Waste:</u> risk of liquid waste contaminating aquifer, contaminating surface water <u>Solid Waste (Non-hazardous):</u> Aesthetic issues <u>Hazardous waste:</u> soil, surface and aquifer contamination, contamination of surface and ground water, soil contamination, aesthetic issues	❑ A waste management plan will be developed before the start of the project activities. ❑ No untreated wastewater will be discharge into open environment ❑ All hazardous waste will be separated from other wastes. ❑ Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register. ❑ An emergency response plan will be developed for the hazardous waste (and substances).

Environmental Aspects	Potential Impact	Recommended Mitigation Measures
		□ On-site audits of the waste management will be undertaken on a regular basis during the project activity. □ Audits of the waste disposal contractors and waste disposal facilities will be undertaken on a regular basis to ensure the implementation of waste handling and disposal procedures.
Wildlife and Habitat	habitat loss and disturbance to fauna, hunting, accidental killing of wildlife	□ Minimize clearing of vegetation. □ Follow all mitigation measures recommended in the EIA to avoid or minimize noise levels, dust emissions, air emissions, and improper disposal of wastes. □ Do not dispose off food wastes in the open. □ Minimize total duration of activities by good management. □ Prohibit hunting, trapping, feeding or harassment of wildlife. □ Physical disturbance to areas outside the work corridors will be avoided;
Natural Vegetation	Clearing of vegetation proposed project	□ Avoid un-necessary damage to vegetation during construction activities. □ Where possible, set-up campsites in existing clearings. □ Minimize off road travel. □ Prohibit use of local firewood for cooking.
Socio – Economic Environment	Local procurement of goods and service, improper disposal of wastes, dust and exhaust emissions, noise from	□ Limit the social interaction between the workforce and the local communities. □ Dispose off all waste following the requirements of the EIA. □ Train drivers in responsible and safe driving practices.

Environmental Aspects	Potential Impact	Recommended Mitigation Measures
	project activities, Local employment.	❑ Train project staff to respect cultural norms. ❑ Residents of the area will be informed at least two weeks before project activities commence. ❑ Maximum number of unskilled and semi-skilled jobs will be reserved for the local communities.

ES.11 Environmental Management Plan (EMP)

For effective implementation and management of mitigation measures, an Environmental Management Plan has been prepared. The EMP provides a delivery mechanism to address potential impacts of project activities, to enhance project benefits and to introduce standards of good practice in all project activities. The EMP has been prepared with the objective of:

- Defining legislative requirements, guidelines and best industry practices that apply to the project.
- Defining mitigation/ monitoring plan required for avoiding or minimizing potential impacts assessed by the EIA.
- Defining roles and responsibilities of the project proponent and the contractor.
- Defining requirements for environmental monitoring and reporting.
- Defining the mechanism with which training will be provided to the project personnel.

Environmental sensitivities and impacts, as well as the associated mitigation plan have been addressed in the EMP. NHA will ensure that the project staff will be adequately trained in HSE sensitivities and operational management procedures, so that all levels of staff effectively contribute to impact prevention and mitigation at all times.

An Environmental Management Plan (EMP) has been prepared and provided in **Chapter 08** of the report, providing:

- A systematic approach to ensure that mitigation strategies prepared in this EIA are implemented during project activities.
- An appropriate monitoring plan is device to ensuring strict adherence to the environmental mitigation and control measures.
- A training program is device to providing awareness training on all potential environmental issues of the project to all personnel at site.
- A waste management plan, identifying the most suitable waste disposal and pollution control options throughout the project lifecycle.

ES.12 Proposed Monitoring

To monitor actual impacts of the project on selected sensitive receptors so that impacts not anticipated in the EIA or impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.

Considering the environmental conditions of the project area and the assessment of potential impacts of the project made in the EIA, the following environmental parameters will be monitored at locations identified during the construction phase (e.g. location of asphalt plants, construction camps etc.).

Air Quality Monitoring – Air quality monitoring will be done during the construction and operation phase of the project at the representative locations. Ambient air quality parameters will include NO_x, SO_x, CO, PM₁₀.

Water Quality Monitoring – Ground and surface water quality monitoring will be done during the construction and operation phase of the project at the representative locations.

Groundwater Quality Parameters: Total Coliforms, Total Colonial Count, Faecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium.

Wastewater Quality Parameters: pH, DO, TSS, Alkalinity, BOD₅, COD, Turbidity.

Noise Monitoring - The monitoring will be carried out at key locations covering all receptors.

1 Introduction

This chapter presents the data relevant to the undertaking of the EIA carried out by SGS Pakistan (Pvt.) Limited for the construction of Dera Ghazi Khan Northern Bypass (20 km) and details of the project title and project proponent, EIA consultants, the project rationale and the approach taken to the EIA study.

1.1 Project Title and Project Proponents

1.1.1 Project Title

The proposed project to which this Environmental Impact Assessment EIA relates is entitled as “EIA for Construction of Dera Ghazi Khan Northern Bypass (20 km)”. DG Khan northern bypass has been designed for 4-Lane dual carriageway bypass. A key map showing the location of the project area is shown in **Figure 1.1**.

1.1.2 Project Proponent

The proponent of the project is “National Highway Authority (NHA)”; while Prime Engineering & Testing Consultant (Pvt.) Ltd. has been assigned to prepare a complete feasibility of the project; including the preparation of the EIA of the said project to be submitted by them to NHA.

1.2 EIA Consultants

The EIA study was carried out by team of SGS Pakistan comprising of Environmentalist, Sociologist, Environmental Chemist and sector experts with diversified experience on local and international assignments. The detail of the project team deputed on this assignment is attached as **Annexure-A**.

1.3 Purpose of the Report

EIA is mandatory according to the Punjab Environmental Protection Act (Amended), 2012. Section 12 (1) of the Punjab PEPA (Amended), 2012 states that: “No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact

assessment, and has obtained from the Provincial Agency approval in respect thereof”.

1.4 Brief Description of Nature, Size, and Location of the Project

The proposed project is Construction of DG Khan Northern Bypass. The proposed alignment starts from approximately Km 98 of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms. Approximately 8.7 kms is passing through sandy area and remaining length after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed.

The proposed project has been designed for 4-Lane within the Right-of-Way (ROW). The facility shall be classified as 4-Lane (dual carriageway) rural arterial as per AASHTO standard classification. The proposed project road shall by-pass the villages or town in order to minimize acquisition of built up area and relocation of locals.

The length of proposed project is 20 kms. The materials to be used in construction of this project would include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement etc. Almost all these raw materials are mostly locally available along the alignment.

The project once completed will provide an adequate way to links between major cities, towns and villages and also available the provision of fastest route to indus highway and national highway. The proposed alignment also proves to be advantageous for the freight traffic moving goods, products and material within cities.

The Dera Cthazi Khan city is situated at the junction of Indus Highway (N-55) and National Highway (N-70). It is the central point of four provinces as it has borders meeting with the four provinces and traffic is coming to and from these provinces. Stone crushing plants are installed all along National Highway (N-70) from where the stone crushed argregates and sand are being supplied to the southern areas of

Punjab. A large cement producing factory named D.G Khan cement is also situated near the city which supplies cement all over country.

1.5 EIA Process

1.5.1 Overview of EIA

EIA is a systematic process to identify, predict and evaluate the environmental impacts of proposed actions and projects. The process is applied prior to major decisions and commitments being made. Wherever appropriate, social, cultural and health effects are considered as an integral part of EIA. Particular attention is given to practical implementation of EIA to prevent and mitigate significant adverse effects of proposed undertakings.

1.5.2 Objective of EIA

The overall objective of the EIA is as follows:

- Description of the proposed project, including an estimate of emissions, effluent and waste and consideration of the project alternatives;
- Identify and investigate all impacts of the proposed project on the physical, biological, and socio-economic environment;
- Evaluation of the baseline environmental conditions in the impact zone to provide a basis for assessing the incremental impacts of the proposed project, including existing pollution levels and nuisance conditions;
- Identification and assessment of the potential impacts on the environment during each of the project phases;
- To propose mitigation measures that would help the Project Proponent in conducting the operation in an environmental sustainable manner; and
- To develop an Environmental Management Plan that would assist the Project Proponent in the effective implementation of the recommendations of the EIA.

1.5.3 Scope of EIA

This EIA covers the construction & operational anticipated impacts of Dera Ghazi Khan Northern Bypass Project. The scope of the EIA includes:

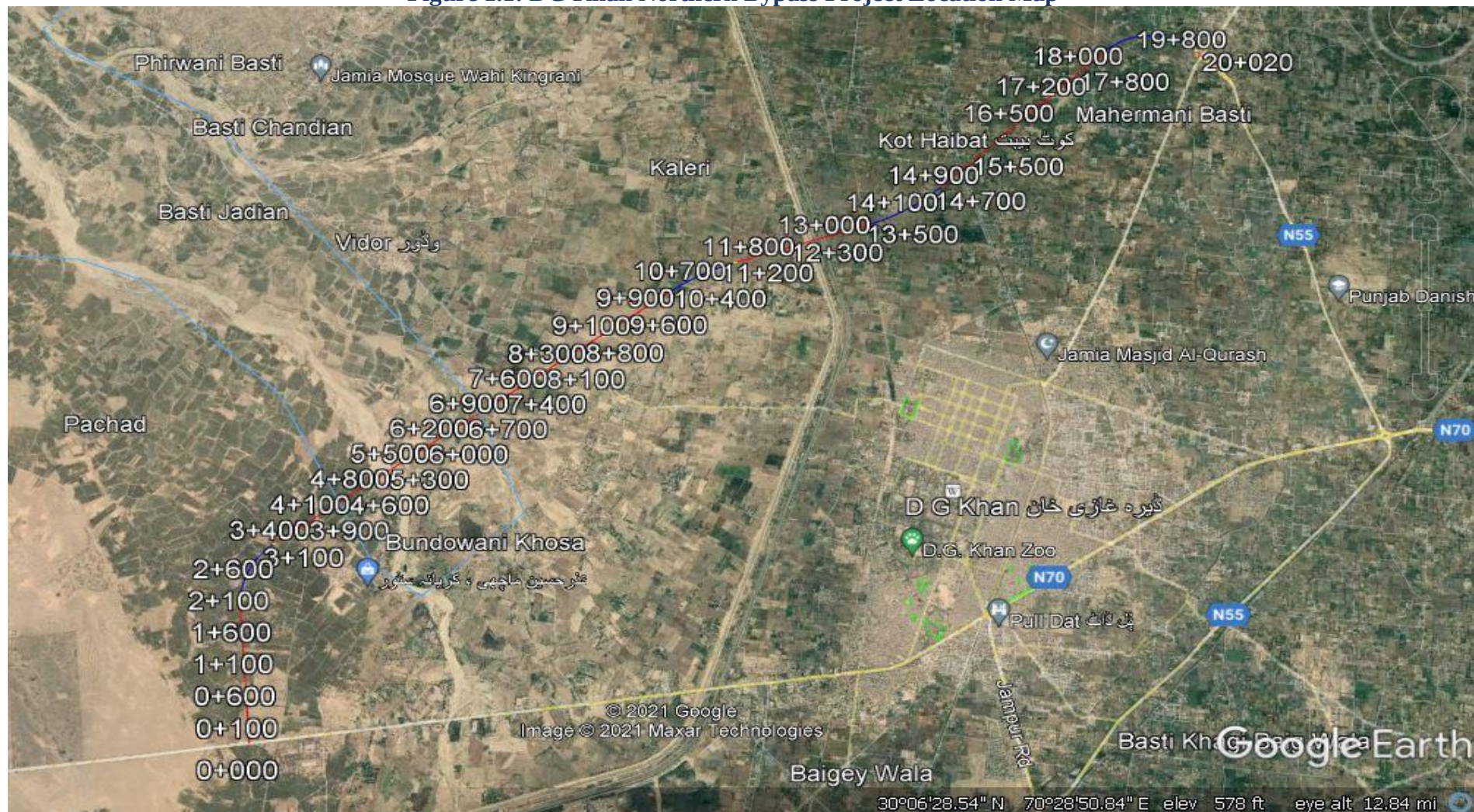
- Construction activities at the proposed project site;
- Relevant off-site construction activities;
- Operation.

1.5.4 Spatial Scope

Impacts are assessed within the area of influence of the proposed project defined as:

- *Immediate Area of Influence:* at immediate footprint of proposed project location.
- *Direct Area of Influence:* within the proposed project corridor and immediate surrounding of Right of Way (ROW).

Figure 1.1: DG Khan Northern Bypass Project Location Map





1.6 EIA Methodology

The EIA project passes through series of stages prior to report preparation. The EIA process and the approach followed for the proposed project is defined below:

1.6.1 Scoping

Scoping is an early stage of the process and is designed to ensure that the environmental studies provide all the relevant information on:

- the impacts of the project, in particular focusing on the most important impacts;
- the alternatives to the project;
- Other environmental sensitivities to be addressed at early stage.

The EIA process started with the scoping. The purpose of scoping was to identify:

- the important issues to be considered in an EIA;
- the appropriate time and space boundaries of the EIA study;
- the information necessary for decision-making;
- the significant effects and factors to be studied in detail.

The scoping was followed by data collection describes in subsequent section.

1.6.2 Data Collection

Following literature review and data collection was carried out for EIA:

- A generic description of the proposed project and its related activities was collected from the Prime Engineering & Testing Consultants (Pvt.) Limited.
- Legislative review of the applicable laws, regulations, guidelines and standards from various organizations and literature search.
- Baseline of the area's environmental and socio-economic settings was collected through literature search and field surveys.

1.6.3 Baseline

The environmental impact is measured through a change in the environment, resulting from a designated action or activity. In order to identify such a change, it is essential to have as complete as practicable understanding of the nature of the existing environment, prior to its interaction with the proposed activity. This

translates into the need to characterize the existing baseline environmental conditions, including establishing prevailing conditions for a range of environmental media, particularly air, water, soil and groundwater, flora and fauna and the human environment.

This was achieved through a detailed review of all secondary resources (i.e. existing documentation and literature); and the undertaking of project specific baseline studies and surveys to collect supplementary data in the following areas:

- Geology.
- Flora and fauna.
- Water quality characteristics.
- Soil quality.
- Traffic.
- Ambient air quality.
- Noise conditions.
- Socio-economic conditions.
- Archaeology.

Both the existing secondary sources and literature studies were conducted and integrated into one coherent description of baseline characteristics.

1.6.4 Stakeholder Consultation

Communities within the project area were consulted during the fieldwork to record their concerns and suggestions.

1.6.5 Evaluation of Alternatives

To establish an environmentally sound preferred option for achieving the objectives of the proposed project, different alternatives including site selection, raw material and technology alternatives were studied in collaboration with the project proponent. Technology selection was made taking into consideration environmentally, economically and socially suitable as well as technically feasible options.

1.6.6 Impact Assessment and Mitigation

The information collected in the previous phases was used to assess the potential environmental impacts of the proposed project activities. The impact assessment approach is provided in **Table 1.1**. Detailed methodology is included in Chapter 7 of the report. Mitigation measures were evaluated to reduce the impacts of project activities on environment. The issues studied during impact assessment include potential impacts on:

- Physical environment of the area
- Biological environment of the area
- Socio-economic environment of the area.

Table 1-1: Impact Assessment Approach

Impact Characteristics	Categories
Nature of the Impact	Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes as a result of change in another parameter.
Duration of the impact	Short term: Lasting only till the duration of the project such as noise from the construction activities. Medium term: Lasting for a period of few months to a year after the project before naturally reverting to the original condition. Long term: Lasting for a period much greater than medium term impacts before naturally reverting to the original condition.
Geographical Location of the impact	Local: Within the area of project i.e. operation site and access road. Regional: Within the boundaries of the project area. National: Within the boundaries of the country. Global: Trans-boundary impacts
Timing	Construction Operation
Likelihood of the impact	High: High likelihood of occurrence during lifetime of operation, Regular/continuous part of operations. Moderate: Moderate possibility of occurrence during lifetime of operation, Periodic/occasional part of operations. Low: Unlikely to occur during lifetime of operation.
Reversibility of the impact	Reversible: When a receptor resumes its pre-project condition. Irreversible: When a receptor does not or cannot resume its pre-project condition.
Significance of the impact	Major, Moderate, Minor, Negligible and Beneficial Based on the consequence, likelihood, reversibility, geographical extent, duration, level of public concern and conformance with legislative or statutory requirements.

Impact Characteristics	Categories
Consequence severity of impact	High: ❑ Serious/catastrophic damage to environment ❑ Direct legislative requirement ❑ Corporate requirement ❑ Serious threat to corporate reputation/profitability/ability to do business. Medium: ❑ Measurable damage to the environment ❑ Subject to potential future legislation ❑ Potential to affect reputation/cost ❑ Implication/reduced efficiency Low: ❑ Negligible damage to the environment ❑ No risk to business

1.7 Organization of the Report

This report has been structured in the following manner:

Chapter 2 (Legal Framework) gives an overview of policy and legislation along with international guidelines relevant to EIA.

Chapter 3 (Project Description) provides the description of the proposed project, its layout plan and associated activities, raw material details and utility requirement.

Chapter 4 (Project Alternatives) provides the description of the site alternatives for the proposed project.

Chapter 5 (Description of Baseline Environment) provides a description of the micro-environment and macro-environment of the proposed project site. This chapter describes the physical, ecological and socioeconomic resources land of project area and surroundings.

Chapter 6 (Stakeholder Consultation) presents the process and finding of stakeholder consultation being carried out for the proposed project.

Chapter 7 (Impact Assessment and Mitigation Measures) describes the potential environmental and social impacts of proposed project on the different features of the micro and macro-environment using the matrix method.

Chapter 8 (*Environmental Management Plan*) explains the mitigation measures proposed for the project in order to minimize the impacts to acceptable limits. It also describes implementation of mitigation measures on ground and monitoring of environmental parameters against likely environmental impacts.

Chapter 9 (*Conclusion*) summarizes the report and presents its conclusions.

The last Chapter is followed by the references and series of **Annexes** that provides supporting information.

1.8 Contact Details

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2 Legal Framework

This chapter provides an overview of the environmental policies, legislations, and guidelines that may have relevance to the proposed project. These include national environmental policy, legislation and guidelines; and international conventions and guidelines. NHA will be required to adhere to the relevant requirements of the policies and legislation during the construction and operation of the proposed activities; which has also been incorporated in the mitigation measures and the EMP provided in the EIA.

2.1 Constitutional Provision

According to the Constitution of Pakistan, the legislative powers lie with the federal parliament and the legislative assemblies of the four provinces of Pakistan. The Fourth Schedule of the constitution provides two lists of issues. One of the lists, the *Federal Legislative List*, includes issues on which only the federal government has legislative powers. The second list, the *Concurrent Legislative List* includes issues on which both the federal and the provincial governments have legislative powers. If a particular legislation passed by a provincial assembly comes into conflict with a law enacted by the national assembly, then according to the constitution, the federal legislation will prevail over the provincial legislation to the extent of the inconsistency. The subject of ‘environmental pollution and ecology’ is included in the concurrent list of the constitution. Thus, allowing both the federal and provincial governments to enact laws on the subject.

Prior to the 18th amendment in the constitution in 2010, only the federal government had enacted laws on environment, and the provincial environmental institutions derived their power from federal law. Article 9 of the constitution defines the right to life as a fundamental right in these words “No person shall be deprived of life or liberty save in accordance with law”.

2.2 National Environmental Policy, 2005

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting on 27th December, 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29th June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country. The broad Goal of NEP is, “To protect, conserve and restore Pakistan’s environment in order to improve the quality of life of the citizens through sustainable development”. The NEP identifies the following set of sectoral and cross-sectoral guidelines to achieve its Goal of Sustainable Development.

Sectoral Guidelines:

Water and sanitation, Air quality and noise, Waste management, Forestry, Biodiversity and Protected areas, Climate change and Ozone depletion, Energy efficiency and renewable, agriculture and livestock, and Multilateral environmental agreements.

Cross Sectoral Guidelines:

Poverty, Population, Gender, Health, Trade and environment, Environment and local governance and Natural disaster management.

The NEP suggests the following policy instruments to overcome the environmental problems throughout the country:

- Integration of environment into development planning,
- Legislation and regulatory framework,
- Capacity development,
- Economic and market-based instrument,
- Public awareness and education, and
- Public private civil society partnership.

NEP is a policy document and does not apply to projects. However, NHA should ensure that the project should not add to the aggravation of the environmental

issues identified in NEP and mitigation measures should be adopted to minimise or avoid any contribution of the project in these areas.

2.3 National Conservation Strategy

Before the approval of National Environmental Policy (NEP) the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment this strategy just exists as a national conservation program.

NCS does not directly apply to construction projects, however, NHA should ensure that the project should not add to the aggravation of the 14 core environmental issues identified in the NCS and mitigation measures should be adopted to minimise or avoid any contribution of the project in these areas.

2.4 National Environmental Legislation

The definition of environmental law can be derived from the legal definition of 'environment' as defined in PEPA 1997. In Section 2(x) of the Pakistan Environmental Protection Act 1997 (PEPA 1997) environment is defined to include air, water, land and layers of the atmosphere; living organisms and inorganic matter; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; social and economic conditions affecting community life; and the interrelationship between these elements. From this definition, an environmental law can be considered to include all laws that are designed to, or that directly or indirectly affect, the management of natural resources including the control of pollution of these natural resources.

By this definition, environmental laws include a) laws that have been specifically enacted to protect the environment such as the PEPA 1997, and b) laws relating to subject such as forest, water resources, wildlife, land, agriculture, health, and town planning.

2.4.1. The 18th Amendment in Constitution of Pakistan and Status of Punjab EPA

Prior to the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through

two 'lists' attached to the Constitution as Schedules as mentioned above. The subject of 'environmental pollution and ecology' was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18th Amendment this subject is now in the exclusive domain of the provincial government. As a result, the Ministry of Environment at the federal level has been abolished. Its functions related to the national environmental management have been transferred to the provinces. The international obligations in the context of environment will be managed by the Ministry of Climate Change.

As a result, Departments of Environment, Forest and Wildlife were formed by the Government of Punjab and Punjab Environmental Protection Department (PEPD) operates under this provincial government.

PEPD is a monitoring and regulating agency with the following main functions:

- Enforcement of Punjab Environmental Protection Act 1997 (Amendment 2012)
- Enforcement of PEQS and where unavailable NEQS
- Implementation of Self-Monitoring and Reporting Tool (SMART)
- Implementation of PEPA-Review of IEE and EIA Regulations 2000
- Coordination of pollution prevention and abatement measures between government and non-governmental organizations
- Assistance to provincial and local governments in implementation of schemes for proper disposal of wastes to ensure compliance with PEQS
- Undertaking measures to enhance awareness on environment among general public
- Conduct research and studies on different environmental issues
- Attend to public complaints on environmental issues
- Carry out any other task related to environment assigned by the government

Punjab EPD will be responsible for the review and approval of the EIA for the construction of DG Khan Northern Bypass Project.

2.4.2. Punjab Environmental Protection Act 1997 (Amended on 2012)

Legislative assembly of Punjab province reviewed and accepted the PEPA 1997 as Punjab's provincial act with some amendments on 18th April 2012. This act has been approved to provide protection, conservation, rehabilitation and improvement of the environment for the prevention and control of pollution and promotion of sustainable development in the whole of Punjab.

The Punjab Environmental Protection Act, 1997 (PEPA, Amended on 2012) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The PEPA is broadly applicable to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. Penalties have been prescribed for those contravening the provisions of the Act. The powers of the Provincial Environmental Protection Agency (PEPD) were also considerably enhanced under this legislation and they have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord, or upon the registration of a complaint.

Under section 12 of PEPA, no project involving construction activities or any change in the physical environment can be taken unless an IEE or EIA as required is conducted and a report submitted to the provincial EPA. This report has been prepared in general requirement of this Section of the Act.

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

The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 (the 'Regulations'), prepared by the Pak-EPA under the powers conferred upon it by the Punjab EPA, provide the necessary details on the preparation, submission, and review of the Initial Environmental Examination (IEE) and the Environmental Impact Assessment (EIA). The Regulation classifies projects on the basis of expected degree of adverse environmental impacts and lists them in two separate schedules. Schedule I lists projects that may not have significant environmental impacts and therefore require an IEE. Schedule II lists projects of potentially significant environmental impacts requiring preparation of an EIA.

As per Sub Part 2 of Part D (Transport) of Schedule II: any provincial highways or major road with a total cost of Rs. 50 million and above shall require filing of an EIA. Hence, the proposed project requires EIA to be submitted in EPA for Environmental Approval.

2.4.4. The Punjab Environmental Quality Standards (PEQS 2016)

The PEQS 2016 promulgated under the PEPA 1997 specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. The PEPA 1997 empowers the Punjab EPA to impose pollution charges in case of non-compliance to the PEQS. Standards for disposal of solid waste have as yet not been promulgated.

During the project, PEQS will apply to all type of effluents, emissions and noise levels from construction camp, commissioning and operation of the proposed project and associated facilities as follows.

- PEQS for Municipal and Industrial Effluents;
- PEQS for Drinking Water,
- PEQS for Ambient Air Quality;
- PEQS for Motor Vehicle Exhaust and Noise;
- PEQS for Noise;
- PEQS for Industrial Gaseous Emissions.

The above PEQS are provided in **Annexure-B**.

2.4.5. Land Acquisition Act, 1894

The Land Acquisition Act (1894) deals with the acquisition of private properties for public purposes. The large development projects including are also being considered under this Act. There are 55 sections in this Act mainly dealing with area notifications, surveys, acquisition, compensation, apportionment awards, disputes resolution, penalties and exemptions.

2.4.6. Canal and Drainage Act, 1873

Canals are defined as channels, pipes and reservoirs constructed and maintained by the Government for the supply for storage of water. Under section 27 of the Act a

person desiring to have a supply of water from a canal for purposes other than irrigation shall submit a written application to a Canal Officer who may, with the sanction of the Provincial Government give permission under special conditions.

2.4.7. The Forest Act 1927

This act is applicable to all regions of Pakistan. It includes procedures for constituting and managing various types of forests, such as reserved forests and protected forests. There are no preserved forests within the Right of Way (ROW) of the proposed project; however, in case of any deviation from the ROW, proponent shall intimate to the Department about the same.

2.4.8. Cutting of Trees (Prohibition) Act, 1975

This Act prohibits cutting or chopping of trees without permission of the Forest Department. Proponent shall ensure that no trees are cut within the Right of Way of the proposed project, except deemed necessary and with the approvals of associated department.

2.4.9. Antiquities Act 1975

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

No antiquity protected under the law was identified in the vicinity of the proposed project during fieldwork for the EIA. Furthermore, the project site is unlikely to contain any buried antiquity. However, the project staff will be instructed before ground preparation and earthworks to report any archaeological artifact or what may appear to be an archaeological relic to the project management. In case of such a discovery, appropriate action will be taken.

2.4.10. Pakistan Penal Code, 1860

The Pakistan Penal Code (1860) authorises fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.

2.4.11. Highways Safety Ordinance, 2000

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

2.4.12. Motor Vehicle Rules, 1969

Motor Vehicle Rules 1969 (MVR 1969) define powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory measures that can be taken to tackle the ambient air quality problems associated with the vehicular emissions during operation phase.

2.5 National Environmental Guidelines

2.5.1. The Pakistan Environmental Assessment Procedures, 1997

The Pakistan Environmental Protection Agency prepared the Pakistan Environmental Assessment Procedures in 1997. They are based on much of the existing work done by international donor agencies and Non Governmental Organisations (NGO's).

2.6 International Conventions & Treaties

2.6.1. Convention on Biological Diversity

The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programmes and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to

develop systems to monitor the use of such components with a view to promoting their sustainable use.

2.6.2. The Convention on Conservation of Migratory Species of Wild Animals, 1979

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1979, requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or co-operate with other countries in matters of research on migratory species.

The Convention contains two appendices. Appendix I contain the list of migratory species that are endangered according to the best scientific evidence available. For these species, the member states are required to endeavour to:

- Conserve and restore their habitats.
- Prohibit their hunting, fishing, and capturing, harassing and deliberate killing.
- Remove obstacles and minimize activities that seriously hinder their migration.
- Control other factors that might endanger them, including control of introduced exotic species.

Appendix II lists migratory species, or groups of species, that have an unfavourable conservation status as well as those that would benefit significantly from the international co-operation that could be achieved through intergovernmental agreements.

2.6.3. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This convention came into effect in March 1973 at Washington. In all 130 countries are signatory to this convention with Pakistan signing the convention in 1976.

The convention requires the signatories to impose strict regulations (including penalisation, confiscation of the specimen etc.) regarding trade of all species

threatened with extinction or that may become so, in order not to endanger further their survival.

The Convention contains three appendices. Appendix I include all species threatened with extinction, which are or may be affected by trade. The Convention requires that trade in these species should be subject to strict regulations. Appendix II includes species that are not necessarily threatened presently but may become so unless trade in specimen of these species is subject to strict regulations. Appendix III includes species which any contracting party identifies as subject to regulations in trade and requires other parties to co-operate in this matter.

2.6.4. International Union for Conservation of Nature and Natural Resources (IUCN) Red List

The red list is published by IUCN and includes those species that are under potential threat of extinction. These species have been categorised as:

- **Endangered:** species that are sent to be facing a very high risk of extinction in the wild in the near future, reduction of 50% or more either in the last 10 years or over the last three generations, survive only in small numbers, or have very small populations.
- **Vulnerable in Decline:** species that are seen to be facing a risk of extinction in the wild, having apparent reductions of 20% or more in the last 10 years or three generations.
- **Vulnerable:** species that are seen to be facing a high risk of extinction in the wild, but not necessarily experiencing recent reductions in population size.
- **Lower Risk:** species that are seen to be facing a risk of extinction that is lesser in extent that for any of the above categories.
- **Data Deficient:** species that may be at risk of extinction in the wild but at the present time there is insufficient information available to make a firm decision about its status.

2.6.5. International and National NGOs

International environmental and conservation organisations such as IUCN and the World-Wide Fund for nature (WWF) have been active in Pakistan for some time. Both these organisations have worked closely with government and act in an advisory role with regard to the formulation of environmental and conservation Policies. Since the convening of the Rio Summit, a number of national

environmental NGO's have also been formed, and have been engaged in advocacy, and in some cases, research.

2.7 Project Administrative Bodies

The implementing agency of the proposed project is NHA, therefore, NHA is responsible for liaising with line departments to ensure that the Project complies with the laws and regulations controlling the environmental concerns of bypass construction and operation, and that all pre-construction requisites, such as permits and clearances are met. The Office of Environment, Afforestation, Land and Social (EALS) of NHA will be responsible for ensuring that all the measures proposed in the Environmental Management Plan are effectively implemented by the contractor during construction phase and by Directorate of Operation & Maintenance of NHA during operation phase of the proposed Project.

2.7.1. Environmental Protection Agency EPA Punjab

Pakistan Environmental Protection Council (PEPC) is the apex inter-ministerial and multi-stakeholder decision making body, which is headed by the Prime Minister. The Pakistan Environmental Protection Agency (Pak-EPA) is the regulatory body responsible for enforcement of Pakistan Environmental Protection Act, 1997. After the 18th amendment, the powers have been delegated to provincial environmental protection agencies for review, approval and monitoring of environmental assessment of projects. For this proposed project, the Punjab-EPA will be responsible for reviewing the EIA report, issuing environmental approval and post approval monitoring of the proposed project activities to ensure compliance with the Environmental Management Plan (EMP) and any other condition of the environmental approval.

2.7.2. Forest Departments of Punjab

The Project implementation will involve clearing of vegetation and trees within the Right of Way (ROW). The Tree avenue plantation will be carried out by the NHA itself or through work awarded to Punjab Forest Department. NHA will also be responsible for liaising with Provincial Forest Department on the types of trees to be planted and other matters concerning plantation layout as an environmental mitigation measure.

2.7.3. Wildlife Department Punjab

Punjab Wildlife Department control the district wildlife through District Officers Wildlife DO (W). According to wildlife department setup, this project comes under the jurisdiction of DO (W) of the two districts of Punjab.

Wildlife related issues pertaining to such areas and associated with the jurisdiction of Punjab during all stages of the Project, the contractor/ proponent will resolve it with the consultation of respective wildlife offices.

3. Project Description

This section provides the brief detail of the proposed project construction of Dera Ghazi Khan Northern Bypass. The project traverses through Dera Ghazi Khan district of Punjab Province. The total project length is 20 km. Proposed project aims are to connect the major cities and towns to serve as fast, efficient and modern means of land transport of goods, passengers for enhancing trade within the cities as well.

The proposed alignment starts from approximately Km 98 of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms. Approximately 8.7 Kms is passing through sandy area and remaining length after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed.

3.1 Need Assessment of the Project & Objectives

National Highways play an important role from regional perspective as they carry transit traffic from Pakistan to China, Iran, Afghanistan and Central Asia States and provide access to almost all parts of the country. Under this project National Highway Authority (NHA) has planned for construction of DG Khan Northern Bypass.

D.G Khan City is a congested City of Southern Punjab. Two National Highways N-55 and N-70 along with other provincial roads are passing through D.G. Khan City. It is a central point of the four provinces as it has borders meeting with all the four provinces and traffic is coming to and from these provinces.

A major traffic coming from Karachi Port on Indus Highway (N-55) and passing through the D.G. Khan City. The eastern bypass has already been constructed under the Indus Highway project in 1999. However, the traffic using National Highway (N-70) still has to pass through the heart of the city in a length of about 10 to 12 Kms which creates a bottleneck and results in frequent blockage of heavy traffic.

The proposed project will largely contribute to the economic and social development of the area and adjoining areas as well as Pakistan on a larger scale. It will bring more population into the stream of benefits, which in turn will change the social complexion of people around this bypass. This link will also contribute to ensure smooth and efficient movement of trade, goods and traffic in relatively shorter time.

The implementation of the project is envisaged to have the following objectives:

- The construction of the said bypass will provide a better road facility for the inhabitants of a lesser developed area of Dera Ghazi Khan and remove the grievances of people of southern Punjab.
- 4-Lane dual carriageway bypass will provide uninterrupted traffic flow resolution and result in ultimate reduction of cost of all suppliers and cost of living index.
- Problem of traffic blockage and congestion in Dera Ghazi Khan City will be solved.
- Time saving of passengers and reduction in accident of traffic user will be possible.
- Provision of employment opportunities during and after the construction of the project thus alleviating the poverty of the area.
- Vehicle operating cost will be reduced.

3.2 Project Location

The proposed alignment starts approximately at Km 98+000 of National Highway (N-70) and traverses upwards on north side to meet the Indus Highway (N-55) approximately at Km 705+000, which is the junction point of Eastern Bypass. The total length of the Bypass is 20 Kms. Project location map is attached as Figure 3.1.

3.3 Project Administrative Jurisdiction

The project corridor will pass through administrations of 3 districts. The proposed project section falls under the following administrative jurisdiction.

3.4 Land Use on the Site

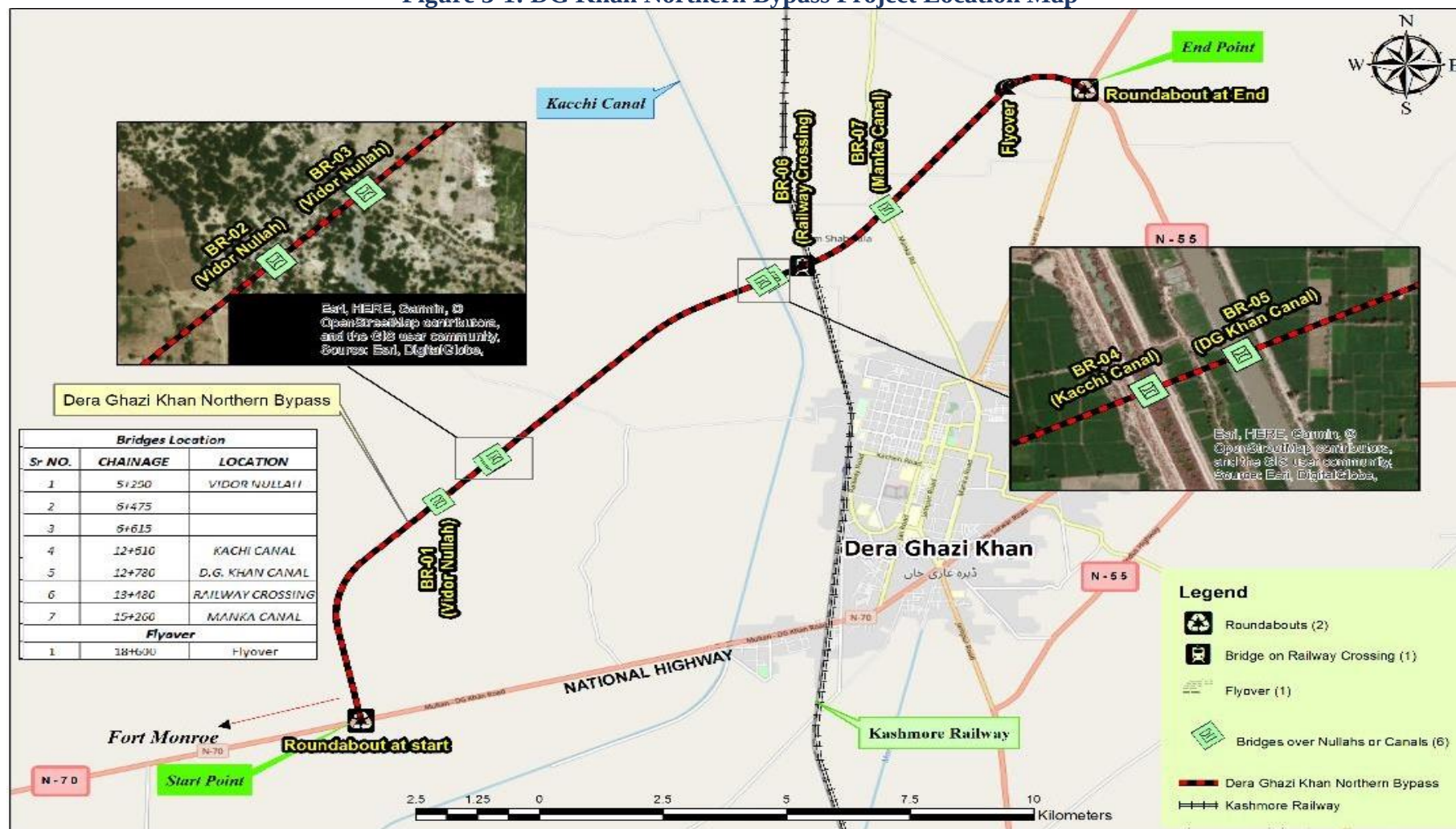
The proposed alignment starts from approximately Km 98 of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms.

Approximately 8.7 Kms is passing through sandy area and remaining length after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed. Details on land/topography and socioeconomic setting of the area is described in Chapter 5.

3.5 Road Access

The major access roads to the proposed project is National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms.

Figure 3-1: DG Khan Northern Bypass Project Location Map



3.6 Vegetation Features of the Site

The number of anthropogenic activities in the area is very high. The major crops of the district are Wheat, Rice, Oil Seeds and Cotton. This is among one of the best cottons growing districts of the country. The major fruits are Citrus, Mango and Guava. Besides, Sunflower, Sugarcane, Jawar, Bajra, Mash, Moong, Masoor, Gram, Maize are also grown in minor quantities in the district.

3.7 Project Implementation Schedule

The construction of the proposed project is expected to be completed within a time period of 18 months including all procurement, financial closing and construction activities. The procurement of works and financial closing is estimated to be completed by May 2021. The construction of the proposed project will be executed after receiving of all relevant approvals. Salient features of the project schedule are mentioned below:

Procurement of works	= 06 Months
Construction Period	= 18 Months
Construction Starting Date	= After Environmental Approval
Construction Completion Date	= Six months after start of construction

3.8 Alignment Alternatives

Keeping in view the environmental, social and economic aspects of the development; two alternatives were considered for the proposed project. Most feasible option in the context of environment, economic and social sustainability was considered for further development. The options that were evaluated to achieve the required goal are provided in Chapter 04 Project Alternatives.

3.9 Components of the Project

The proposed Project is designed for 120 km/hr speed facility. The project is designed for 4-lane dual carriageway with 3.65 m lane width and whole corridor Right of Way (ROW) is 60m. The civil works will involve construction of four lanes, fence, 04 minors' bridges and Flyover at D.G. Khan Bypass.

Road Geometric Standards:

AASHTO geometric guidelines have been used as Geometric standard for the design of the project:

ROW	60m
Length of Project	20.02 Km
Lanes	4-Lane
Lane Width	3.65 m
Shoulder	2.5m each side (outer), 0.6m each side (Inner)
Minor Bridges/ Flyover	07 numbers
Design Speed	120 km/hr

3.10 Design of Proposed Project

It is envisaged that the Project shall be constructed as 4-Lane dual carriageway. Culverts shall be constructed over cross drainage works. Road furniture comprising of lane markings, traffic signs, guard rails and reflectors shall be provided. Proper intersections shall be designed where required.

The geometric design of the proposed highway project shall be governed by AASHTO Criteria. DG Khan Northern Bypass project shall conform to the following specifications entailing design speed of 120 Km/hr, road width (Travel Lanes) consisting of 4-lane. Various locations along the proposed ROW require provision for smooth connection for the existing route for communication.

Design Life:

Embankment	50 years
Bridges	100 years
Road Pavement	10 years

Design Standards and Codes:

Maximum super elevation	6%
-------------------------	----

Geometric design standards	A policy on geometric design of highway and streets 2003
Classification of Highway	Rural Highway
Design vehicle	6-axle trailer (1.20+202)
Maximum grade	1.5%
Minimum grade	0.5% in cut and 0.3% in fill
Drainage	Curb and gutter and chutes for controlled drainage

3.11 Civil Works

The proposed DG Khan Northern Bypass is designed for 120 km/hr speed facility.

The civil works will involve construction of four lanes, grade-separated interchanges, cross drainage structures, 07 minor bridge etc.

The bypass will be 4 lanes (2 lane each direction). Inner shoulder will be 0.6m wide and outer shoulder will be 2.5m wide with median barrier in between having 3.65m lane width.

3.12 Traffic Estimate

Traffic estimate has been carried out for the proposed bypass project based on a Traffic Survey carried out at different stations along the proposed alignment. A vehicular load of approximately 8382 vehicles were estimated considering base year of 2021.

3.13 Construction Materials

The materials to be used in construction of this bypass would include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement etc. Almost all these raw materials are mostly locally available along the alignment. Huge magnitude of construction material for proposed bypass will be procured from approved quarries and new quarries may be required by the contractor to be approved during that stage.

3.14 Cost & Magnitude

The total cost of the proposed project is estimated to be around **Rs. 7,148,926,887** for 4-lane project as per LOS requirements and estimated cost break up is given in table 3-1.

Table 3-1: Tentative Breakup Cost

1	Construction Cost	6,393,212,431
2	Contingencies at 3% of A	191,796,373
3	NHA Establishment Charges at 1.5% of A	95,898,186
4	Consultancy Fee For Design & supervision at 3% of A	191,796,373
5	Escalation at 0% (on 60%), 6.5% (on 40%)	166,203,523
6	Enviromental Protection & Mitigation Charges	10,000,000
7	Shifting of Utilities	100,000,000
Total Cost		7,148,926,887

3.15 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 local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the contractor after approval from client- NHA.

The area requirement for construction camps will depend upon the deployed manpower and the type and quantity of machinery mobilized. In view of the area required, it will not be possible to locate camp sites within the ROW and the contractors will have to acquire land on lease from private landowners for the establishment of Camps. Environmental Management Plan (EMP) considerations will have to be considered before the selection of sites for the required purpose.

3.16 Manpower Requirements

The contractor will mobilize staff depending on the stretch of site to be constructed and package length awarded to the contractor. The manpower required during the construction and operation of the proposed Bypass would be 150 during construction phase and approximately 60 staff during operation phase of the project.

3.17 Construction Machinery and Equipment

The list of the machinery and the equipment required but not limited to for the proposed project is given below:

- | | |
|------------------------|-------------------------------------|
| 1. Dump Truck | 11. Self-Propelled Pneumatic Roller |
| 2. Front End Loader | 12. Asphalt Distributor |
| 3. Dozer | 13. Batching Plant/Crusher |
| 4. Grader | 14. Concrete Transit Truck |
| 5. Vibratory Roller | 15. Concrete Pump |
| 6. Water Tankers | 16. Excavator |
| 7. Spreader | 17. Water Pumps |
| 8. Three Wheel Rollers | 18. Cranes |
| 9. Tandem Roller | 19. Vibrators |
| 10. Asphalt Plant | 20. Generators |

3.18 Restoration and Rehabilitation Plan

After the completion of construction phase of the proposed project, it is the responsibility of the contractor to restore the site that has been disturbed due to construction activities. It is responsibility of NHA to ensure that environmental value of the project area is maintained for future generations. There may be areas that could be affected by construction activities which may require rehabilitation such as stockpile sites, campsites, side-tracks, borrow pits and washing yard.

Stockpile sites

Stockpile areas and construction camp sites should be developed to sustain the visual aspect of the project area. Limits of disturbance and/or clearing must be clearly marked out on the site using posts or flagging tape before any ground disturbing activity takes place.

side-tracks

Sidetracks may create a much greater impact than the actual construction site itself. If sidetracks are justified, limits of disturbance must be clearly marked out on the site before any ground disturbing activity takes place. Rehabilitation of sidetracks require removal and disposal of fill materials used for temporary approaches, abutments, crossings or embankments. All remaining areas must be reshaped to blend back in with preexisting landforms.

Borrow Pits

Borrow pits are areas either in a road reserve or adjacent land holdings that have been used to extract materials such as gravels and soils. They can vary considerably in size, depending on the quantity of material taken and the borrow pits' reserve body of remaining material. The variable size, shape and nature of borrow pits preclude very specific recommendations; however, the following general conditions apply

- Before extraction commences, licenses and permits should be checked and limits of disturbance and/or clearing must be clearly marked out on the site before any ground disturbing activity takes place; and
- At the completion of extraction, the former borrow pit must be made stable and safe. This usually requires the sides of the pit to be reshaped with gentle safe grades. All disturbed areas associated with borrow pits must be retopsoiled, seeded, fertilized and mulched (if appropriate) as part of the restoration plan. Main Roads has been discouraging the conversion of borrow pits to stock watering points.

Monitoring

To achieve continuous improvement and ensure the activities specified in contracts are being adhered to, regular monitoring will be undertaken with emphasis placed on the continuity between site characteristics and the adjacent landscapes. Restoration of sites disturbed by construction activities is unlikely to ever mimic the original landscape. Performance of the contractor can usually be gauged by comparing adjacent landscapes. Low continuity between these landscapes usually indicates that no attention has been given to site stability.

4 Project Alternatives

The discussion and analysis of Alternatives in an Environmental Impact Assessment (EIA) considers different practicable strategies that will promote the elimination of identified negative environmental impacts. This section is a requirement of the EPA Punjab and is critical in consideration of the ideal development with minimal environmental disturbance. This report has identified some major environmental impacts as noted by scientific experts. The findings of these impacts were utilized to analyze possible options for the final development. The following alternatives have been identified and are discussed in further detail below:

- Alternative-I ‘No Development Option’
- Alternative-II Site Option - Site Selection Criteria’
- Alternative-III ‘Other Transport Modes’

4.1 Alternative-I No Development Option

The “No Development” alternative is required to ensure the consideration of the original environment without any development. This is necessary for the decision-makers in considering all possibilities. The development will have a minimal effect on the physical environment. In terms of the social environment, the “No Development” alternative would result in traffic density on the existing roads, detour during floods / rains, increase travel hazard, eliminate job opportunities, higher transport costs, higher travel time, less efficient traveling, non-development of the hinter-land, increase the dust nuisance created by driving on deteriorated road and increase the wear and tear on the vehicles. If the existing road network will continue to be the main transportation passing through the city, traffic congestion is expected to increase, while, road conditions are expected to deteriorate resulting in more frequent traffic congestions; resulting in frequent accidents and traffic jams with the passage of time. Residents of the proposed belt will keep on suffering from degraded or lacking efficient transportation access. The NO PROJECT conditions will result in further worsening the present environmental conditions and increased disturbance to residents of the existing road network areas and the road users. Keeping in view increased population, lack of vibrant and efficient economic corridor across the

country, lack of job opportunities, lack of good governance and security control, it is important that the traffic shall be diverted outside the city to avoid traffic congestions and air pollution and to cater for the increased vehicular movement carrying the freight and passengers across the city and to provide impetus for regional connectivity to Pakistan.

4.2 Alternative-II 'Site Option - Site Selection Criteria'

Keeping in view the environmental, social and economic aspects of the development, proposed location was considered for the proposed project. Most feasible option in context of environment, economic and social sustainability was considered for further development. For the proposed project of DG Khan Bypass, three (03) options of alignments were considered. The salient features and their differences are listed below:

Option-1: Follows shorter route of 18.53 km.

Option – 1 as mentioned this option follows the shorter route which is passing close to the city population and agriculture lands. This resulted in the route passes through and near the major settlements connects at the N-55.

Option-2: Follows shorter route of 18.9 km.

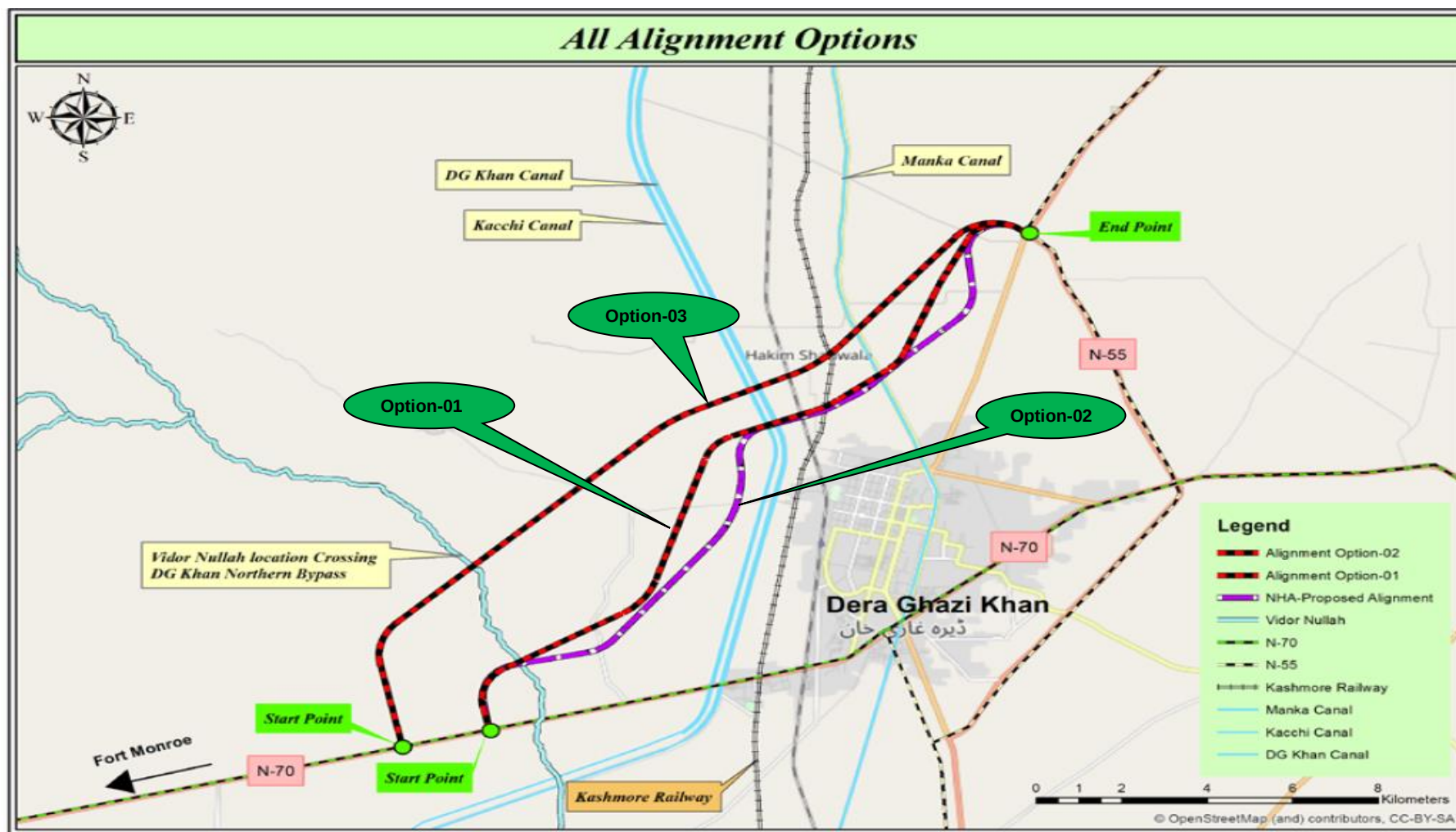
Option – 2 as mentioned this option follows the shorter route which is also passing close to the major settlement and agriculture lands. This will also result in the route passes through and near the major settlements on the existing road and connects at the N-55.

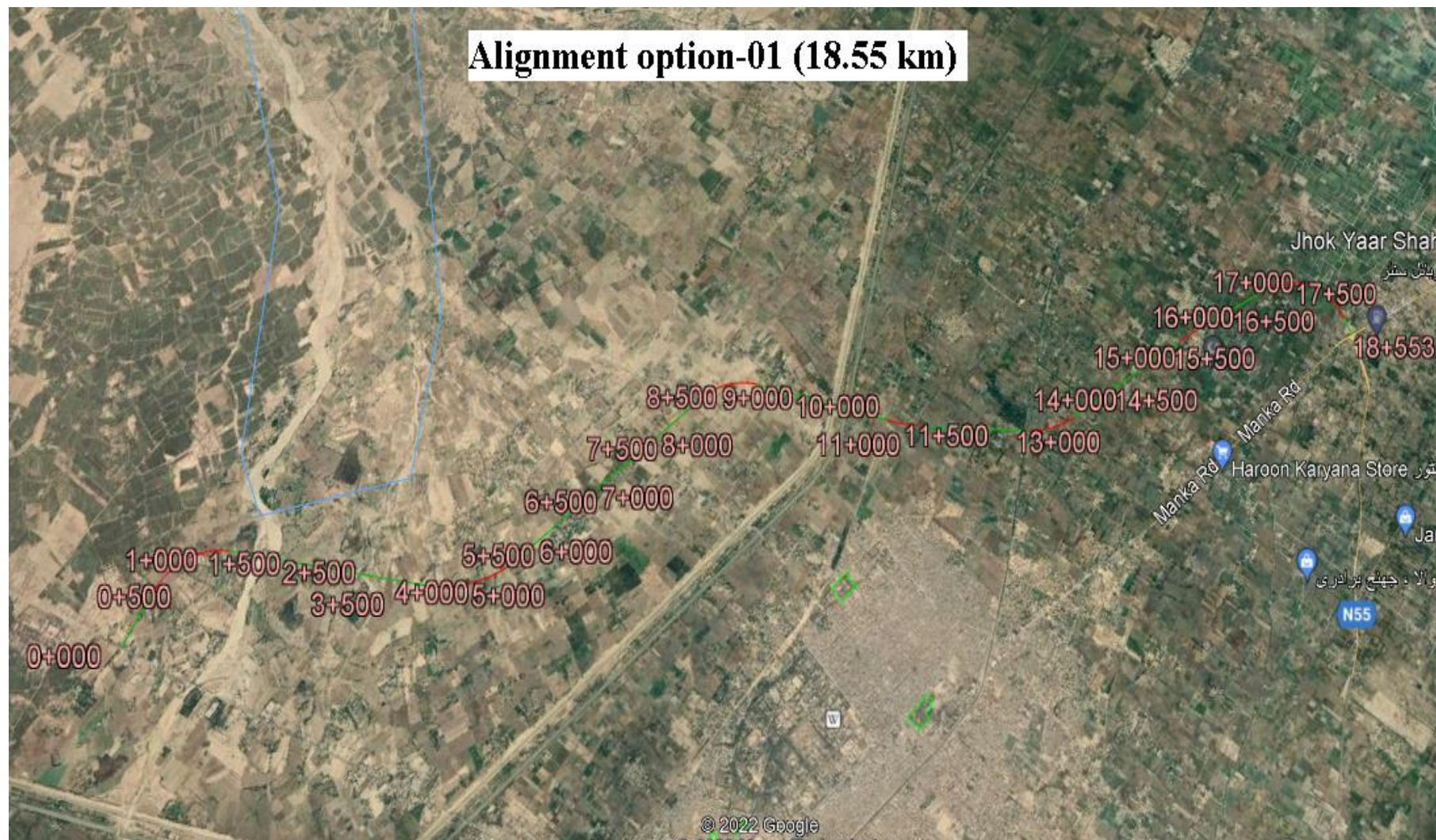
Option-3: Follow bypass route of 20 km.

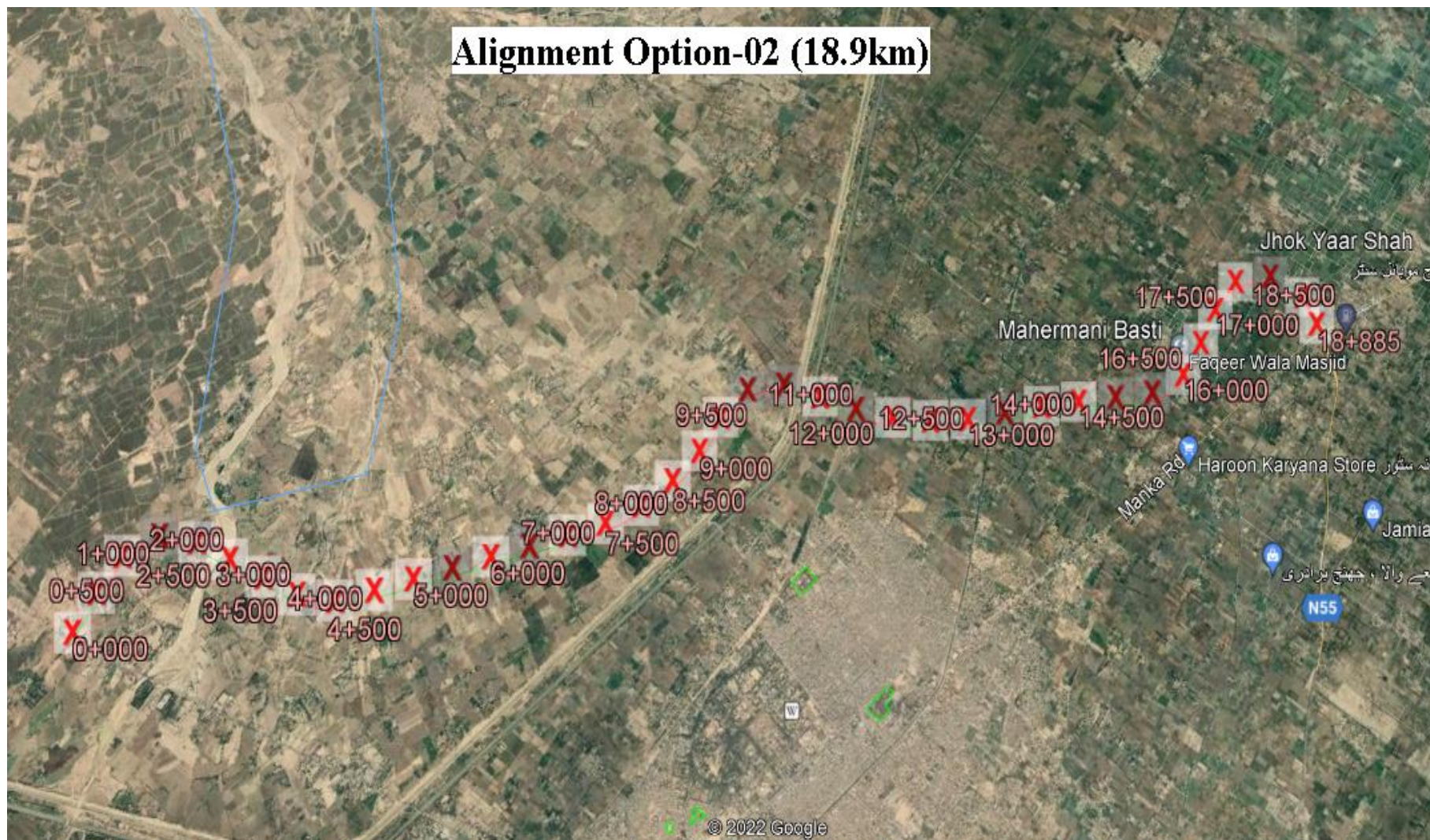
Construction of the bypass as new alignment passing from away distance as compared with option-01 and option-02 avoiding traffic congestions. The initiation point moved to the west i.e. 3.82KM from the Airport road.

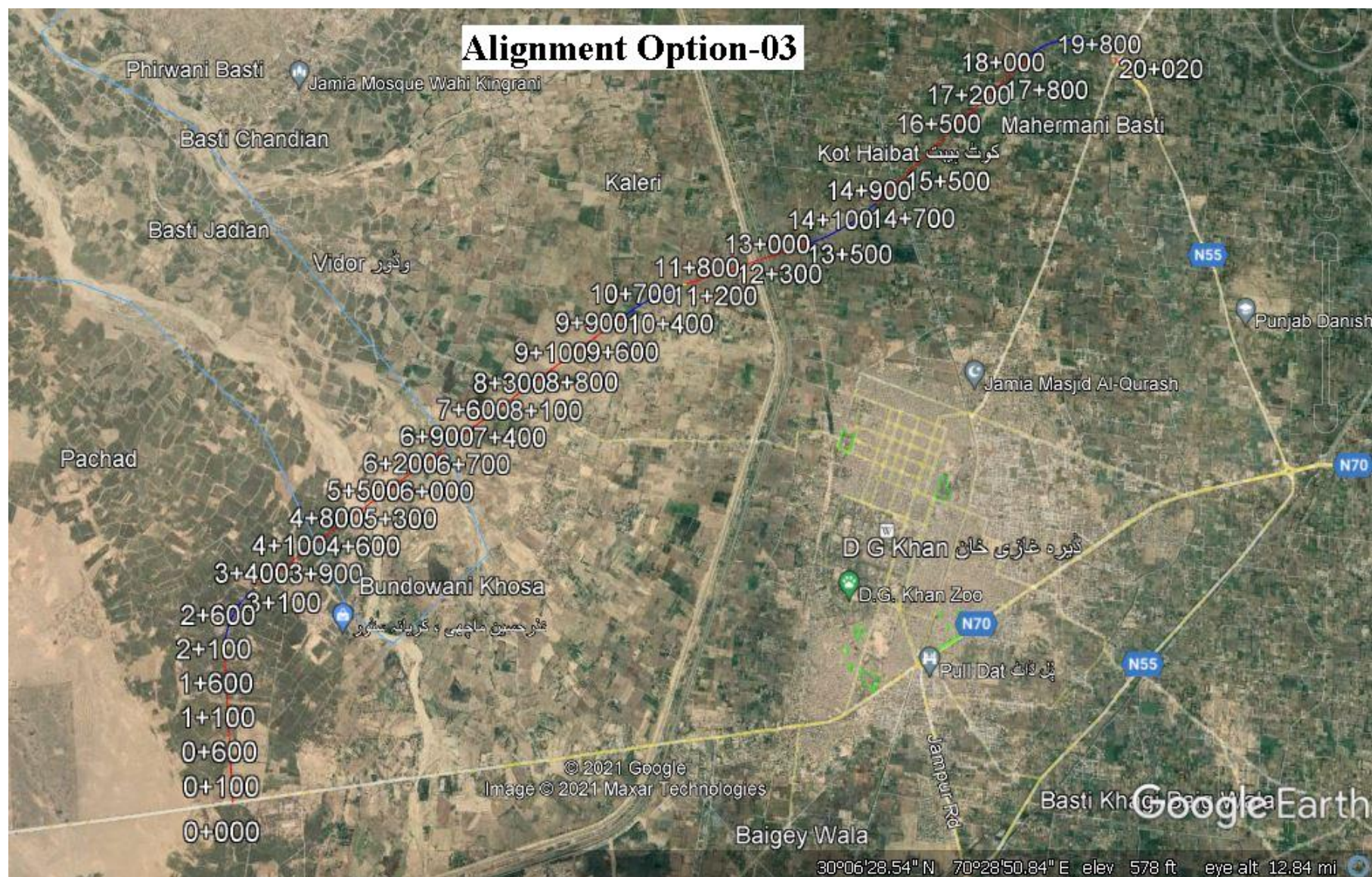
All options for the proposed DG Khan northern bypass are shown in the following maps as **Figure 4.1**.

Figure 4-1: All Alignment Options









4.2.1 Evaluation Criteria

The sites were evaluated for the proposed project in order to control and mitigate the environmental and socioeconomic impacts at an early stage. The evaluation of sites was based on following criterion:

1. Sufficient land should be available for development.
2. It should be easily accessible not putting an additional construction/transportation cost to access the proposed project.
3. Proximity of environmentally sensitive receptors should be avoided.
4. There must be minimum resettlement requirements.
5. Minimum cutting of the trees.
6. Avoiding all the locations/structures of cultural and archeological importance.
7. It shall be designed such that the traffic load passing through the city can be diverted to avoid traffic congestion in the city.

4.2.2 Site Selection

Recognizing that the proposed development may have adverse impacts on surrounding environment, site selection exercise was carried out in close consultation with the Prime Engineering team. Proposed alignment for bypass project was decided as an appropriate option to achieve a balance between the area to be used for the construction and resources required maintaining the operations. The merits and demerit of the options evaluated are given in below Table 4.1.

Table 4-1: Merits & Demerits of Alignment Options for the Proposed Project

Alignment Options	Total Covered Length (Km)	Merits	Demerits
Option 1	18.5	▪ Shorter route ▪ Less cost ▪ Economic benefits ▪ Easy and safe movement	▪ Alignment passes close to the major towns ▪ More people will be affected from this option ▪ Construction of round about required for Government Institute of Technology, D.G. Khan, which will add to the traffic congestion and risk of accidents. ▪ More allied structures falling in this alignment
Option 2	18.9	▪ People willingness as it is public demand since many years ▪ Less cost ▪ Social benefits ▪ Safety benefits ▪ Economic benefits ▪ Easy and safe movement ▪ Reducing car accident, travel time and cost ▪ Savings in vehicle operating costs and travel time ▪ Lower resettlement to be required ▪ Bypass to avoid resettlement in the major towns. ▪ Bypass to divert the heavy traffic out of towns to reduce traffic congestions. ▪ Safe and time saving travel.	▪ More people will be affected from this option ▪ Construction of round about required for Government Institute of Technology, D.G. Khan, which will add to the traffic congestion and risk of accidents. ▪ More allied structures falling in this alignment ▪ Damage to the number of trees present on the sides of the road.
Option 3	20	▪ Social benefits	▪ Higher cost

Alignment Options	Total Covered Length (Km)	Merits	Demerits
		▪ Safety benefits ▪ Economic benefits ▪ Easy and safe movement ▪ Reducing car accident, travel time and cost ▪ Less people will be affected ▪ Savings in vehicle operating costs and travel time ▪ Lower resettlement to be required ▪ People willingness as it is public demand since many years ▪ Bypass to avoid resettlement in the major towns. ▪ Bypass to divert the heavy traffic out of towns to reduce traffic congestions.	▪ Cutting of trees

4.3 Alternative-III Other Transport Modes

The alternative transport mode includes railway, whereas, air access is not found feasible on financial grounds. The train service already exists in the area, but it is insufficient to meet the requirement of transportation and trade. With the improvement of the railway network, the traffic may be reduced up to some extent; however, this would not be the solution to cater the traffic problems and required economic and commercial goals in the near future.

4.4 Comparison Analysis of Alternatives

The comparison between the above three alternatives were based on the environmental, social, technological and economic impacts. The comparison shows that Alternative: III: Selection of Best Possible Site Option was found to be the most suitable alternative to have it applicable.

For **Alternative: III - Site Option - Site Selection Criteria**; A number of Alignment Options for proposed bypass were developed, in order to explore the best and most efficient alignment/route that meets the project goals such as time saving, minimum travel time, straighter route, cost efficient etc. Out of three alignments option developed, **Option-3** was selected as the final alignment for the highway. Option 3 is 20 KM in length and opted due to the following reasons:

- Lower resettlement is required for construction of the proposed bypass project.
- Less allied structures falling in this option
- Less people will be affected by this option
- Accidents and traffic congestion will be minimized

In order to explore the best and most efficient alignment/route that meets the project goals such as resettlement, land loss, time saving, minimum travel time, straighter route, cost efficient etc. Out of all possible options the final decided design of proposed bypass was selected as the final alignment for the proposed project. Proposed project alignment is selected and opted due to the following reasons:

- The construction of the said bypass will provide a better road facility for the inhabitants of a lesser developed area of Dera Ghazi Khan and remove the grievances of people of southern Punjab.
- 4-Lane dual carriageway bypass will provide uninterrupted traffic flow resolution and result in ultimate reduction of cost of all suppliers and cost of living index.
- Problem of traffic blockage and congestion in Dera Ghazi Khan City will be solved.
- Time saving of passengers and reduction in accident of traffic user will be possible.
- Provision of employment opportunities during and after the construction of the project thus alleviating the poverty of the area.
- Vehicle operating cost will be reduced.
- This option has been finalized after consultation with engineering experts.

Based on ground study, site survey and data collection on planned development projects and land use in the project area;

The initiation road of the project was moved to the west i.e. 3.82KM from the Airport road in order to avoid any interference with future planned developments in the area.

Another reason for moving the initiation point to the left was because the previous initiation point was in close proximity to the 'Government Institute of Technology, D.G. Khan' which may lead to the traffic congestions and accidents during college timing.

Construction works along with construction of a roundabout would have required acquisition of land of the Institute.

Therefore, warranting movement of the initiation point further left. This Alignment option is preferred as it has by-passes D.G. Khan and most settlements by following a path further northward. The Alignment Option has been designed so that it does not have a weaving alignment like the previous two Alignment Options.

This results in an increased length of 20.008KM, but also relatively lower acquisition of built up area and disturbance of locals.

5 Environmental and Socio-economic Baseline

This chapter describes the existing environmental and socioeconomic settings of the project area and surroundings. The project area in this document is defined as ‘the area where the project related activities to be carried out which include the proposed project site and surroundings and the area that can interact with the project’s positive and negative externalities in the long run’. The environmental impact of any activity or process will be assessed on the basis of a deviation from the baseline or normal situation. Followings are the main components of the baseline:

- Physical Environment
- Biological Environment
- Socioeconomic Environment

The description provided in this section is based on Desk-top surveys and literature review, Field surveys, Air and Noise Monitoring, Soil and Water Analysis, Existing information sources and information obtained through detailed consultation with the Government departments and other agencies.

5.1 Physical Environment

5.1.1 Topography

The proposed alignment starts approximately at Km 98+000 of National Highway (N-70) and traverses upwards on north side to meet the Indus Highway (N-55) approximately at Km 705+000, which is the junction point of Eastern Bypass. The total length of the proposed bypass is 20 kms.

Pakistan geologically overlaps both with the Indian and the Eurasian tectonic plates where its Sindh and Punjab provinces lie on the north-western corner of the Indian plate while Baluchistan and most of the Khyber-Pakhtunkhwa lie within the Eurasian plate which mainly comprises the Iranian plateau, some parts of the Middle East and Central Asia. The northern areas and Azad Kashmir lie mainly in Central Asia along the edge of the Indian plate and hence are prone to violent earthquakes where the two tectonic plates collide.

Most of the area is characterized by rugged hilly terrain with high mountains of Koh-e-Sulaiman, steep parallel ridges and narrow valleys. The local relief is about 700 meters with maximum and minimum heights of 1025 and 300 meters above sea level respectively.

The Dera Ghazi Khan is located in a strip between the river Indus and the Koh-Suleman range of mountains separating it from the Baluchistan Province. It is surrounded by Dera Ismail Khan on the North and Rajanpur on its South. Indus river flows on the East across which lie the districts of Muzafargarh and Layyah. Loralai and Dera Bugti districts of Baluchistan Province lies on the West separated by the Koh-Suleman range of mountains.

D.G. Khan is one of the most progressive looking districts of Punjab with literacy rate of 48% amongst school going children. Schools are providing computing facilities to students. The people are industrious and talented. During the survey it was observed that mostly people use ground water for drinking purpose. The general height of this proposed highway is almost 200-250 meters above the sea level.

5.1.2 Seismicity

Pakistan lies on an active seismic belt of earth. Seismic observations indicate that hundreds of shocks originate every year. Mostly, these seismic waves are of low intensity and do not have significant effect. On the basis of Peak Ground Acceleration (PGA) values obtained through Probabilistic Seismic Hazard Assessment, Pakistan is divided into 5 seismic zones. The boundaries of these zones are defined in Table 5.1.

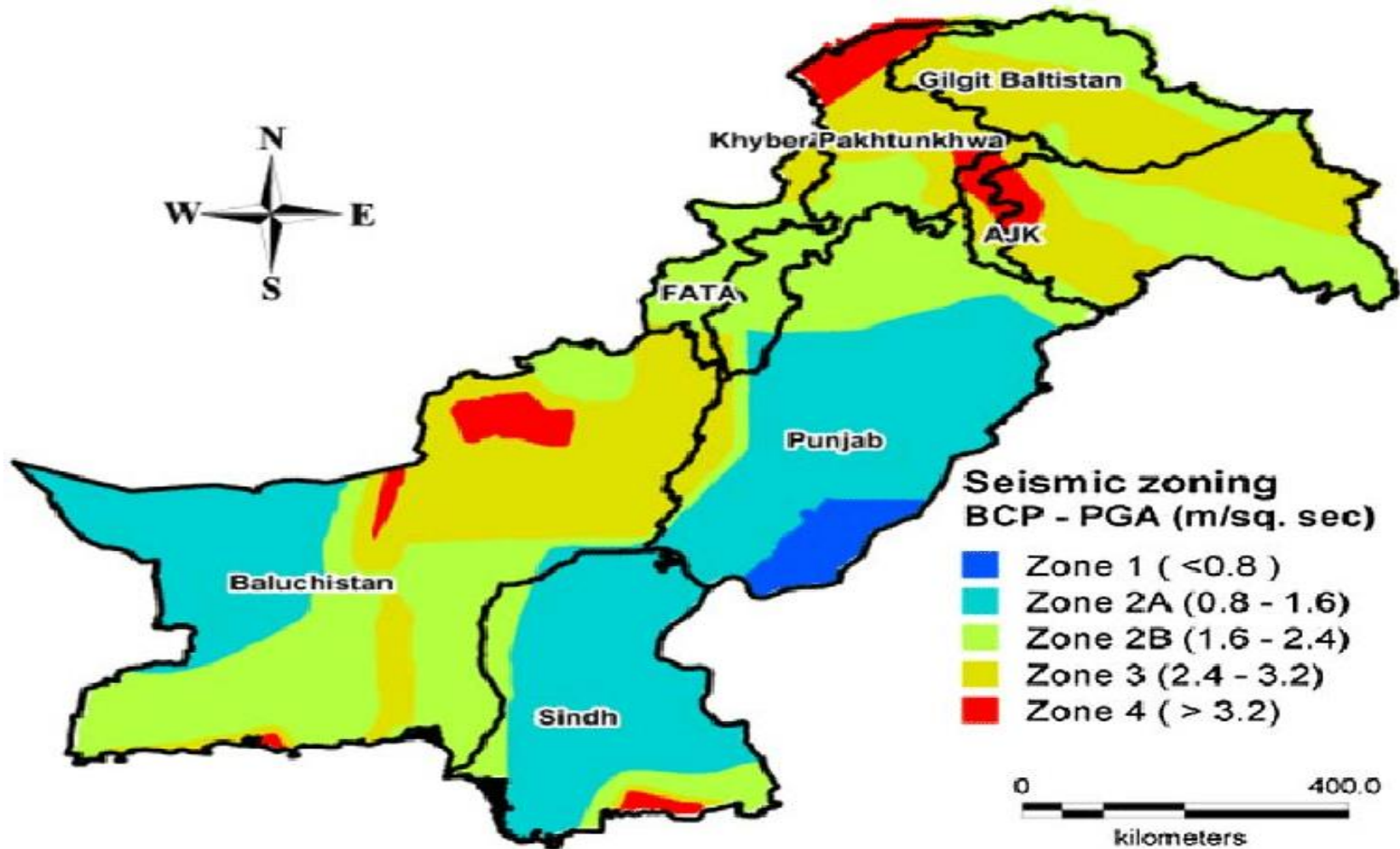
Table 5-1: PGA Values of Seismic Zones of Pakistan

Zone	PGA (g)
1	0.05 to 0.08
2A	0.08 to 0.16
2B	0.16 to 0.24
3	0.24 to 0.32
4	> 0.32

Source: Building Code of Pakistan Seismic Provisions, 2007

As per Building Code of Pakistan – Seismic Provision 2007, proposed project site lies in Zone 2B of the Seismic Zones with a peak horizontal ground acceleration of 0.16-0.24g. This indicates that the project lies in moderate seismic zone. Hence all the applicable provisions, related to soil and foundations, structural design requirements have been considered in the design of the structures. The seismic zoning map is shown in Figure 5.1.

Figure 5-1: Seismic Zoning Map of Pakistan



5.1.3.2 Groundwater

Aquifer Characteristics

A certain amount of water filters into the ground because of seepage from the canals and rainwater collected on the surface. This water drains downwards below the root zone and finally reaches at a groundwater level at which every available crevice in the earth is filled with water. This area is known as the zone of saturation and the water found here is referred to as groundwater. The community prefers groundwater as it is considered clean & safe and can be accessed easily through hand pumps.

Aquifer Recharge

The sources of aquifer recharge are:

- Rainwater drains are the primary source of recharge in the area
- Leaching of irrigation water from agricultural fields
- Rainwater percolation.
- River Indus
- DG Canal

Groundwater Table

During the visit of the project area and its vicinity; groundwater depth was found about 50-200 feet. The ground water is the major source of drinking water in the area. Exploitation of ground water through tube wells for irrigation is also observed in the area. Ground water samples were collected from different locations of the project area.

5.1.4 Climate

The climate of district is hot in summer and cold in winter. The climate is almost uniform throughout the district except hilly portion which has severe winter and a mild summer. Except the hilly track, land of D.G. Khan is plain. The temperature here averages 32 °C. The average annual rainfall is 104 mm. There is not much of rainfall during the winter which lasts from the end of October till the middle of

March and is generally quite pleasant. The change from winter to summer is very sudden and by the end of April heat become intolerable.

There is a tendency for the rainfall to increase with the expansion of cultivation and vegetation. Due to the barren mountains of Koh-Suleman and the sandy soil of the area, windstorms are common in the summer. During summer, the temperatures are generally amongst the highest in Pakistan. Fort Munro, located on the edge of Punjab Province, has relatively cooler weather. In winter, scattered snowfall has been reported.

5.1.4.1 Climate of Project Area

The information presented below gives detailed historical monthly average weather conditions along with exceptional weather occurrences.

Seasons and Rainfall

The proposed project is located in the region that encounters four seasons, the hot summer starts from May and continues till July, monsoon starts from July and continues to September while winter season end in February starting from November and spring season lasts for two months from March and April.

Temperature

The ambient temperature of proposed project region varies from summer to winter. The change in temperature has a direct influence on the environment of the project area. Hot and dry conditions during summer season changes the air quality by increasing the particulate matter, due to dried road pavements and open soil. The maximum monthly temperature reaches to 48°C during summer and minimum monthly temperature reaches 20°C during winter. The mean monthly temperatures for DG Khan and average rainfall are given in Figure 5.3 and Figure 5.4 respectively.

Figure 5-3: Mean Monthly Temperature (C°) DG Khan

Monthly Average Temperature

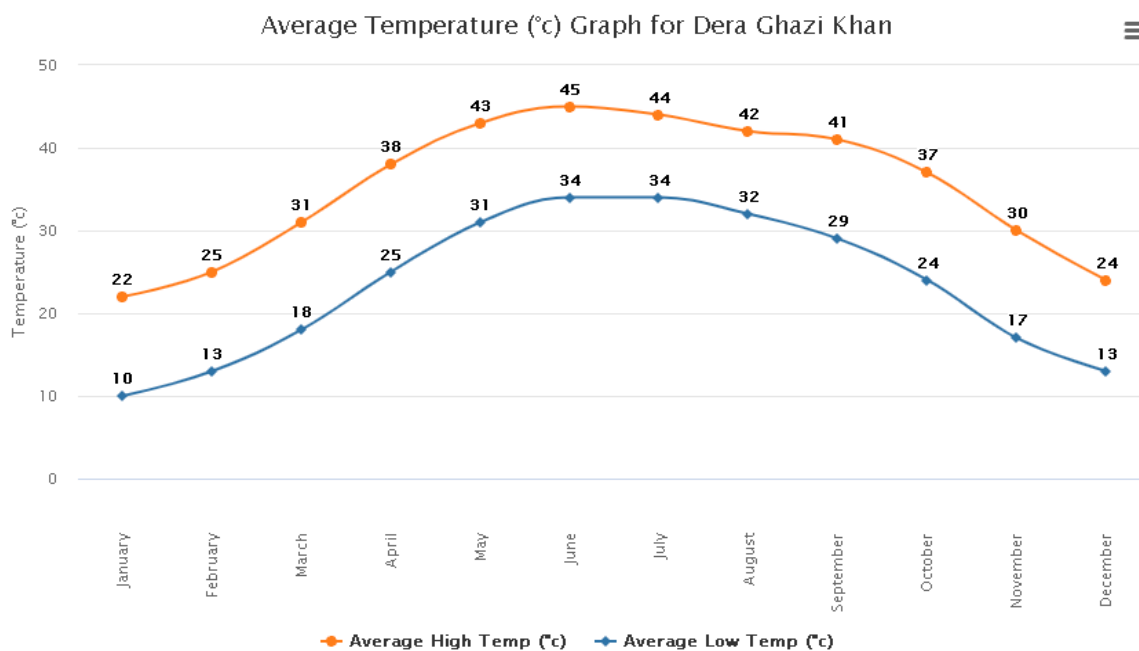
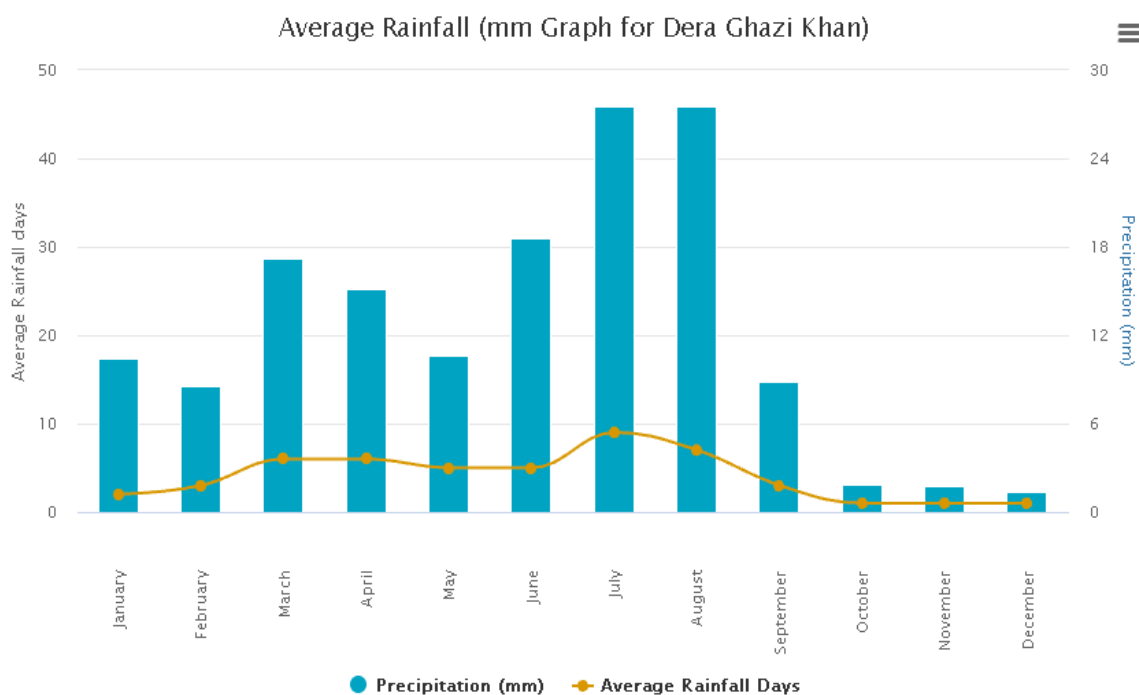


Figure 5-4: Mean Monthly Rainfall (mm) DG Khan

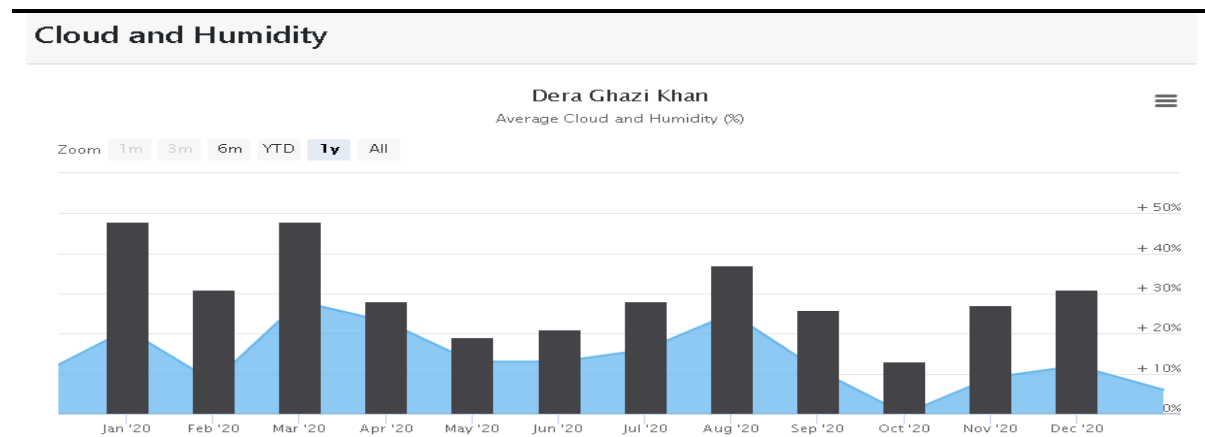
Monthly Average Rainfall



Relative Humidity

The relative humidity in project region varies from 48 to 13%. The highest humidity in the area was recorded 48%, which was in the month of January and March 2020. The humidity data is depicted in the following Figure 5.5.

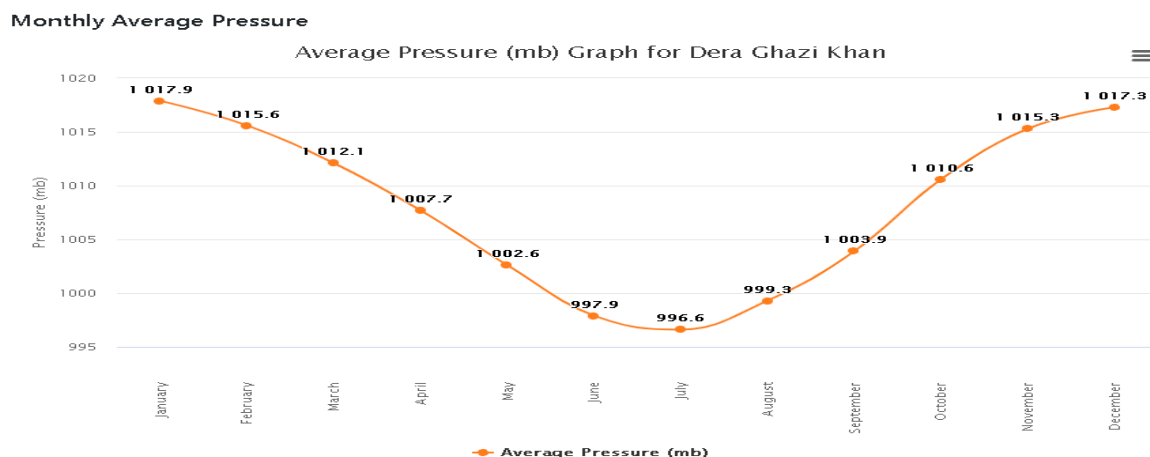
Figure 5-5: Mean Monthly Cloud and Humidity (%)



Atmospheric Pressure

Atmospheric pressure has important effects on weather conditions. High pressure supports sunny, clear, and favorable weather conditions, but lower levels promotes rainy and cloudy weather conditions. Wind speeds and seasonal patterns vary considerably in the project area. The annual pressure is ranging from 996.6 to 1017.9 of millibar. The data of monthly barometric pressure of proposed project area is summarized as Figure 5.6.

Figure 5-6: Mean Monthly Pressure (millibar)



5.1.5 Environmental Baseline Monitoring

To assess the environmental conditions of the project area, following environmental parameters were monitored;

1. Ambient air quality monitoring,
2. Noise monitoring,
3. Water sampling and analysis
4. Soil sampling and analysis

Environmental baseline monitoring was conducted at project site. The details of the sampling/ monitoring locations along with discussions on results are given in the subsequent sections. Pictorial over-view of environmental monitoring carried out in the project area is presented in Figure 5-7. Monitoring results are presented in Annexure-E of report.

5.1.5.1 Ambient Air Quality

There is no significant source of air pollution in the area except for the areas close to highway and areas containing industries in project site. The remainder of the project area is rural, and cultivation & livestock is the main occupational activity. The potential existing sources of air pollution in the project area are road traffic, certain industries, crushing units, farm machines and agricultural activities.

Major air pollutants including CO, NO, NO₂, NO_x, SO₂ and Particulate Matter (PM₁₀) were monitored during field visit at 02 points of the proposed project site. The ambient air monitoring was done at 50-100meter distance from roadside. The results of all ambient air quality monitoring were observed below the standards because there are few air pollution sources were found in the study area. Results of Ambient air monitoring are presented in Table 5.2. Photographic record of environmental monitoring for ambient air quality and noise levels is given in Figure 5.7.

Table 5-2: Results of Ambient Air Quality Monitoring at Proposed Project Site

Parameter	Methodology / Technique	Unit	Monitoring Duration	LDL	Taunsa Bypass	Sakhi Sarwar Bypass	Limits as per PEQS
Nitrogen Oxide (NO)	US EPA Designated Method RFNA-1289-074	µg/m ³	24Hours	0.75	14.58	13.89	40 (µg/m ³) For 24 Hours
Nitrogen Dioxide (NO ₂)	US EPA Designated Method RFNA-1289-074	µg/m ³	24Hours	0.75	23.75	20.12	80 (µg/m ³) For 24 Hours
Sulfur Dioxide (SO ₂)	US EPA Designated Method ESQA-0486-060	µg/m ³	24 Hours	1.3	14.02	13.39	120 (µg/m ³) For 24 Hrs
Carbon Monoxide (CO)	US EPA Designated Method RFCA-0981-054	mg/m ³	24 Hours	0.1	2.06	1.97	5 (mg/m ³) For 8 Hours
Ozone (O ₃)	USEPA Designated Method EQOA-0880-047	µg/m ³	24 Hours	1.96	11.31	11.29	130 (µg/m ³) For 01 Hrs
Particulate Matter (PM ₁₀)	ISO 21501-4:2007	µg/m ³	24 Hours	1.00	121.6	139.7	150 (µg/m ³) For 24 Hrs
Particulate Matter (PM _{2.5})	ISO 21501-4:2007	µg/m ³	24 Hours	1.00	23.0	32.6	35 (µg/m ³) For 24 Hrs
Suspended Particulate Matter (SPM)	High Volume Sampler	µg/m ³	24 Hours	1.00	351.9	463.5	500 (µg/m ³) For 24 Hrs

5.1.5.2 Noise

There is no continuous major source of noise in the proposed project area. Intermittent sources include farm tractors, farm equipment, crushing units and road traffic. Considering the intermittent nature of these noise sources, it can be concluded that the noise pollution in this area is low. Noise Levels measured during the field surveys are given in Table 5.3.

Table 5-3: Noise Level Results

<i>Location</i>	<i>Noise Level (dB) (Day time)</i>	<i>PEQS (Day time)</i>	<i>Noise Level (dB) (Night time)</i>	<i>PEQS (Night time)</i>
Taunsa Bypass	52.6	65	51.6	55
Sakhi Sarwar Bypass	57.3	65	52.9	55

5.1.5.3 Water Quality

Groundwater

In order to examine the groundwater quality of the project area, two groundwater samples from different locations were collected and analyzed.

The sampling and analysis were carried out in accordance to the internationally recognized methods including APHA and UESPA recognized methods. The samples were analyzed for 25 parameters (both physical and chemical) and for 4 microbiological parameters. The analysis results of groundwater samples show that value of majority of physical and chemical parameter are within the drinking water limits defined in PEQS for drinking water. Detailed results are provided in Table 5.4 and Table 5.5.

Table 5-4: Physical and Chemical Analysis of Ground Water

S.No.	Parameters	Method	Unit	PEQS	Analysis Results	
					Taunsa Bypass	Sakhi Sarwar Bypass
1.	pH	APHA4500H ⁺ B 20 nd Edition	-	6.5-8.5	7.45	7.40
2.	Color	APHA 2120 C 20 nd Edition	Pt-Co	≤15	<5.0	<5.0
3.	Total Dissolved Solids (TDS)	APHA 2540 C 20 nd Edition	mg/l	<1000	459	1298
4.	Chloride (Cl)	APHA 4500Cl ⁻ B 20 nd Edition	mg/l	<250	25.25	72.84
5.	Total Hardness	APHA 2340 B & C 20 nd Edition	mg/l	<500	272	566
6.	Fluoride	APHA 4500F ⁻ B,D 20 nd Edition	mg/l	≤ 1.5	<1.0	<1.0
7.	Nitrate	APHA 4500NO ₃ B 20 nd Edition	mg/l	≤50	<1.0	<1.0
8.	Nitrite	APHA 4500NO ₂ B 20 nd Edition	mg/l	≤3	<0.01	<0.01
9.	Cyanide (CN)	APHA 4500CN E 20 nd Edition	mg/L	≤0.05	<0.05	<0.05
10.	Cadmium (Cd)	APHA-3111 B 20 nd Edition	mg/l	0.01	<0.01	<0.01
11.	Copper (Cu)	APHA-3111 B 20 nd Edition	mg/l	2	<1.0	<1.0
12.	Lead (Pb)	APHA-3111 B 20 nd Edition	mg/l	≤ 0.05	<0.05	<0.05
13.	Nickel (Ni)	APHA 3111 B 20 nd Edition	mg/l	≤ 0.02	<0.02	<0.02
14.	Manganese (Mn)	APHA-3111 B 20 nd Edition	mg/l	≤ 0.5	13.06	<0.05
15.	Aluminum (Al)	APHA-3120 B 20 nd Edition	mg/l	≤ 0.2	0.007	<0.005
16.	Antimony (Sb)	APHA-3120 B 20 nd Edition	mg/l	≤ 0.005	<0.005	<0.005
17.	Arsenic (As)	APHA 3120 B 20 nd Edition	mg/l	≤ 0.05	<0.005	<0.005
18.	Boron (B)	APHA 3120 B 20 nd Edition	mg/l	0.3	0.088	0.27
19.	Mercury (Hg)	APHA 3112 B 20 nd Edition	mg/l	≤ 0.001	<0.001	<0.001
20.	Selenium (Se)	APHA 3120 B 20 nd Edition	mg/l	0.01	<0.005	<0.005
21.	Barium (Ba)	APHA 3120 B 20 nd Edition	mg/l	0.7	0.045	0.019

Table 5-5: Microbial Analysis of Ground Water

Parameters	Method	Results		
		PEQS	Taunsa Bypass	Sakhi Sarwar Bypass
Total Colony Count	APHA 9215 20 nd Edition	-	2.26 x 10 ⁴	1.37×10 ⁴
Total Coli forms	APHA 9202 B 20 nd Edition	-	Absent	Absent
Faecal Coli forms (E.Coli)	APHA 9202 D 20 nd Edition	0 / 100ml	Absent	Absent
Faecal Streptococci/Enterococci	APHA 9230 C 20 nd Edition	-	Absent	Absent
BDL: Below Detection Limit				

5.1.5.4 Soil Quality

Three soil samples were collected from project area to check the soil quality of the project site. The collected samples were preserved and submitted to laboratory for analysis. A summary of soil sampling results is presented as Table 5.6. sampling photographs are shown in Figure 5.7.

Table 5-6: Soil Analysis Results

Parameters	Method/Technique	Unit	Analysis Results	
			Taunsa Bypass	Sakhi Sarwar Bypass
pH	USEPA 9045 C	-	8.92	8.93
Conductivity	ISO 11265:1994	µS/cm	<1.0	<1.0
Grease & Oil	USEPA 9071 B	mg/kg	0.0016	0.0011
Chloride	In House Titrimetric	mg/kg	192.84	144.63
Chromium (Cr)	USEPA 3050 B	mg/kg	BDL	BDL
Lead (Pb)	USEPA 3050 B	mg/kg	8.093	7.19
Cadmium (Cd)	USEPA 3050 B	mg/kg	<00.50	<00.50
Zinc (Zn)	USEPA 3050 B	mg/kg	19.97	9.16
Silver (Ag)	USEPA 3050 B	mg/kg	<00.50	<00.50
Arsenic (As)	USEPA 3050B	mg/kg	1.4	<00.50
Selenium (Se)	USEPA 3050B	mg/kg	<00.50	<00.50
Barium (Ba)	USEPA 3050B	mg/kg	54	16
Mercury (Hg)	USEPA 7471B	mg/kg	<0.050	<0.050
BDL: Below Detection Limit				

Figure 5-7: Photographs of Environmental Monitoring



5.2 Biological Environment

In this section, the baseline environmental conditions pertaining to biological environment have been described on the basis of primary and the secondary data. These conditions have subsequently been used to identify the potential impacts on the biological environment that are likely to arise from the project activities. There is no protected area located near or within the project boundaries.

5.2.1.1 Floral Attributes of the Project Area

Based upon observations during the field visit; many species of plants were directly observed in the project area. List of the floral species in the project area are given in the following Table 5.7.

The number of anthropogenic activities in the area is very high. The major crops of the district are Wheat, Rice, Oil Seeds and Cotton. This is among one of the best cotton growing districts of the country. The major fruits are Citrus, Mango and Guava. Besides, Sunflower, Sugarcane, Jawar, Bajra, Mash, Moong, Masoor, Gram, Maize are also grown in minor quantities in the district.

Potato, Turnip, Garlic, Cauliflower, Peas and Onion are main vegetables grown in the district. Besides, Carrot, Tomato, Ladyfinger and Chillies are also grown in the district in minor quantities. Following species mentioned in Table 5-6 were observed during filed survey of the proposed project site.

Table 5-7: Floral Species in the Project Area

Sr.No.	Botanical Name	Family	Common Name
1.	<i>Phoenix dactylifera</i> L.	Arecaceae	Khajoor
2.	<i>Calotropis procera</i> (Willd.) R. Br.	Asclepiadaceae	Aak
3.	<i>Brasica compestris</i> L.	Brassicaceae	Sarsoon
4.	<i>Dalbergia sissoo</i> Roxb.	Fabaceae	Tahli
5.	<i>Pongamia pinnata</i> L.	Fabaceae	Sukh Chain

Sr.No.	Botanical Name	Family	Common Name
6.	<i>Aloe vera (L.) Burm.f</i>	Liliaceae	Kanwar Gandal
7.	<i>Azadirachta indica (L.) A. Juss.</i>	Meliaceae	Nim
8.	<i>Melia azedirach L.</i>	Meliaceae	Dharek/Bakain
9.	<i>Acacia nilotica (L.) Deliled.</i>	Mimosaceae	Desi kikar
10.	<i>Eucalyptus camaldulensis Dehnh.</i>	Myrtaceae	Sufaida
11.	<i>Psidium guajava L.</i>	Myrtaceae	Amrood
12.	<i>Syzygium cumini (L.) Skeels</i>	Myrtaceae	Jaman
13.	<i>Ziziphus mauritiana Lam.</i>	Rhamnaceae	Beri
14.	<i>Vitis vinifera L.</i>	Vitaceae	Angoor
15.	<i>Citrus sinensis (L.) Osbeck</i>	Rutaceae	Kinno/Malta
16.	<i>Cordia myxa</i>	Boraginaceae	Lasura
17.	<i>Triticum Aestivum L.</i>	Poaceae	Wheat

Figure 5-8: Photographs of the Floral Species of the Project Area



5.2.1.2 Faunal Attributes of the Project Area Birds

Based upon observations during the field visit many species of birds were directly observed in the project area. The most favorite habitat of the Avian Fauna was found in the surroundings of the study area especially trees in agricultural fields. These areas are composed of larger as well as smaller patches of vegetation.

Most common species include Quail, Black Drongo, Brown Partridge, Egret, House Crow, Pigeon and Duck etc. All these species are also commonly found in other ecological zones of the country. A list of the birds observed during the field visit and document review is given in Table 5.8.

Table 5-8: List of Birds Observed During the Field Visit

Sr. No.	English Name	Scientific Name	Status		Occurrence				Listing		
			Migratory	Resident	Common	Abundant	Less Common	Rare	Provincial Laws	IUCN	CMS
1	Bank Myna	<i>Acridotheres ginginianus</i>		x		x					
2	Bay-backed Shrike	<i>Lanius vittatus</i>		x	x						
3	Crow	<i>Corvus</i>		x	x						
4	Black Drongo	<i>Dicrurus macrocercus</i>		x	x						
5	Pigeon	<i>Columbidae</i>			x						
6	Egret	<i>Ardea alba</i>		x	x						
7	Chiffchaff	<i>Phylloscopus collybita</i>		x		x					
8	Common Redstart	<i>Phoenicurus phoenicurus</i>	x			x					
9	Indian Roller	<i>Coracias benghalensis</i>		x				x			
10	Pied Kingfisher	<i>Ceryle rudis</i>		x	x						
11	Long-eared Owl	<i>Asio otus</i>	x		x						
12	Pied Bushchat	<i>Ceryle rudis</i>		x	x						
13	Common Rosefinch	<i>Carpodacus erythrinus</i>	x				x				
14	Steppe Eagle	<i>Aquila nipalensis</i>	x			x					
15	Greater Coucal	<i>Centropus sinensis</i>	X					x			
16	Kingfisher	<i>Alcedo atthis</i>					x				

Mammals

Dense vegetation provides living shelter to the mammals like Urial, Cats, Russian Dog, Goats, Sheep, Cow, Buffalo, Horse etc. All these species are commonly found in the project areas as well as in country and no significant threat can be expected from any activity.

Reptiles

During the study, several types of droppings were found which indicate the presence of reptiles.

None of the reptiles and mammalian species found here is listed under any category of the IUCN Red List. Ten species of reptiles were also recorded including snakes, lizards and agamas. Only one species i.e. Indian cobra is listed as Data Deficient in the IUCN Red List. A list of the mammals and reptiles of the project area is given in Table 5.9.

Table 5-9: List of Mammals and Reptiles Observed During the Field Visit

Sr. No.	English Name	Scientific Name	Occurrence			Listing		
			Common	Less Common	Rare	Prov. Laws	IUCN	CITES
Mammals								
1	Asiatic Jackal	Canis aurius	x					
2	Five Stripped Palm Squirrel	Funambulus pennanti	x					
3	Indian Crested Porcupine	Hystrix indica	x					
4	Indian Desert Jird	Meriones hurrionae	x					
5	Indian Gerbil	Tatera indica	x					
6	House Mouse	Mus musculus	x					
7	House Rat	Rattus rattus	x					

Sr. No.	English Name	Scientific Name	Occurrence			Listing		
			Common	Less Common	Rare	Prov. Laws	IUCN	CITES
8	Jungli Cat	<i>Felis silvestris ornate</i>		x				
Reptiles								
9	Indian Cobra	<i>Naja naja naja</i>			x		x	
10	Pakistan Ribbon Snake	<i>Psammophis leithii</i>	x					
11	Garden Lizard	<i>Calotes versicolor</i>	x					
12	Saw scaled Viper	<i>Echis carinatus</i>	x					
13	Sand Gecko	<i>Crossobamon orientalis</i>	x					
14	Indian Krait	<i>Bungarus caeruleus</i>		x				

Figure 5-9: Photographs of the Observed Birds during Field Survey



Desi Chicken



Black Drongo



Egret



House Crow



Pigeon



Duck

Figure 5-10: Photographs of the Observed Animals during Field Survey



Goat & Sheep



Donkey



Cart



Buffalo



Cow

5.3 Socio-economic Environment

5.3.1.1 Methodology

This section describes the key socioeconomic features of the study area, including the administrative setup, population, education, health, infrastructure, occupations, and cultural resources.

Primary and secondary data sources were used to develop the socioeconomic baseline of the area. Secondary data was collected using published data in the form of literature, research journals and internet. Primary data was collected using questionnaires and then verifying the information through community meetings. Stakeholder consultation was carried out with local community and Government departments.

There were two basic aims of the study; first to inform and consult with the local communities about what is the proposed project and what would be the likely impacts and second to carry out an in-depth socio-economic survey of the villages/cities falling in the project area. To this end, a detailed study of the project area was conducted. The Socio-economic features of the project area is shown in **Figure 5.11**.

Focused group discussion and Structured Questionnaire survey was carried out to arrive at community needs and their concerns regarding the proposed activities.

5.3.1.2 Structures of Authority

Formal Structure

The project district falling in project work are under the general charge of the Deputy Commissioner, who combines the functions of the District Magistrate as well as the District Collector. He is also responsible for the co-ordination of the functions of all nation building departments in the district. As District Magistrate, he is responsible for maintaining law and order in their district. For the purpose, the Executive Magistrate and the police assist him.

5.3.1.3 Demographics

Population

The majority of the population is poor, but they have been ruled by the rich landlords and chiefs of Baloch tribes which played a significant role in the national and provincial politics. Some of these feudal use the title Sardar for themselves, including the Chief Minister of Punjab Usman Buzdar, former President of Pakistan Farooq Leghari, Governors of the Punjab Zulfikar Ali Khosa and Latif Khosa, Mir Badshah Qaisrani, Sardar of the Malghani Balouch tribe, Chief Minister of Punjab Dost Muhammad Khosa, Chief Secretary of Punjab, Nasir Mehmood Khosa, Former Inspector General Police of Punjab, Tariq Khosa, and Supreme Court Judge Asif Khosa. The city is one of the oldest districts in South Asia. Dera Ghazi Khan did not develop like other cities in Punjab. Based on the surveys of 2004–2005, Dera Ghazi Khan district is considered one of the twenty poorest districts of Pakistan with about 51% of its population living below the poverty line.

Population at and near vicinity of the proposed project area was consulted in order to get socioeconomic profile of the area. The average household size of the consulted population was found 6 persons per household.

During field survey, public consultation was carried with different age group of community members. Number of community members from almost all field of life were interviewed during field survey and their comments were recorded. 100% of the people shows their willingness for the proposed project. They said the road condition is too worse and it is not good for travel and transport. Social and economic benefits are hindered due to the bad condition of road.

5.3.1.4 Land Use

Three broad land-use categories were recorded in the area, includes:

- **Uncultivable wasteland:** This includes the area's flooded lands, mountainous area and waterlogged areas.
- **Cultivated land:** This comprises land being currently cultivated and fallow agricultural land.

- **Human settlements:** This includes all structures and shelters created by human beings, including livestock sheds and places of worship, education, and recreation. In addition, this category includes the tracks, paths and uncultivated land within the cumulative locus of household-built structures.

5.3.1.5 Livelihood and Property Rights System

Land Ownership

The land in the project area mostly private land owned by locals comprising small and big landowners. The project area will be bought by the Government of Pakistan and proper compensation will be provided to locals as per laws of Government of Pakistan.

Agriculture

Agriculture is one of the most important economic activities in the project area. The land is suitable for irrigated agriculture and is capable of producing good yields of wheat, corn, sugarcane and maize.

Livestock

Livestock consists primarily of buffalos, sheep, cows, goats and donkeys. Livestock is the most important asset of the poor and the livestock they own is their major buffer against poverty.

Employment

While the majority of the area's population depends mainly on agriculture and livestock rearing for its livelihood, small business is also a source of earning. A number of people are employed in the education, irrigation, police, roads departments and Pakistan army. People also work in industries present at different locations in the vicinity of proposed highway project.

5.3.1.6 Socioeconomic Profile

Health Profile

Health facilities are available in the project site. In case of emergency, the patients visit BHU, THQ, DHQ and other private clinics and hospitals present in nearby cities including Multan and rural health units.

Housing

Both Kaccha and mostly Pakka houses were observed in the project area but majority of the families live in pakka houses (made of concrete). About 70% of Pakka while 30% of Kaccha houses were found are in the project area.

Source of Information

Radio and TV are major source of information for community. Newspapers and mobiles are also present in the project area. Newspapers like The News, Dawns, Jang, Nawa-e-Waqt etc. are also available in the city.

Literacy Rate & Education System

According to Bureau of Statistics Report, the literacy ratio of Dera Ghazi Khan District is 48%. There are several government and private schools in the district. For higher education, people consider moving to major cities like Multan, Islamabad & Lahore etc.

Infrastructure

Electricity is available in most of the areas although many villages around the proposed bypass alignment lack facility of Natural Gas and locals use LNG cylinders and wood for cooking.

Water

Hand pump is major source of ground water consumption with an average depth of about 80-150 feet. Most of housing units use piped water. The majority of the population in the project area relies on groundwater as surface water is not suitable for consumption.

Transport

The project area is accessible through the N-70 and N-55 highway. The area remains busy around the clock with the freight and commuter traffic. Tractor trolleys and donkey carts are used to carry loads locally. People in the area have their own cars and motorbikes. Local transport such as buses, pickups and rickshaws are also available.

Dress

People usually wear Shalwar and Kameez.

Food

Chapati are usually eaten as food. Locals also eat rice. The southern Punjab cities of Multan, Dera Ghazi Khan, Bahawalpur are also known for their sohan halwa products. Multani Chaamp is a meat dish consisting of lamb chops prepared with various flavours and spices.

Betrothal

Generally, betrothal traditions are found, and pre-marriage relations are established which is called mangni.

Marriage

In few rural area marriages are happened under Watta Satta customs and arranged marriages are generally held throughout the all relevant districts.

Gender

Gender analysis defines the evolving socioeconomic role and functions of men and women as they relate to and complement each other within a specific sociocultural and economic context. This section describes the roles and responsibilities of women in the project area, as well as their access to and control over resources, health, education, and ownership of assets.

Activities Performed by Women

Women play an important role in addressing food security and nutritive wellbeing at the household level. They remain busy in indoor and outdoor work from early morning to sunset. Women are responsible for cooking, dishwashing, looking after their children, washing clothes, collecting fuel wood, collecting fodder for livestock, and working in agricultural fields.

Female Education and Awareness

Education facilities for girls are available in the surrounding residential area of project site.

Photographs of socio-economic environment of the project area are attached in Figure 5.11.

5.4 Locals Perception of the Proposed Project

Focused group discussions revealed a high satisfaction of locals based on their general perception about the highway projects. The majority of participants expressed no serious complaints regarding proposed project activities in the area and welcome the idea of the proposed project.

The community members also hoped that the new project activities will provide jobs for local community and Government authorities will also provide health facilities as welfare work in the area. They welcomed the project with the hopes that the project will bring development in the area. They also highlighted that unemployment, lack of natural gas and health facilities are major issues of the area.

5.5 Secondary Consultation

Stakeholder consultation was also carried out with Government departments. The following Government departments were visited in Dera Ghazi Khan.

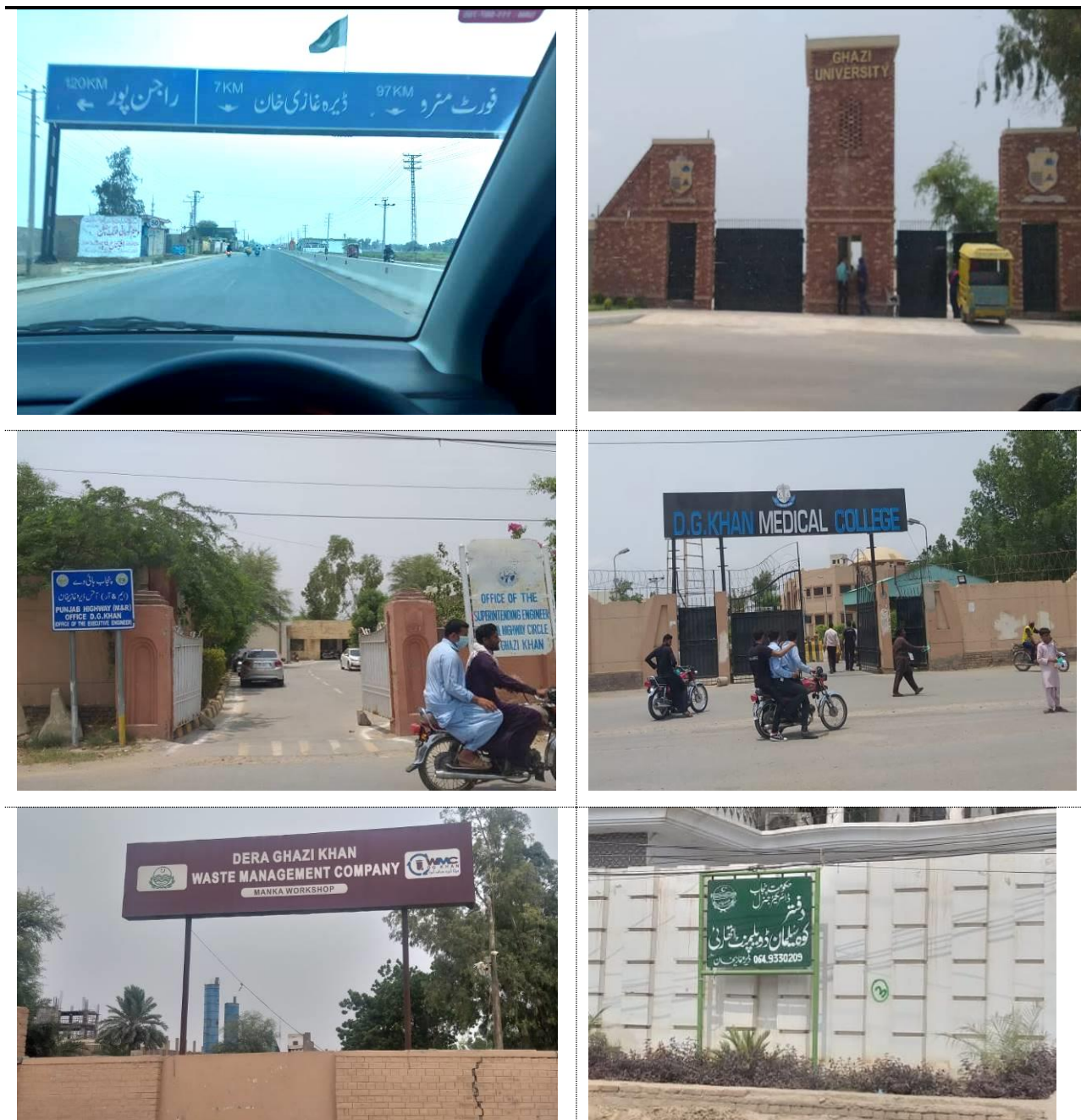
- District Forest Departments
- Environment Protection Agency.
- Wildlife Department DG Khan
- Irrigation Department DG Khan

- PCRWR DG Khan
- Mines and Mineral Department DG Khan

The participation of project stakeholders in project planning, design and implementation is now universally recognized as an integral part of environmental assessment.

During the discussion, the brief project description and details were communicated with the concerned departments and their comments and suggestions were noted. None of the government official expressed any serious issue regarding the implementation of the proposed project. In general, all of the officials welcomed the project as it will bring development in the area and betterment for the community. Details on Secondary stakeholder consultation is presented in Chapter-6 of the report.

Figure 5-11: Socio-economic Condition of the Project Area





6. Stakeholders Consultation

Stakeholder consultation is a mean of involving all primary and secondary stakeholders in the project's decision-making process in order to address their concerns, improve project design, and give the project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a mean of enhancing project sustainability.

Community input (both of knowledge and values) on socioeconomic and environmental issues can greatly enhance the quality of decision-making. Stakeholder consultation was therefore conducted in the project area not only to satisfy the legal requirements of the EIA process in Punjab but also to improve and enhance the social and environmental design of the project.

6.1 Objectives of Stakeholders Consultation

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

Through the public consultation process, Prime Engineering and Testing Consultants hope to:

- Promote better understanding of the project, its objective, and its likely impact;
- Identify and address concerns of all interested and affected parties of project area;
- Provide a means to identify and resolve issues before plans are finalized and development commences, thus avoiding public anger and resentment and potentially costly delays;
- Encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership.

6.2 Consultation Process

Primary stakeholders were consulted during informal and formal meetings held in the project area. The consultation process was carried out in the Saraiki and Urdu languages. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the proposed project, their feedback was documented during the primary stakeholder consultation. The issues and suggestions raised were recorded in field notes for analysis, and interpretation, by reaching out to a wider segment of the population and using various communication tools such as participatory needs assessment, community consultation meetings, and focus group discussions.

Secondary stakeholder consultations were more formal as government officials were consulted during face-to-face meetings. They were briefed on the EIA process, the project design, and the potential negative and positive impact of the project on the area's environment and communities. It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid any conflict with local administrators. The issues recorded in the consultation process were examined, validated, and addressed in the EIA report.

6.3 Stakeholders Consulted

In the consultation process for EIA, following key stakeholders were consulted:

- Primary Stakeholders i.e. Local communities.
- Secondary Stakeholders i.e., Environment, Wildlife, Forest, Highway Authority, Forest, Wildlife, Agriculture and Irrigation Departments etc.

Meetings with stakeholders consisted of community consultation meetings, focus group discussions, and in-depth interviews with government officials. The location of the meetings, the process followed, and the outcomes are discussed in this section. Photographs of consultations are included as **Figure 6.1**.

6.4 Primary Stakeholder

The findings of the Community consultations are given as follow. All these have been addressed in various sections of the EIA, and the mitigation plans have been incorporated into the EMP. The summary of the various primary stakeholder consultations is given below:

6.4.1 Community Concerns

Project Approval

The community consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities was evident. The consultations were considered a good gesture and appreciated, especially by the men and village elders. The poverty level is such that communities are looking to any project proponent to improve their financial well-being to a great extent. Project proponent recognizes that benefits from the project should be distributed judiciously and equitably especially among primary stakeholders in the project area and will continue to ensure that this principle is followed in its projects and community development program.

Resettlement/Relocation

The proposed alignment is passing through the district of Dera Ghazi Khan. The land for the proposed bypass is required to be acquired yet. The people who own lands within the proposed alignment showed their concerns about compensation process. People wanted to get suitable amount for their lands. The locals were assured the lands will be acquired as per rules and regulations defined by Government of Punjab. However, people show positive response regarding the proposed project.

Local Employment

Communities in the project area emphasized that local villagers should be given priority when employing people for various project-related works and activities according to their skills.

Interaction with Local Community

Non-Local work force coming in the project area that will not be aware of the local customs and norms may result in conflicts with the local community. Most of the project area people welcomed the project idea and showed their comfortability in case of non-local work force.

All Primary stakeholders are in favour of proposed project. They said this proposed project will have positive impacts on their life.

6.5 Secondary Stakeholders Consultation

The secondary stakeholder consultation was conducted in order to provide details about the proposed project and get suggestions if any about the proposed project and its activities. Some of the main offices are mentioned as follow:

- Environmental Protection Agency
- Wildlife Department DG khan
- Forest dept. DG Khan
- Irrigation dept DG Khan
- PCRWR DG khan
- Mines & Mineral Department DG Khan

Meetings were held with all above mentioned stakeholders. Brief detail about the project was provided to all available officers. All the stakeholders welcomed the idea of proposed project.

A detailed meeting was held with EPA representative Mr. Azhar Kar Inspector. Detailed discussion was held, and he welcomed the idea of construction of bypass alignment. He suggested that;

- Minimum 1% of the total cost of project shall be designated for tree plantation.
- Water shall be sprinkled regularly during construction to suppress the dust.
- Details of the alignment shall be displayed at different locations for public awareness.
- Construction shall be preferred in winter instead of summer to reduce the dust emissions.

- Waste collection, segregation and disposal system shall be developed and implemented
- Regular inspection and maintenance of vehicles shall be done
- Maximum activities shall be done as part of the Corporate Social Responsibility

In a meeting with Mr. Mr. Shahid Nawaz Assistant director Wildlife dept DG khan has welcomed the idea of proposed project and informed that no protected area is present in the vicinity of proposed project area and suggested that proponent should do some welfare work for local communities.

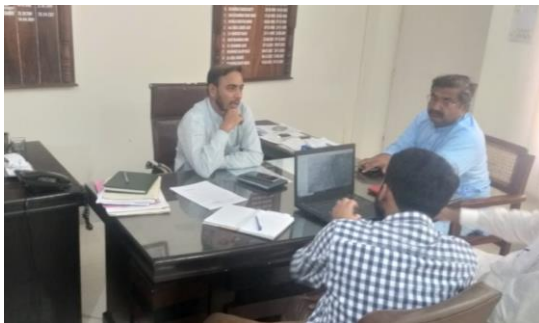
Mr. Khalid Javed Bhutta (DFO) Forest dept. DG Khan and Mr. Afzal shahid (clerk) office of the forest department were visited to record their views about the proposed project. They suggested that NHA shall plant and maintain the trees along the proposed bypass after regular coordination with Forest Department. He added that indigenous species of plants shall be planted.

Consultation with Mr. Sabir Hussain (Executive engineer) Irrigation Dept. DG Khan was done, and their comments were recorded. He added that heavy rain may affect the road and its protection measures shall be considered during design and construction.

Mr. Muhammad Sohail Lab Assistant PCRWR Dg khan and Mr. Farooq Sultan Deputy Director Mines & Mineral Dept. DG Khan. They said the project is much awaited in the project area and people are eagerly waiting for the project to start. The load of heavy traffic is higher on the existing road which will be diverted after construction of this bypass road. They said the project shall be started at earliest for improved and safe travelling.

Generally, all of the secondary stakeholders were in favor of proposed project. Further, the proposed project should be executed with appropriate mitigation measures to reduce the environmental and social impacts. The proposed bypass road is dire need of the people of project area. A detail list of primary and secondary stakeholder consulted, and consultation/surveyed forms is presented in **Annexure-D** of the report

Figure 6-1 : Stakeholder Consultation







7 Impact Prediction, Evaluation and Mitigation Measures

This chapter discusses the potential environmental and social impacts of the proposed activities, predicts the magnitude of the impact and assesses the significance. The proposed mitigation measures to minimize adverse impacts, resulting residual impacts of the project and environmental management plan (EMP) are discussed in the next chapter.

The discussion of the environmental and socioeconomic impacts is then organized in the following manner:

Impacts Associated with Proposed Project Activities

- Environmental Impact—Construction and Operation Activity
- Socioeconomic Impact—Construction and Operation Activity

7.1 Identification of Potential Impacts

In the first step, potential impacts of the project are identified by desktop screening exercise, using checklist during field visits for collection of baseline data, professional judgment, published literature on environmental impact of similar projects and standard environmental guidelines. A critical step in identifying potential impacts is discussion with project proponent, consultation with stakeholders and communities to identify their concern. Public consultation was carried out to identify the concerns of primary and secondary stakeholders.

The main aspects associated with potential impacts are as follow;

- Geomorphology, soil
- Water resources (aquifer and surface water quality)
- Ambient air quality
- Waste discharges
- Noise pollution
- Greenhouse gases emissions
- Ozone depleting substance
- Protected areas
- Ecology of the area, including flora and fauna

- Vehicle movement
- Socio-economic conditions; and
- Archaeology

7.2 Impact Classification

The potential impacts are classified according to the type of potential receptors. The following receptor categories were used:

- Community (people, their social and cultural values, aspirations and archaeological sensitivity)
- Land and soil (land resources, soil resources)
- Air quality (ambient air quality, GHG emissions, Ozone depletion)
- Water resources (aquifer and surface water resources)
- Ecosystem (vegetation, wildlife, and biodiversity).

7.3 Impact Scoping Criteria

Identified potential impacts are evaluated on the basis of following criteria;

- the present baseline conditions, the change in environmental parameters likely to be effected by proposed project related activities,
- Is there an impact that environmental standards or environmental guidelines applicable to the project will be breached? This includes the national standards such as the Punjab Environmental Quality Standards (PEQS) and guidelines such as the World Bank, International Finance Corporation (IFC) and WHO environmental guidelines.
- Is there a high risk of a permanent, irreversible, and significant change to environmental conditions due to the particular project activity? Some impacts are transitory; they last until the activity that is the cause of the impact is there. Others may last much longer than the activity. After a long period, the environmental parameter may or may not revert to its natural state.
- Did the community express any concern about this aspect?

An impact scoping matrix is described in below Table 7.1.

Table 7-1: Impact Scoping Matrix

Project Phase	Environmental Impact	Social Impact
Construction Activity	❑ Water resources depletion, contamination. ❑ Dust Emission ❑ Vegetation Loss ❑ Vehicle and Equipment Exhaust ❑ Soil Contamination ❑ Drainage and Storm Water Run-off ❑ Camp Effluent ❑ Hazardous and Non-Hazardous Waste Management ❑ Wildlife Disturbance	❑ Traffic disturbance, unrest, road accident ❑ Land acquisition ❑ Employment conflicts ❑ Archaeological resources damage ❑ Safety and security ❑ Mobility and transportation ❑ Project and Community Interface ❑ Cultural and religious sites ❑ Local Economy ❑ Local Employment
Operation Activities	❑ Air Pollution ❑ Noise Pollution ❑ Wastewater ❑ Green House Gas emissions ❑ Water Resources Depletion ❑ Hazardous and non-hazardous substances ❑ Waste Management	❑ Unskilled labour jobs ❑ Occupational Health and Safety ❑ Economic Activity (Primary and multiplier effects) ❑ Human Rights

7.4 Impact Assessment Methodology

The impacts have been assessed following standard international guidelines and best available practices. The method defines three levels of consequence (or severity) and likelihood (or probability of occurrence) - High, Medium or Low - of an impact. A standard risk based approach has been used in which;

The significance of an impact is determined on the basis of the level of consequence and likelihood of the impact e.g. an impact of medium severity is assigned a low significance if the likelihood of occurrence of the impact is low and high significance if the likelihood of occurrence is high or almost certain. The definition of consequence and likelihood is illustrated in Table 7.2 and impact significant matrix is provided in Table 7.3.

Table 7-2: Definitions for Consequence and Likelihood of Impacts

Level	Consequence (Severity of Impact)	Likelihood
High	Serious/catastrophic damage to local and regional environment Direct legislative requirements of EPA and World Bank Corporate requirement Serious threat to corporate reputation/profitability/ability to do business	High likelihood of occurrence during lifetime of operation Regular/continuous part of operations
Medium	Measurable damage to the environment Subject to potential future legislation Potential to affect reputation/cost Implication/reduced efficiency	Moderate possibility of occurrence during lifetime of operation Periodic/occasional part of operations
Low	Negligible damage to the environment No risk to business	Unlikely to occur during lifetime of operation

Table 7-3: Impact Significant Matrix

Consequence	Likelihood		
	High	Medium	Low
High	<i>High</i>	<i>High</i>	<i>Medium</i>
Medium	<i>High</i>	<i>Medium</i>	<i>Low</i>
Low	<i>Medium</i>	<i>Low</i>	<i>Low</i>

The prediction of impacts also includes the duration of impacts (in terms of long-medium and short-term), nature of impact, geographical location of the impact and reversibility of the impact. Impact assessment criteria for the above-mentioned parameters are illustrated in Table 7.4.

Table 7-4: Impact Assessment Criteria

Impact Characteristics	Categories
Nature of the Impact	Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes as a result of change in another parameter.
Duration of the impact	Short term: Lasting only till the duration of the project such as noise from the construction activities. Medium term: Lasting for a period of few months to a year after the project before naturally reverting to the original condition such as contamination of soil or water by fuels or oil. Long term: Lasting for a period much greater than medium term impacts before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical Location of the impact	Local: Within the area of project i.e. operation site and access road. Regional: Within the boundaries of the project area. National: Within the boundaries of the country.
Reversibility of the impact	Defined as Reversible: When a receptor resumes its pre-project condition. Irreversible: When a receptor cannot resume its pre-project condition.

Identification of the mitigation measures: If it is determined that the predicted impact is significant, suitable mitigation measures are identified. There is a range of mitigation measures that can be applied to reduce impacts. This is discussed in following Sections 7.6.

Evaluation of the residual impact: Incorporation of the suggested mitigation measures reduces the adverse impact of the project and brings it within the acceptable limit. This step refers to the identification of the anticipated remaining impacts after mitigation measures have been applied—the residual impacts. This is discussed in following Sections 7.6.

Identification of the monitoring requirements: The last step in the assessment process is the identification of the monitoring requirements. The scope and frequency of the monitoring depends on the residual impacts. The purpose of monitoring is to confirm that the impact is within the predicted limits and to provide timely information if unacceptable impact is taking place. An environmental management plan (EMP) will be developed with identification of monitoring requirements. This is discussed in next chapter.

7.5 Potential Impacts and Mitigation Measures during Design Phase

7.5.1. Topography

The topography along the project area will change to some extent because of construction of project related structures such as embankments, culverts etc. Visual changes to the topography will be of permanent and moderate and permanent in nature and do not require any mitigation measures, except that the project design should consider aesthetic concerns.

7.5.2. Landscape

The proposed project of DG Khan Bypass passes through District Dera Ghazi Khan. Topography of the project area is mixed with most of the area as flat with no noticeable variation in the surface.

The proposed alignment starts from approximately km 98 of National Highway (N-70) and goes upwards on north side to meet Indus Highway (N-55) at Km 705 approximately which is the junction point of Eastern Bypass. The total length of bypass is 20 Kms.

Approximately 8.7 Kms is passing through sandy area and remaining length after crossing the Katchi Canal and D.G. Khan Canal is passing through agricultural land where dismantling of some minor structures involved. No major utilities relocation is involved. The proposed alignment also crosses the railway line where flyover has been proposed.

After the construction of proposed project, the landscape of the project area will be changed in terms of better road infrastructure, construction of bridges & flyover and planned plantation of trees along the proposed project. This will permanently change the landscape of the project area due to loss of agricultural land but at the same time will have a positive impact in terms of socio-economic development of the project area.

7.5.3. Land Acquisition

One of the major project related impact will be the land acquisition for the proposed project that will result in causing disturbance to the affected residents along the project area. Most of the alignment is proposed to traverse along barren and few of agricultural area. This impact will be permanent and major negative in nature.

The summary of total land acquisition is listed below;

The proposed mitigation measures to reduce the impacts are:

- Careful alignment and route selection by the designer to minimize the impacts by avoiding the residences/houses of these families;
- Proper access should be provided to the farmers to cultivate the divided land at a minimum travel distance;
- For the land coming in the proposed project, the affected people will be provided with suitable compensations as per rules and regulations of Government of Punjab.

7.5.4. Flora

For the establishment of proposed Bypass and camps; different areas will be cleared, so loss of vegetation will occur. It is expected to cut quite a number of tree trunks within proposed project site.

This loss will be compensated by planting strips on both sides of the highway. Compensatory Planting shall be done in rows. As a desirable requirement, 10 number of trees shall be planted for each tree cut along the alignment length of 20 km. Planting will be done as soon as the construction of the road is completed. Native species would be planted, and no invasive/ exotic species would be introduced.

Maintenance is the key to the establishment of the plantation. Regular monitoring of plantation will be carried out by the executing agency. Any failures will be immediately beaten up.

7.5.5. Road Safety

The increased vehicular traffic and speed on the road may result in road safety issues like traffic accidents. The accidents may also be due to tiredness of the drivers. This impact will be major and negative in nature.

The mitigation measures include:

- These impacts will be mitigated by providing traffic signs to facilitate road users about speed limits for light and heavy vehicles. All lanes and sharp bends will be reflectorized to facilitate travelers at night. Phone numbers to be contacted in an emergency shall be displayed at intervals. Necessary highway safety features have been incorporated in design to address safety issues.

7.5.6. Public Utilities

Due to the proposed project, public utilities will be affected creating disruption of public services and inconvenience to the local residents. This impact is temporary and may be considered as moderately negative in nature.

Mitigation measures will include:

- Incorporate technical design features to minimize effect on public utilities;
- Provision in the design and budget for the relocation of the existing utility infrastructures wherever required;
- All public utilities likely to be affected by the proposed project need to be relocated well before the commencement of construction work.

7.6 Impacts Associated with Construction Activities

In this section, the environmental and socioeconomic impacts associated with the proposed project construction activities are discussed. Construction activities here mean construction of campsite, road and associated activities. The identified impacts assessment is detailed in the below Table 7.5.

Table 7-5: Impact Assessment of Construction Activities

Environmental Aspects	Potential Impact	Project Phase	Description	Consequence Severity Rating	Likelihood /Frequency	Nature of Impact	Geographical Location of Impact	Duration of Impact	Reversibility of Impact	Significance of Impact
Protected Areas & Archeology	Habitat loss, temporary relocation, loss of relics	C	No protected area or archeological relics are present in the route of proposed alignment design.	Low	Low	Low	Not applicable	Construction and operation	No	Very Low
Geology and Soils	Soil erosion, soil contamination by the spillage of fuel, oil and chemicals	C	The construction activity will involve clearing of land for the purpose of construction of proposed project. The land will be acquired from the landlords as per government rules. During construction, there is a potential for spills of fuel, lubricating oils and chemicals that could lead to soil contamination.	Medium	High	Direct	Local / Regional	Short Term	Reversible	High

Environmental Aspects	Potential Impact	Project Phase	Description	Consequence Severity Rating	Likelihood /Frequency	Nature of Impact	Geographical Location of Impact	Duration of Impact	Reversibility of Impact	Significance of Impact
Water Resources	Depletion of aquifer from overuse, and contamination of water resources by the spillage of fuel, oil and chemicals	C	During Construction activity surface water resources are used so there is no chance of over exploitation or depletion of water resources in the project area. Groundwater in the proposed project area is available at depth of 50-200 feet and already accessible by locals, so proposed project activities will not impact on local water resources. The main water resources are groundwater in the project area. Along the alignment. Surface and aquifer quality may deteriorate if pollutants are mixed with surface runoff during rain and carried to water resources in the vicinity, or if pollutants leach into the ground.	Medium	Medium	Direct	Local / Regional	Short Term	Irreversible	Medium
Air Quality	Vehicular emission, Dust emission	C	Construction activities can generate locally exhaust emission and dust during activities such as 'earthmoving' operations by using tower cranes, bulldozers etc. and other pollutants emission from heated	Medium	Medium	Direct	Local/ Regional	Short Term	Irreversible	Medium

Environmental Aspects	Potential Impact	Project Phase	Description	Consequence Severity Rating	Likelihood /Frequency	Nature of Impact	Geographical Location of Impact	Duration of Impact	Reversibility of Impact	Significance of Impact
			asphalt, generators and vehicles.							
	GHG Emissions	C	The main source for GHG emissions will be heated asphalt, generators, and vehicles.	Low	Low	Indirect	National	Long term	Irreversible	Low
	Ozone Depletion	C	HCFC and CFC's if any of them used during project activities, can deplete ozone layer.	Low	Low	Indirect	National	Long term	Irreversible	Low
Noise	Impacts at nearest community, Disturbance to the wildlife	C	There is a potential of disturbance to nearby community due to noise. There is also potential of wildlife temporary relocation because of noise.	Medium	Medium	Direct	Local	Short term	Reversible	Medium
Waste	Liquid Waste: Risk of liquid waste contaminating aquifer, or surface water	C	The proposed project activity would generate liquid waste from campsite.	Medium	Low	Direct	Local	Short term	Reversible	Low
	Solid Waste (Non-hazardous): Aesthetic issues	C	The proposed project works will result in the generation of a range of non- hazardous solid wastes.	Low	Low	Direct	Regional	Short term	Reversible	Low
	Hazardous waste: soil, surface and aquifer contamination	C	Hazardous waste such as waste oil / asphalt, batteries, chemicals and clinical waste generated	Medium	Medium	Direct	Local	Short term	Reversible	Medium

Environmental Aspects	Potential Impact	Project Phase	Description	Consequence Severity Rating	Likelihood /Frequency	Nature of Impact	Geographical Location of Impact	Duration of Impact	Reversibility of Impact	Significance of Impact
			during construction and fabrication activities.							
Traffic	Disturbance to local community	C	During the project activities, the traffic movement on the linked/nearby roads and project site will increase. These roads are having appropriate movement, so no major issue will be raised due to movement of vehicles.	Medium	Medium	Direct	Local	Short term	Reversible	Medium
Wildlife and Habitat	Direct habitat loss and migration of wildlife, Temporary Disturbance to Fauna, Hunting, Accidental killing of wildlife	C	The operation under consideration can result in short term displacement of wildlife species along work areas corridors. There is also potential of habitat loss because of clearing of vegetation during construction activities.	Medium	Low	Direct	Local /Regional	Short to long term	Irreversible	Medium
Natural Vegetation	Clearing of vegetation	C	There is a potential for the floral loss and trees to be cut because of land clearing during road and camp site construction activities. The plan is to grow more trees along the alignment. Every single tree being cut for road construction will be replaced by 10 trees.	Medium	Medium	Direct	Local	Long term	Irreversible	Medium

Environmental Aspects	Potential Impact	Project Phase	Description	Consequence Severity Rating	Likelihood /Frequency	Nature of Impact	Geographical Location of Impact	Duration of Impact	Reversibility of Impact	Significance of Impact
Socio – Economic Environment	Local Procurement of Goods and Service	C	Local procurement of goods and services will be procured from local market. So overall it is benefit for locals.	Positive impact	-	-	-	-	-	Positive impact
	Local Employment	C	Due to proposed project activities, there will be employment opportunities for locals for unskilled work. Almost 2100 personnel will be required during construction activities which will generate work opportunities for locals.	Positive impact	-	-	-	-	-	Positive impact
	Disturbance to community from material and equipment transport	C	Project site can be accessed through different routes and there is low to medium traffic on average. So, there will be no major issue of disturbance for local due to project.	Low	Low	No impact	Local	Short term	Reversible	Low
	Employment Conflicts	C	The potential employment related issue includes dissatisfaction among local communities over the number of jobs offered to them, disagreement on definition of 'local' and also on distribution of jobs within the local community	Low	Low	No impact	Local	Short term	Reversible	Low

Environmental Aspects	Potential Impact	Project Phase	Description	Consequence Severity Rating	Likelihood /Frequency	Nature of Impact	Geographical Location of Impact	Duration of Impact	Reversibility of Impact	Significance of Impact
	Project and Community Interface	C	Inter-cultural differences between the project staff from other areas and the local community can result in frictions.	Low	Low	No impact	No impact	No impact	No impact	Low

C = Construction Phase

7.7 Discussion on Key Environmental Aspects, Mitigation Measures and Residual Impacts during Construction Phase of Project

The potential impacts of the proposed project have been discussed in the following sections. Where appropriate, mitigation measures have also been included to reduce the unacceptable impacts. This section includes a priority list of the most important measures that the project proponent should adopt to ensure a practical, cost-effective and sufficient approach to impact mitigation. Information is included as to how the recommended mitigation measures should be incorporated into detailed project design and in the contract documents.

Broadly, these measures can be classified into following categories:

- Avoiding the impact altogether by not taking certain proposed activity or parts of an activity, for example, using Halon, HCFC and CFC-free equipment to avoid impact on ozone layer.
- Minimizing impacts by limiting the degree or magnitude of the activity, for example, minimizing dust emission by using water sprinkler.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Compensating for the impact by replacing or providing substitute resources or environments.

The project proponent plays a vital role in developing the mitigation plan by identifying possible mitigation measures and assessing the feasibility of proposed measures.

This section provides a summary of the residual effects that are likely to be present following implementation of the mitigation measures.

7.7.1. Geomorphology and Soils

Potential Impacts

Impacts on geomorphology and soils may arise from the following project activities:

- Clearing and levelling for road construction.
- Contamination of soil due to spillage of fuels, oils, asphalt or chemicals.

Likely impacts of these activities can include:

- Physical scarring of the landscape,
- Accelerated soil erosion,
- Alteration of soil quality by loss of topsoil,
- Soil contamination.

Assessment of Potential Impacts

The physical scarring caused by clearing and levelling during construction activities could lead to alteration of soil quality by removal of topsoil, losses of plant cover and limited soil erosion induced by disturbance to native soil.

The total area affected would include approximately 20 km along the length of project, it is expected that the project crew will use existing roads for transportation of goods. Construction should follow good industry practices to avoid unnecessary clearing outside of the work corridors and likelihood of soil erosion along or across natural drainage paths.

Loss of topsoil may take place along the alignment of the proposed Highway. The spillage and leakage of fuels, oils, asphalt and other chemicals may lead to soil contamination. Possible contaminant sources include fuel, lubricant oil, asphalt and chemical storage areas at sites, and all project vehicles. A spill prevention plan will be developed and implemented. The mitigation measures listed in following section of the report are adhered with.

Mitigation Measures

The proposed mitigation measures to reduce the impacts on geology, topography, and soil during the proposed construction activities are:

- Vegetation clearing will be kept minimum;
- Unnecessary clearing of vegetation and offset clearing shall be strictly prohibited;
- Vehicle speeds shall be regulated and monitored to avoid excessive dust emissions;
- Off-road travel should be avoided and observance of this should be monitored during the operation;
- Use of existing roads for transportation of goods.

- Vehicles and equipment would not be repaired in the field. If unavoidable, impervious sheathing / drip trays will be used to avoid soil and water contamination.
- Waste oils should be collected in drums and disposed-off through recycling / waste contractors.
- Regular inspections would be carried out to detect leakages in construction vehicles and equipment.
- Fuels, lubricants, and chemicals will be stored in covered and with bunded walls, underlain with impervious lining.
- Appropriate arrangements for spill control, including shovels, plastic bags and absorbent materials, will be available near fuel and oil storage areas.

Residual Impact

The land use will change as a result of construction of the road project. The nature of impact is direct and its duration is short term in nature but takes time to rehabilitate the natural environment of the area, so the overall significance of impact is high. If the mitigation measures are effectively implemented, the residual impact of the proposed activities on the area's geophysical environment is expected to be reduced in significance.

7.7.2. Water Resources

Potential Impacts

Proposed activities could affect the area's water resources in two ways:

- Reduction due to overuse, and
- Contamination (surface or groundwater)

Assessment of Potential Impacts

Water will be required during construction activities. Water will be procured from both ground and surface water resources. Water conservation practices will be utilized to reduce the overall water consumption during proposed project activities. The analysis results for the surface water resources shows that the water is fit for construction process while ground water resources will be utilized at camp sites.

Surface or groundwater quality may deteriorate if pollutants are mixed with surface runoff during rain and carried to water resources in the vicinity, or seeped in the ground. Potential sources of pollution in such cases may include:

- Domestic waste (sanitary and kitchen discharge);
- Oil and grease from vehicles and machinery;
- Stored fuel, oil and other chemicals;

Sewage from the camp should go into an impermeable septic tank. The impermeable septic tank will prevent untreated sewage from polluting surface water.

Mitigation Measures

The mitigation measures described below will ensure that the project area's surface and aquifer resources are not significantly affected by project activities.

- The water extraction will be kept at minimum;
- A water management plan will be developed. The plan will also include strategies to minimize water use (and therefore volume of discharge) and maintain reserves;
- Follow good housekeeping practices with all machinery that may potentially discharge wastewater;
- No untreated effluents will be released to the environment
- Effluents from the camp offices and the residential camps will be treated in the septic tank before its disposal. The treated water (if confirming to PEQS) will be used for tree plantation or will be disposed-off through waste contractor (if effluent does not confirm to PEQS). The septic tank will be completely covered, so that surface runoff may not come in contact with the effluent.
- Fuels, lubricants, and chemicals will be stored in covered and with bund walls, underlain with impervious lining.
- Spill prevention plan shall be followed to mitigate any kind of spill.

7.7.3. Air Quality

Potential Impacts

Air emissions from proposed project-related activities are likely to include:

- Dust emissions produced during construction activities;

- Combustion products (nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, and volatile organic compounds) from generators;
- Combustion products from vehicles used for project-related activities;
- Combustion products from molten asphalt.

Assessment of Potential Impacts

The sources of emissions during construction activities will not be significantly enough to alter the ambient air quality at a regional level. The emissions will disperse quickly with the prevalent wind currents. All generators, vehicles, equipment and machinery will be properly maintained during the operation to minimize emissions.

Other factors that support the insignificant nature of the impact are:

Dust Emissions:

Dust emissions during construction can be an issue. Potential sources of dust emission during construction activities include earthworks (dirt or debris pushing and grading), exposed surfaces, exposed storage piles, truck dumping, hauling, vehicle movement, and concrete mixing and batching.

Dust emitted during construction activities can result in deterioration of ambient air quality in the vicinity of the source, and be a nuisance to the communities, bad for agriculture fields and construction workers itself. Dust clouds also reduce road visibility, creating a traffic hazard.

Vehicle and Equipment Exhaust Emissions:

Combustion processes in generators and other construction equipment result in exhaust gases that can affect the ambient air quality locally.

Emissions produced by vehicles and equipment will be in terms of the resulting pollutants (SO₂, NO_x, PM, etc.). However, the environmental issue can be avoided by using properly maintained equipment.

Emissions from Heated Asphalt:

Raw asphalt may be heated at site (open burning) during the road asphaltting process. This process results in exhaust gases that can affect the ambient air quality locally.

Emissions produced by open burning will be in terms of the resulting pollutants (SO₂, NO_x, CO₂, etc.). However, the environmental issue can be avoided by using prepared heated asphalt.

Mitigation Measures

The mitigation measures given below will further reduce their impact, and ensure that they remain within acceptable limits.

- Water will be sprinkled daily or when there is an obvious dust problem on all exposed surfaces to suppress emission of dust. Frequency of sprinkling will be kept such that the dust remains under control, particularly when wind is blowing towards the receptors.
- All equipment, generators, and vehicles used during the project will be properly tuned and maintained in good working condition in order to minimize exhaust emissions;
- Construction materials that are susceptible to dust formation will be transported only in securely covered trucks to prevent dust emission during transportation.
- All project vehicles will be checked regularly to ensure that engines are in sound working condition and are not emitting smoke;
- Open burning of Asphalt should be avoided as much as reasonable practicable

Residual Impact

Implementation of the proposed mitigation measures is likely to leave no long-term residual impact on the ambient air.

7.7.4. GHG Emissions

The main source for GHG emissions will be generator and vehicle emissions and emission from the preheated asphalt during the project activity. The overall rating given to impact is low because the GHG emissions generated will be less and to minimize the impact all vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition.

By implementing the mitigation measures listed above in 7.6.4. Ambient Air Quality, the residual impact of the proposed activities is expected to be insignificant.

7.7.5. Ozone Depletion

The proposed project will not use any source of ozone depleting compounds such as Halon, Chlorofluorocarbons (CFC), Hydrochlorofluorocarbons (HCFC) or any other source which deplete the ozone layer, so the overall assessment of the impact is significantly low.

7.7.6. Noise Pollution

Potential Impacts

Potential sources of noise pollution will include operation of generators, machinery, construction equipment, and vehicles during the project activities.

The potential noise related issues during construction activities would disturb workers and the surrounding communities of proposed ROW Project.

Assessment of Potential Impacts

The potential sources of significant noise during the construction period include the construction machinery, generators at camps and construction related traffic.

There is no continuous major source of noise in the communities. Intermittent sources of noise found during the field survey included farm tractors and road traffic. Increased noise levels during construction activities can be a source of nuisance for locals and a source of disturbance to wildlife. The main exposure of noise pollution will be on crew members. To minimize exposure to noise, personal protective equipment (PPE) will be used by the workers.

Construction noise levels at the nearest receptor in the nearby village, located from the proposed alignment, would fluctuate depending on the type, number, distance from receptor, and duration of use of various construction equipment. In this analysis, the noise level due to each equipment likely to be used in the construction of the highway, would initially be calculated. The noise level results would be compared with Punjab Environmental Quality Standards for Noise to meet the permissible limits.

There is also a potential of temporary wildlife relocation because of noise, so to reduce this impact, night work will be minimized thus reducing the disturbance to wildlife. The overall impact level is medium in significance as the likelihood of occurrence is medium.

Mitigation Measures

- All on-site personnel will use required personal protective equipment (PPE) in high noise areas that will be clearly marked.
- Proper engineering control will be applied to noise producing sources like generator.
- It will be ensured that generators, vehicles and other potentially noisy equipment used are in good condition. Noise from generators, vehicles, other equipment and machinery will be kept to the minimum through regular maintenance.

The strategy to minimize the noise in the community to within acceptable limits will be based on the following:

- Reduce equipment noise at source
- Before the start of the operations conduct a noise survey of the equipment and prepare a noise control plan
- Use noise-abating devices wherever needed and practicable.
- Blowing of horn will be prohibited on the access road to the project site and inside the site

Residual Impact

By implementing the above mitigation measures the overall impact will be significantly low. Residual noise impact is expected to be low from the construction activities of the proposed project corridor.

7.7.7. Waste Discharges

Potential Impacts

The expected waste generated during construction activities and their proposed methods of disposal are discussed below Table 7.6.

Likely impacts from Hazardous and non- hazardous waste generated by construction activities (if disposed-off improperly) can include:

- Surface and groundwater pollution;
- Soil contamination;
- Air pollution, odor;
- Health hazards;
- Aesthetic issues.

Table 7-6: Construction Activities Waste

<i>Category</i>	<i>Waste Generated and point source</i>	<i>Mitigation Measures</i>
Solid Waste		
Hazardous	batteries, rubber tire, used oil filters, chemical containers, contaminated soil, grease trap sludge,	Used oil and ferrous/non-ferrous materials will be provided to approved contractor for recycling. Batteries will be hauled away by contractor for recycling.
Non-hazardous	Packaging waste Paper, textiles cardboard, rubber, wood, glass, tin cans,	Combustible materials such as paper, card board, textiles will be burnt on-site. Non-combustible materials such as glass, plastics, tin and aluminum cans will be hauled away by contractor for recycling.
Non-hazardous	Food waste	Food waste will be provided to waste contractor.
Non-hazardous Recyclable	Cable drums, wood, packaging, scrap metal, recyclable plastic sheeting, debris, plastic, aluminum cans etc.	Will be hauled away by contractor for recycling.
Non-recyclable	Demolition Waste: Concrete, spent asphalt, plaster, plumbing, heating and electrical parts	Concrete and plaster will be utilized for filling of depressions / pits. Plumbing, heating and electrical parts will be hauled away by the contractor for recycling.
Liquid Waste		
Hazardous	Sewerage water	Wastewater from kitchen and washing areas will be collected for reused for plantation. Sewerage will be treated by using septic tank and treated water will be reused for water sprinkling.

Assessment of Potential Impacts

All the waste generated during construction activities will be disposed-off through implementation of an effective waste management plan. By proper implementation of a waste management plan, the overall potential risk/impact will be significantly low.

Domestic Wastes:

Domestic wastes generated during construction activities will include sewage or black water, grey water (from kitchen, laundry, and showers), kitchen wastes, and recyclable wastes. Sewage or black water will be treated and disposed by means of a septic tank and will be reused for plantation. Grey water will also be collected for reuse in garden or plantation.

Organic waste or compostable material including vegetation waste, food waste and leaves of trees will be utilized for bin composting. Compost would be used as soil conditioner or fertilizer for plants. Recyclable materials such as paper, card board, textiles, plastics, tin and aluminum cans will be hauled away by contractor for recycling.

Oil Stains and Spills:

Fuel or oil stains, leakage or spill during construction operations can result in contamination of soil and water. Consequently, spill containment will be used for all fuel and lubricant storage. All spills to ground will be remediated as soon as reasonably practical. The waste management plan will be developed to include this.

Mitigation Measures

A waste management plan will be developed before the start of the project activities. Key elements of the waste management system will be the following:

On-site handling

- The recyclable waste will be sent to approved waste contractors.
- Waste bins will be placed inside the boundary. All waste removed from the site will be under license and handled by an approved contractor. All hazardous waste will be separated from other waste.

Audits

- On-site audits of the waste management will be undertaken on a regular basis during the project activity;
- Audits of the waste disposal contractors and waste disposal facilities will be undertaken on a regular basis to ensure the implementation of waste handling and disposal procedures.

Records

- Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a waste tracking register.

Disposal

- All non-hazardous waste material that cannot be recycled or reused will be disposed of as per waste management plan;
- Depending on the nature and quantity of the hazardous waste, it will be disposed of by licensed hazardous waste contractors as per the waste management plan;

Other Management Measures

- Training will be provided to personnel for identification, segregation, and management of waste;
- An emergency response plan will be developed for the hazardous waste (and substances)
- All containers of hazardous waste will be labelled appropriately;
- Equipment and material containing asbestos, poly-chlorinated biphenyls (PCBs), and ozone depleting substances (ODSs) will not be used.

Residual Impact

Even after implementation of the above measures, it is possible that some littering may take place. Monitoring will be undertaken to minimize the residual impact.

7.7.8. Traffic

Potential Impacts

Following will be the potential impacts from the traffic;

- Disturbance to local community,

Assessment of Potential Impacts

The nearest community settlement is located within 1 to 10 km from the proposed project at various locations. The proposed project final alignment option is to use existing road along the respective stretches of the road, so all the proposed project related traffic will use existing road and thus ensuring that the community will be least influenced by the construction vehicle movement.

Mitigation Measures

- Journey management plan will be developed;
- To the extent possible, peak traffic times will be avoided for project traffic;
- Vehicles will remain confined to defined access;
- Parking at NO PARKING areas shall not be allowed

Residual Impacts

By implementing the above mitigation measures the overall impact will be significantly low, so the residual impact is low.

7.7.9. Wildlife and Habitat

Potential Issues

Impacts on wildlife may arise from the following project activities:

- Noise generated from project activities;
- Movement of personnel and vehicles;
- Lights used at the project facilities;
- Clearing of vegetation;
- Improper disposal of wastes;
- Removal of crucial habitats

Likely impacts of these activities can include:

- Temporary migration of mammal and bird from the area;

- Accidental killings of wildlife.
- Loss of existing habitats i.e. aquatic and terrestrial

Assessment of Potential Impacts

Mainly at some locations agricultural land will be affected due to the proposed project and crop yield will be disturbed to some extent. But in the long run, due to the construction of the proposed project, better transport facilities and opportunities will be available to the farmers to enhance the crop yield by harnessing the modern equipment, seeds and feed for improved cultivation.

During the construction activities, there will be possible disturbance to wildlife which will be due to disturbance and loss of habitat, clearing and levelling of construction site. Wildlife may also be disturbed due to sensory disturbance from earthwork, construction; movement of vehicles and crew personnel. This can possibly result in changes in distribution and abundance.

To minimize the impact, vegetation loss will be kept to an absolute minimum. Cutting of trees will be avoided. No-hunting and no-trapping policy will be strictly enforced, unless human life is under threat. Most of the animals in the region are common to the area. Birds are least susceptible to the long-term impact of temporary activities, as they are highly mobile and tend to avoid areas of project activity. No endangered or vulnerable species are found in the proposed project area. So, the overall significant of impact is low.

Mitigation Measures

The following mitigation measures will reduce the adverse impact on the wildlife of the project area:

- Vegetation loss will be kept to an absolute minimum. Cutting of large trees will be avoided;
- Compensatory planting for ten trees against each fallen tree of similar floral function will be followed;
- Compensation for the loss of trees owned by the affected people will be provided;
- Introduction of invasive/ exotic species and native species will be recommended for plantation;

- Open Fires will not be allowed;
- A 'no-hunting, no-trapping, no-harassing' policy will be strictly enforced, unless threatening to human life.
- Uncontrolled discharge of waste of any kind shall be controlled in the area;
- Discharging firearms will be explicitly prohibited;
- General awareness of the crew will be enhanced regarding the wildlife, through environmental training, notice board postings, tool box talks etc;
- The project staff will be educated and instructed to avoid killing. Feeding or harassment of wildlife will not be allowed;
- Physical disturbance to areas outside the work corridors will be avoided;
- The total duration of activities will be minimized by good management;
- All mitigation measures to minimize noise levels, dust emissions, air emissions, and waste management required by the EIA will be adhered to;
- Food wastes will not be disposed-off in the open;
- Movement of all project personnel will be restricted to work areas and day time;
- Night travelling will be kept to a minimum.
- The proper pathway will be provided at major water channels for the movement of both terrestrial and aquatic species in the proposed alignment of ROW project.

Residual Impact

Once the mitigation measures given above are implemented, it is expected that the project will have lesser significant impacts on the area's wildlife.

7.7.10. Natural vegetation

Potential Impacts

Clearing of or damage to vegetation due to camp road construction activities will occur due to:

- Clearing of land for road site
- Clearing of land for camp sites
- Off road travel.

Assessment of Potential Impacts

For the establishment of proposed highway and camps; different areas will be cleared, so loss of vegetation will occur. It is expected to cut quite a number of tree trunks within proposed project site. At the length of proposed project total 762 trees will be cut along the alignment. No rare, sensitive or vulnerable species are recorded or reported in the study area. Most of the plants found in the area have the properties to grow in more than one habitat because of their wide ecological aptitude and have populations large enough to ensure their genetic diversity. The removal of this portion of vegetation is not likely to harm the overall diversity of plant communities and the genetic diversity of species. To minimize the impact; camp sites and access routes will be constructed on those areas where vegetation loss may be avoided and unnecessary damage to vegetation will be avoided. Moreover, the vegetation will be removed only in the alignment of road construction while area around 30 feet along the roadside will be avoided for any extra cutting of trees. The plan is to grow more trees along the alignment. Every single tree being cut for road construction will be replaced by 10 trees. Plantation of approximately one percent of total project cost is the part of planning. Moreover, tree species will be planted as per ecological conditions of the respective project area. The significance of the impact is reduced and any loss of vegetation is reversible.

Mitigation Measures

The following mitigation measures will reduce any adverse impact on vegetation:

- Vegetation clearing from road site and camp sites will be kept to a minimum;
- Fuel-wood will not be used during project activities;
- When developing new access roads, routes that minimize vegetation loss will be chosen, avoiding unnecessary damage to vegetation;
- Any significant removal of or damage to vegetation in this area will be compensated by afforestation/reforestation;
- Off-road travelling will be minimized.

Residual Impact

Given the current state of the vegetation, and implementation of the proposed mitigation measures, little significant residual impact on the natural vegetation of the area is anticipated.

7.7.11. Socio-economic Impact

Potential Impacts

Potential sources of positive and meditative impacts on local communities can include:

- Safety and security
- Mobility and transportation
- Project and Community Interface
- Cultural and religious sites
- Archaeological Sites
- Local Economy
- Local Employment.

Assessment of Potential Impacts

Safety and Security:

The operations may affect the safety and security of the inhabitants of the areas in the following ways: conflicts between residents and the construction contractors, carriage of fire arms on the site will be banned. Community sensitive project planning and implementation as prescribed through the recommended mitigation measures will minimize the occurrence of any such impacts. Further project vehicles will use the existing road to extent possible and there will be least road safety issues.

Mobility and Transportation:

The project activities may affect mobility of local women. Project personnel will be given gender sensitization briefings and will be instructed to respect local norms, the local culture, particularly in relation to the womenfolk of the area. Moreover, arrangement of the workers from the local communities will also help to follow the local norms in better way.

Project and Community Interface:

Inter-cultural differences between the project staff from other areas and the local community could result in frictions.

To mitigate these issues locals will preferred for unskilled jobs. Also with proper management of the workforce, it is possible to avoid any complaints.

Cultural and Religious Opportunities:

Cultural sites in the form of mosques, tombs and graveyards exist in the proximity of proposed project site. It will be assured to avoid such places in order to maintain respect for such places.

Archaeological Sites:

There are no documented sites of archaeological, historical, or cultural significance within the proposed alignment.

Local Economy:

There will be positive impact on local economy due to project activities:

- Increased turnover of local businesses and shops due to an increased demand from project contractors and their employees. During the proposed project activities such as construction, material such as the gravel, aggregate, steel, cement, sand for site construction will be procured from local market. General supplies which include camp supplies (food, etc.), fuels and oils etc. will also be procured from nearest urban areas.
- An increase in the income of locals may occur due to employment in the project.
- Local Employment:
- Distribution of employment opportunities during construction activities. Local people will be hired for unskilled jobs. When hiring local people, preference will be given to people living within the close proximity of project site, as they will be the most directly influenced by the project.

Mitigation Measures

The following mitigation measures will be implemented:

- Limit the social interaction between the workforce and the local communities;
- All vehicle drivers will be trained in community safety aspects. Drivers will be trained in responsible and safe driving practices; safe speed limits for vehicles will be followed;
- The construction crew's interaction with the local population will be minimized.
- The project proponent and the contractor will maintain liaison with the local community. The communities will be informed of the construction activities well in advance.
- There will be no interaction with the local women folk.
- The company will maintain a social complaint register at the site to document all complaints received from local communities. The register will also record the measures taken to mitigate these concerns.
- Awareness and cultural inductions to educate the contractor workforce on the requirement of minimizing social interaction with local communities;
- Project staff will respect cultural norms.
- The non-local project staff will be sensitized to local culture and norms.
- Unnecessary interaction of local population with the non-local project staff will be avoided.
- Residents of the area will be informed at least two weeks before project activities commence.
- Maximum number of unskilled and semi-skilled jobs will be reserved for the local communities.

7.7.12. Land Acquisition

One of the major project related impact will be the land acquisition for the proposed project that will result in causing disturbance to the affected residents along the project area. Most of the alignment is proposed to traverse along agricultural land.

This impact will be permanent and major negative in nature.

The proposed mitigation measures to reduce the impacts during the proposed construction activities are:

- Careful alignment and route selection by the designer to minimize the impacts by avoiding the residences/houses of these families.

- Proper access should be provided to the farmers to cultivate the divided land at a minimum travel distance.
- For the land coming in the proposed project, the affected people will be provided with suitable compensations as per rules and regulations of Government of Punjab.

7.8 Impacts Associated with Operation Activities and Mitigation Measures

In this section, the environmental and socioeconomic impacts associated with the proposed project operation activities are discussed. The impacts that are discussed are as follows:

Environmental Impacts

- Air Emissions
- Water Resources
- Green House Gas Emissions
- Hazardous Material
- Ozone Depletion
- Noise
- Wastewater
- Waste Management
- Occupational Health and Safety

7.8.1. Air Emissions

Potential Impacts

Impacts on local air quality may arise from the following project activities:

- Biomass Combustion due to traffic
- Particulate matter emissions results from unburned carbon and impurities in fuels

Likely impacts of these activities can include:

- Deterioration of local and regional air quality
- Respiratory diseases in local community
- Global Warming (Increase in CO₂ and NO_x in the atmosphere can cause global warming)

- Acid Precipitation (impact on aquatic ecosystem of surface water and ground water through acidification)

Assessment of Potential Impacts

Highway activities can have a major impact on the local and regional air quality. The pollutants can seriously impair human health and ecological environment and other materials. The emissions include sulphur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, and particulates (which may contain trace metals). The emission levels depend on the type and size of facility, the type and quality of fuel and the manner in which it is burned.

A significant impact will be interpreted if the concentration of pollutants in the ambient air exceeds the PEQS or recognized international guidelines for ambient air quality such as World Bank and World Health Organization (WHO) ambient air quality guidelines.

The impact will also be considered significant if the pollutants emission level as well as the ground level concentration exceed the values as set out by Punjab- EPD.

It is obvious that the transport will be shifted from nearby roads to proposed Highway. Still there will be an increase in transportation. This distribution of traffic will share the air pollution load which will result in a slight change in existing air quality scenario in proposed project area.

Mitigation Measures

The proposed mitigation measures to reduce the impacts on air quality during the proposed operation activities are:

- Use of cleaner fuels and if possible to renewable fuels
- Motivation for proper maintenance of vehicles
- Monitoring of Ambient air parameters (CO, PM₁₀, SO₂, and NO_x etc.) should be carried out on annual basis.

Residual Impact

If the mitigation measures are effectively implemented, the residual impact of the proposed activities on the area's air quality is expected to be low in significance.

7.8.2. Water Resources

Potential Impacts

Proposed activities could affect the area's water resources in two ways:

- The surface water bodies may get polluted due to uncontrolled release of contaminated storm water/road runoff from road surfaces
- The pollution risk from accidental spillage may increase moderately.

Assessment of Potential Impacts

Surface water quality may deteriorate if pollutants are mixed with surface runoff during rain and carried to water resources in the vicinity. The pollutants associated with the road-runoff include:

- hydrocarbons such as fuel and polycyclic aromatic hydrocarbons from wear and tear of the road surface, tyres, lubricants leaking from vehicles and from unburnt fuels
- suspended solids including insoluble heavy metals as colloidal materials

Mitigation Measures

The mitigation measures described below will ensure that the project area's aquifer resources are not significantly affected by project activities.

- In order to discharge rapid removal of storm-water/road runoff, cross slopes and longitudinal drainage will be provided in the design. Well-designed cross drainage structures limit ponding across embankments
- Retention basins with reedbeds provided in the design will improve the quality of polluted storm-water/road runoff;
- The surface water quality monitoring will also be carried out at defined intervals

Residual Impact

Groundwater may get polluted due to contaminated road runoff on earthen shoulders and embankments planted with grasses. However, the areas in the immediate vicinity of the proposed highway will be avoided for vegetation due to the risk of contamination.

Groundwater quality monitoring will be carried out as per schedule suggested in the Environmental Monitoring Plan.

7.8.3. GHG Emissions

Potential Impacts

Greenhouse gases are released as a result of combustion process. The increase in greenhouse gas emissions in the atmosphere due to human activities such as combustion and land use change contributes to the global warming.

Assessment of Potential Impacts

The Kyoto Protocol is an amendment to the United Nations Framework Convention on Climate Change (UNFCCC) an international treaty on global warming. Ratifying developed countries commit to reduce their combined greenhouse gas levels. Islamic Republic of Pakistan ratified the United Nations Framework on climate change in January 1994 and is a party to other international agreements concerning climate change. Developing countries including Pakistan have no obligation beyond monitoring and reporting emissions.

Mitigation Measures

There are no generally accepted methods for the mitigation of CO₂ emissions. However, one possible mitigation strategies will be given consideration. This includes;

- Carbon sequestration by planting trees near the project vicinity.
- Smoke generating vehicles will not be allowed to travel on the highway.

Residual Impacts

CO₂ emissions contributes to the global warming however, CO₂ emissions from the proposed project will be considerably less as it is expected that there will be shifting of traffic from the nearby roads towards proposed Highway so overall emissions will be with limited increase.

7.8.4. Hazardous materials

Potential Issues

Although, there will be no use of hazardous material during the operational phase except for cleaning agent; still oil leakages from the vehicles are expected. Moreover oil storage at rest areas might be expected for generators etc. These chemicals have a potential to harm human health and contaminate soil, surface and groundwater if not handled correctly.

Assessment of Potential Impacts

A significant impact will be interpreted if the hazardous materials are not handled properly. These chemicals and hazardous materials will be handled following the mitigation measures described below:

Mitigation Measures

A chemical and hazardous material handling procedure will be prepared that will contain:

- Storage areas for fuels and liquid chemicals will be designed with secondary containment to prevent spills and contamination of soil and groundwater.
- Labeling will be placed on all storage containers as appropriate to national and international standards. The labeling will clearly identify the stored materials.
- Supporting information such as Material Safety Data Sheets (MSDS) will be available for all hazardous materials.
- Disposal of any hazardous material will be according to the MSDS requirements.

Residual Impacts

Implementation of the proposed mitigation measures is not likely to leave any significant impact.

7.8.5. Ozone Depletion

The proposed project will not use any source of ozone depleting compounds such as Halon, Chlorofluorocarbons (CFC), Hydrochlorofluorocarbons (HCFC) or any other source which deplete the ozone layer, so the overall assessment of the impact is significantly low.

7.8.6. Noise

Potential Issues

The proposed ROW project may result in increase in noise. The increased noise may be a source of disturbance to nearby communities.

Assessment of Potential Impacts

Noise sources in the community are mostly intermittent in nature including road traffic specifically during day times. The PEQS for noise require that the sound level in residential areas should not exceed 65 dB(A) during the day and 55 dB(A) during the night.

Mitigation Measures

The following mitigation measure will be undertaken in order to further reduce the noise levels.

- The noise producing vehicles will not be allowed to enter at interchanges.
- Tree plantation to reduce the effect of noise pollution.

Residual Impacts

Implementation of the mitigation measure proposed above will result in negligible / no residual impact due to noise on surrounding environment.

7.8.7. Solid Waste Management

Potential Issues

The solid waste generated during the operational phase of proposed project can pose a health hazard, pollute soil, surface and ground water if not managed properly.

Assessment of Potential Impacts

A significant impact will be interpreted if the waste management is not carried out properly; which may affect the health of nearby communities, pollution of soil, surface or groundwater:

The operation of the proposed project will generate a relatively minor volume of solid wastes. This solid waste will be domestic in nature.

- Domestic waste from the highway activities which will include, waste from kitchen and general rubbish, recyclable waste such as empty containers, paper, plastics bottles etc.

All wastes generated from the project will be properly managed by proposed controls discussed in the following section. The environmental impacts will be minimum after the implementation of the proposed mitigations.

Mitigation Measures

Key elements of the waste management system will be the following:

- Separate waste bins will be placed for different type of wastes - plastic, paper, metal, glass, wood, and cotton.
- Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling.
- Non-hazardous, non-recyclable wastes such as kitchen wastes will be disposed-off on designated site.
- No waste will be dumped at any location outside the proposed project boundary.
- Records of all waste generated will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register.
- Training will be provided to personnel for identification, segregation, and management of waste.

Residual Impacts

Proper implementation of the mitigation measures will ensure that the residual impact from waste is minimum.

7.8.8. Occupational Health and Safety

Health risks and workers safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment specifically due to road traffic hazards, air emissions, unhealthy drinking water, storage handling and transport of hazardous material etc. Workers will be provided with safe and healthy working

environment taking into account risks inherent to the particular sector and specific classes of hazards in Project area.

Mitigation Measures

- Obligatory insurance against accidents for laborers/workers;
- Providing basic medical training, road safety training to specified work staff and basic medical service during operations
- Firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;
- Elaboration of a contingency planning in case of major accidents;
- Instruct foremen to strictly enforce the keeping out of non-working persons;
- Particularly children, off work sites;
- Adequate signage, safety cones, lightning devices, barriers, yellow tape and persons with flags during operations to manage traffic;
- There should be proper spill control for Oil spillage / leakage of vehicle;
- Efforts will be made to create awareness about road safety among the drivers;
- Timely public notification on planned construction works;
- Seeking cooperation with local educational facilities (school teachers) for road safety campaigns;
- Provision of proper safety and diversion signage, particularly at urban areas and at sensitive/accident-prone spots;
- Setting up speed limits;
- Eliminate any unusable impounding of water.

7.8.9. Environmental and Social Benefits

Changes in Land Value

The proposed project is expected to appreciate the current land values of associated villages, towns and cities. Land owners will have an opportunity to sell their land on increased prices and start new businesses. This impact will be major positive in nature.

Employment

The project will generate directly hundreds of jobs during the construction phase of the project. The project operational phase will also generate new jobs. Most of these vacancies will be filled by Pakistani nationals.

Similarly the construction and operation of the project will create far greater number of indirect income resources for example income resource for transporters for the transportation of the materials, procurement of goods from local market etc.

Overall the proposed project will have a very positive impact on the employment opportunities in Pakistan.

Community Development

Improved community infrastructure will promote new business opportunities. In addition such an activity will also increase the land value that will benefit the local residents. This impact will be permanent and major positive in nature.

8 Environmental Management Plan

The potential environmental impacts are identified from the planning stage of proposed project through the Environmental Impact Assessment (EIA) process. The EIA has identified potential impacts that are likely to arise during the project. The EIA has examined in detail both negative and positive impacts at each stage of the project covering both construction and operations phase. To minimize the effects of adverse impacts the EIA has recommended mitigation measures. These mitigation measures include the use of alternative technologies, management and physical controls, or compensation in monetary terms. The proposed mitigation measures have been based on the understanding of the sensitivity and behavior of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industrial practices while operating in similar environments. For residual impacts (impacts remaining after applying the recommended mitigation measures) and for impacts in which there can be a level of uncertainty in prediction at the EIA stage, monitoring measures have been recommended to ascertain these impacts during the course of the project.

For effective implementation and management of the mitigation measures an Environmental Management Plan (EMP) has been prepared. The EMP satisfies the requirement of the Punjab Environmental Protection Department Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.

The EMP is a tool that serves as to manage environmental impacts and specifically focuses on implementation of mitigation measures in its true sense against likely environmental impacts.

8.1. Purpose and Objectives of the EMP

The primary objectives of the EMP are to:

- Achieve NHA Corporate HSE goals;
- Facilitate the implementation of the mitigation measures identified in the EIA;
- Define legislative requirements, guidelines and best practices that apply to the project;

- Define the responsibilities of the project proponent;
- Define a monitoring mechanism and identify monitoring parameters in order to:
 - Ensure the complete implementation of all mitigation measures.
 - Ensure the effectiveness of the mitigation measures.
- Define requirements for environmental monitoring and auditing.
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations;
- Identify training requirements at various levels.

8.2. Components of the EMP

The EMP consists of the following:

- Legislation and guidelines
- Organizational structure; roles and responsibilities
- Monitoring / Management plan
- Environmental monitoring
- Communication and documentation
- Change management Plan
- Training programme

8.3. Legislation and Guidelines

The EIA has discussed national and international legislation and guidelines that are relevant to the project; proponent will ensure that the project is conducted in conformance to the project proponent corporate environmental policy, national legislation and relevant international conventions and that guidance is sought from national and international guidelines. Project proponent will also ensure that its key project management staff and all its assigned contractors are aware of these legislation and guidelines prior to the start of project activities. The details on national and international legislation and guidelines are given in **Chapter 2** of the report.

8.4. Organizational Structure and Responsibilities

This section provides an organizational structure for environmental management during the proposed project operation and defines the roles and responsibilities of the

various players for the duration of the project. The proposed project includes the following organizations:

- NHA as the project proponent and owners of the EMP;
- Project construction contractor(s) as executors of the EMP during construction phase of the project;
- Operation & Maintenance (O&M) team as executor of the EMP during the operational phase of the project.

These organizations will have the following roles and responsibilities during the project.

8.5. Roles and Responsibilities

General

Roles and Responsibilities of NHA

National Highway Authority (NHA) as project proponent will be responsible for ensuring the implementation of the EMP. NHA will be responsible for the overall environmental performance of the project. Project proponent will monitor the environmental performance of the project to ensure that the project is carried out in accordance with governing legislation, project proponent corporate policies and recommendations of this EIA.

Details of specific NHA personnel involved in the project are given below:

Project Director: Project Director will be responsible for the successful implementation of the Project. He will be assisted by the Supervision Consultants. Project Director will have a Deputy Director for the said project.

Director (Environment, Social and Land/Resettlement): The Director (Environment) will be the overall in-charge for handling NHA's obligations with respect to the EMP. The Director (Environment) will depute one Deputy Director (Environment) for the Project, who will be responsible for ensuring that the provisions of the EMP and Site-Specific Environmental Management Plan (SSEMP) are implemented.

Deputy Director (Environment) will be assisted by Assistant Director (Environment) for the execution of Environmental Management Plan (EMP) for the Project.

Deputy Director (Social and Land/Resettlement) will be responsible for the land acquisition and resettlement related issues.

Executive District Officer (E.D.O. Revenue) will be assisted by D.D.O (Revenue), Assistant Revenue Officer and Patwaris in assessing the award price for land acquisition to the affectees.

The responsibilities of Director (Environment) may be briefly described as follows:

- To coordinate with regulatory agencies including PEPD, EIA/IEE consultant, local NGOs, that could assist the NHA in independent reviews of environmental and social compliance;
- To supervise environmental and social assessment reports, and provide substantial inputs and guidance to the EIA consultant;
- Supervise Project design consultant to get the approval of EIA from the EPD Punjab;
- To ensure that the design consultant has incorporated all the mitigation measures proposed for the design phase in the design and included in the contract documents;

Specifically, before the start of the Project, the NHA's Deputy Director (Social and Land/Resettlement) will ensure that the following activities are carried out in a transparent manner and according to the acceptable standards:

- Identifying and verifying Project affected persons (PAPs) on the basis of specified documents;
- Identifying which public facilities and utilities need to be relocated;
- Identifying alternative resettlement sites for PAPs outside the ROW;
- Carrying out a consultation and dissemination campaign with regard to compensation procedures, entitlement packages, and proposed alternative resettlement sites;
- Preparing individual entitlement files;
- Preparing and approving compensation budgets;

- Ensuring that an adequate notice period is given to PAPs before shifting;
- Providing shifting assistance to displaced squatters and to assist squatter owners to salvage their facilities; and
- Approve the SSEMP prepared by the contractor prior to the commencement of civil works.

Roles and Responsibilities of Contractors

NHA will appoint design consultants, supervision consultants, construction contractor(s) for the construction, testing and commissioning of the proposed project including the auxiliary facilities.

Design Consultant: Design consultant will ensure that all the mitigation measures designated for the design phase are incorporated in the design and included in the contract documents.

Supervision Consultants: Supervision consultants appointed by the Project Director (NHA) will be headed by a “Project Manager”. Supervision consultant along with his team will supervise the Project contractors to ensure quality of work and fulfilment of contractual obligations. The Supervision Consultant (SC) will provide one Environmental Specialist/ Monitoring Consultant (MC) who will:

- Ensure that all the environmental and social parameters/provisions comply with the applicable standards;
- Ensure that day-to-day construction activities are carried out in an environmentally sound and sustainable manner;
- Organize periodic environmental training programmes and workshops for the Contractors’ staff and NHA site staff in consultation with the NHA; and
- Develop “good practices” construction guidelines to assist the Contractors and NHA staff in implementing the EMP;
- Assist NHA as required in developing the bi-annual environmental monitoring reports;
- Assist NHA in reviewing the SSEMP developed by the contractor.

Construction Contractor: EMP will be made a part of the contract agreement and the contractor will ensure that all Project activities are in compliance with the EMP and PEQS.

Operations and Maintenance (O&M) Contractor: Similarly, Operations and Maintenance (O&M) team will be appointed during operational phase of the project. These contractors will be responsible for implementation of, or adherence to, all provisions of the EMP and with any environmental and other codes of conduct required by project proponent. Overall responsibility for environmental performance of the operation will be the liability of the senior management of the contractors. Site managers of the contractors will be responsible for the effective implementation of the EMP.

8.6. Planning and Design of the Operation

Design of the Operation

Design and operations of the proposed project have been described in **Chapter 3** of the EIA report. Following approval of the EIA, if any aspect of the operations or requirements of the EIA need to be changed, project proponent will categories that change in accordance with the Change Management Plan provided in **Section 8.14** of this EMP and take appropriate measures thereon.

Approvals

Obtaining No Objection Certificate (NOC) from Environment Protection Department Punjab (Punjab EPD) will not relieve the proponent or its appointed contractors or suppliers of any other legal obligations and hence the proponent and its contractors and suppliers will obtain all other relevant clearances and necessary approvals required by the Government of Punjab prior to commencing the respective operations. The Deputy Director (Environment) will sustain a working partnership among the NHA, EPD Punjab, Forest and Wildlife Dept. and other organizations.

Contractual Provisions

Adherence to the requirements of the EIA, EMP and PEPD provided NOC in terms of environmental mitigation will be required from all project contractors and suppliers and thus EMP will form part of their contracts with project proponent.

8.7. Implementation of the EMP

Co-ordination with Stakeholders

Project proponent will ensure that co-ordination required with the project stakeholders on environmental and social matters as required by the EMP is maintained throughout the operation.

Environmental Management Systems

Project proponent and the contractors will ensure that the mitigation measures mentioned in the EIA are adhered to and organizational Environmental Management Systems are implemented during the proposed project. The contractors will abide by the relevant contractual provisions relating to the environment.

Monitoring

Project proponent and its contractors will ensure that monitoring of the project activities is carried out according to the monitoring programme given in the EMP.

Change Management

The EIA recognizes that changes in the operation or the EMP may be required during the construction & operation activities and therefore provides a Change Management Plan (incorporated in **Section 8.10**) to manage such changes.

Emergency Procedures

Project proponent and its contractor will prepare and maintain contingency plans to deal with any emergency situation that may arise during the construction or operation phase e.g. fire, major oil spills, medical evacuation and communicate these to the regulatory agencies if and when required by these agencies. Emergency plans will be in accordance to project proponent internal procedures.

Approvals

The project contractors will be responsible for obtaining all relevant approvals from project proponent such as approvals for waste contractors and others as specified in the environmental management and monitoring plan.

Training

Project proponent and its contractors and suppliers will be responsible for the selection and training of their staff which shall be capable of completing the project activities in an environmentally safe manner. Project proponent and its contractors and suppliers will be responsible for providing induction to their staff members on the EIA, the EMP and their implementation provided in the EMP. The contractors will be responsible for providing awareness training on potential environmental issues of the project to all personnel at site. In addition, trainings on medical evaluation, emergency preparedness and implementation of EMP will also be covered during the training.

Communication and Documentation

For effective monitoring, management and documentation of the environmental performance during the construction and operational phase of the project, environmental matters will be discussed during meetings held on-site. Environmental concerns raised during the meetings will be mitigated after discussions between project proponent and the contractors. Any issues that require attention of project proponent higher management will be communicated to them for action. Project proponent and its contractors will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the project.

Restoration

Project proponent will ensure that the restoration of the site after the end of construction activities and after the useful life of proposed project is carried out according to the requirements of the EIA and EMP.

Audits

Project proponent and its contractors and sub-contractors will carry out periodic audits/inspections of all project activities regarding their effects on the surrounding

environment. The contractors will take account of any recommendations relating to the activity/operation arising during the monitoring, with the prior consent of the proponent.

8.8. Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) will be used as a management and monitoring tool for implementation of the mitigation measures identified by the EIA.

The purpose of monitoring is to ensure that the impact is within the predicted limits and to provide timely information if unacceptable impact is taking place. The scope and frequency of the monitoring depends on the residual impacts identified in **Chapter 7** of the report. To address the mitigation measure and monitoring requirement identified in EIA, a management plan is developed. It ensures that the project is designed, constructed, maintained and implemented in the manner described in the EIA.

A detailed monitoring plan is discussed in following tables. These tables list all the impacts of project components and their associated mitigation measures identified in the EIA. For each component, the following information is presented in the plan:

- The required mitigation measures recommended in **EIA**.
- The person/organization directly responsible for adhering to or executing the required mitigation measures.
- The person/organization responsible for ensuring and monitoring adherence to mitigation measures.
- The parameters which will be monitored to ensure compliance with the mitigation measures.
- The timings at which the mitigation or monitoring has to be carried out.

Project proponent will hold primary and overall responsibility for ensuring full implementation of the EMP. The Environmental Management and Monitoring Plan has been provided separately for pre-construction, construction and operations phase of the proposed project activities in **Table 8.1**, **Table 8.2** and **Table 8.3** respectively.

Table 8-1: Management and Monitoring Plan – Design /Pre-construction Phase

Sr.	Project Activity	Impacts	Mitigation	Responsibility
1	Alignment selection	▪ Accidents due to improper design ▪ Resettlement & compensation issues of local people ▪ Disturbance to properties / businesses ▪ Tree cutting ▪ Crossing from areas under conservation, resorts and wildlife considerations. ▪ Road roughness producing sounds, perturbing the fauna in the natural habitat of area.	▪ Avoid sharp curves/turns in the design; ▪ Ensure minimum tree cutting and vegetation clearance during alignment selection; ▪ Selection of the route with minimum dislocation/ resettlement of the structures/people; ▪ Proper signage while passing through animal, aviary areas. ▪ No horn signage.	DC, NHA
2	Public and Cultural Properties	▪ Disturbance to people visiting public properties i.e. mosque, schools, shrines and graveyards etc.	▪ Incorporate technical design features to minimize the Project construction activities to avoid any interference to cultural & heritage sites and public property as far as possible; ▪ In case of unavoidable interference prior notification and ▪ Consultation needs to be made to reach consensus on procedures and options (e.g. re-location/re-building) or any other form of agreed compensation; ▪ Provide animal, pedestrian and vehicular underpasses if required.	DC, NHA
3	Shifting of Public Utilities	▪ Disturbance and interruption to the public may occur	▪ Incorporate technical design features to minimize effect on public utilities; ▪ All public utilities likely to be affected by the proposed project need to be relocated well before the commencement of construction work.	DC, NHA
4	Identification of sites for	▪ Disturbance to the public may occur	▪ Construction camps will be located away from the local communities & cultural sites. Asphalt,	DC, NHA

Sr.	Project Activity	Impacts	Mitigation	Responsibility
	construction camps, asphalt & batching plants and crushers.	Tree cutting may be involved for the construction of camp site, asphalt and batching plant sites.	batching and crushing plants (if required) must be installed in the downwind direction from residential areas and agricultural land.	
5	Land Acquisition	- Loss of agricultural land - Resettlement Issues	- Mitigation measures will involve careful alignment and route selection by the designer to minimize the impact; - Adequate budget will be provided in the Project cost for the compensation to the affected people as per land acquisition law of Punjab Government.	DC, NHA
6	Excavation of Earth	- Soil erosion and contamination - Loss of fertile top layer of soil - Air quality may also deteriorate during excavation	- Agricultural areas will be avoided for borrowing of materials, unless requested by the landowner for lowering the land to create new irrigation polders; - Contractor needs to obtain approval for excavation and for plan of rehabilitating the site after excavation; - Identify locations where excavated material would be utilized.	DC, NHA
7	Protected or Reserved Areas	- Disturbance to the sensitive natural environment - Loss of significant vegetation - Loss of habitat - Loss of Biodiversity	- The proponent shall coordinate with forest and wildlife department during design stage - Approval shall be obtained from concerned departments - Strict mitigation measures shall be adopted and implemented after coordination with forest department.	DC, NHA
DC= Design Consultant, NHA = National Highway Authority				

Table 8-2: Management and Monitoring Plan – Construction Phase

Sr.	Project Activity	Impacts	Mitigation	Responsibility
1	Site clearing / leveling	- Loss of vegetation may occur; - Soil erosion & - Soil and surface water pollution/contamination.	- Unnecessary clearing of outside the working areas will be avoided and shall be strictly prohibited - Assure minimum disturbance to native flora during construction especially where the asphalt, batching and crushing plants will be installed; - Clear without destroying large plants and turf where possible and preserve them for replanting in temporary nurseries; - Move earth and vegetation only during dry periods. Store topsoil for re-spreading. If vegetation is required to be removed during wet periods, disturb ground only just before actual construction; - Use erosion control measures such as hay bales, berms, straw, or fabric barriers; - Re-vegetate with recovered plants and other appropriate local flora immediately after equipment is removed from a section of the site;	CC, SC, NHA
2	Construction crews and camps	- Construction and operation of crew camps may pollute the surface & groundwater - Workers may rise conflicts with the locals	- Explore off-site accommodation for crew. Keep camp size to a minimum. - Avoid as much clearing of vegetation as possible, define footpath for crew; - The contractor will provide plan for removal and rehabilitation of site upon completion; - Photographs will be taken before any activity to record the conditions of site at locations that are likely to undergo soil erosion. Similar photographs will be taken after restoration, where applicable. - Provide proper solid waste disposal facilities at camp. - Provide proper sanitation facilities. - Maintain emergency response system; - Strictly prohibit poaching, and cutting of trees; - Drinking water should meet the PEQS and WHO Guidelines; - Movement of all project personnel will be restricted to work areas; - Wildlife protection rules will be included in the Camp Rules. - Ensure that a 'no-hunting, no-trapping, no-harassing' wildlife policy will be strictly observed, unless threatening to human life.	CC, SC, NHA
3	Excavation, acquisition work,	Soil erosion.	Identified quarry sites and borrow pit sites to be exhausted, reinstated and rehabilitated before opening other sections.	CC, SC, NHA

Sr.	Project Activity	Impacts	Mitigation	Responsibility
	transportation and storage of raw materials	▪ Air pollution: aerial emission of dust. ▪ Noise, ▪ Land degradation ▪ Loss of land value at raw material sites and stockpile. ▪ Loss of vegetation.	▪ Exhausted quarries to be backfilled. ▪ Limit earth movements to dry season. ▪ Borrow pits should be rehabilitated. ▪ Balance cut and fills to avoid deposition. ▪ Material from borrow site should be directly transported and deposited to the site where it has to be used. Stockpiles should be positioned and sloped to create least visual impact. No foreign material generated or deposited should remain on the site after completion of the activity and the areas affected by stockpiling should be reinstated. ▪ Stockpiles should be covered with tarpaulin sheet or any method to avoid dust emission ▪ Use appropriate methods of controlling soil erosion. ▪ Control speed of construction vehicles and impose speed limits for all. ▪ Prohibit idling of vehicles ▪ Sensitize workforce. ▪ Maintain work equipment. ▪ Material shall be appropriately secured to ensure safe passage between the destinations during transportation. Loads shall have appropriate cover to prevent spillage and contractor should be responsible for any clean up resulting from any failure. ▪ All runoff from batching plant should be strictly controlled and cement-contaminated water should be collected, stored and disposed off at the designated site. ▪ Provide impervious platform, bund walls and collection tank for spillage of liquid fuel and oil at storage area.	
4	Handling/ transportation of hazardous materials	▪ Toxicity, soil contamination and air pollution are the major impacts which may occur by mishandling of hazardous waste.	▪ Prevent dumping of hazardous materials especially near seasonal nullahs. ▪ Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc. ▪ Emergency Response Plan is prepared to address the accidental spillage of fuels and hazardous materials. ▪ Immediate collection of spilled oils/fuels/lubricants through collection of contaminated soils and skimming oils from surface water through appropriate technologies.	CC, SC, NHA

Sr.	Project Activity	Impacts	Mitigation	Responsibility
5	Waste Management	Solid waste may be generated from the active construction sites and also from the camp sites	- Bitumen waste should be stored in closed containers and placed in a fenced storage area with paved floor. - Separate bins will be placed for different type of wastes - plastic, paper, metal, glass, wood, and cotton. - Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors - An emergency response plan will be developed for the hazardous waste and substances. - On-site audits of the waste management will be undertaken on a regular basis during the period of project activity. - Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a waste tracking register. - Training will be provided to personnel for identification, segregation, and management of waste. - No waste will be dumped at any location.	CC, SC, NHA
6	Hydrology and drainage	- Soil erosion - Accidents - Water pollution	- Roads design and related activities not to encroach on environmentally sensitive areas such as wetlands. - Replant road reserve with grass or stabilizing shrubs to prevent soil erosion. - Design adequate culverts for all crossings to accommodate peak runoff from effective catchments.	DC, CC, SC, NHA
7	Traffic control	Traffic jams and congestion may take place and cause inconvenience to the people where the construction will take place especially at the sites for bridges, underpasses, culverts and interchanges.	- Efforts should be made to accommodate the traffic along the road/interchanges as far as practically possible. - Provision of signboards directing the drivers about the diversion. Providing and maintaining traffic management comprising diversion warning, guiding and regulatory signage, channelizers and delineators, lightening etc. - Contractor staff should be trained and put on the duty to manage the traffic during the construction activities taking place along the road; - Movement of vehicles carrying construction material should be restricted; - Availability of continuous services of police for traffic control especially at diversions in urban areas.	CC, SC, NHA

Sr.	Project Activity	Impacts	Mitigation	Responsibility
			Max. allowable speed for heavy machinery on the site should not exceed than 20 km/ hr.	
8	Worker's Health & Safety	- Health problems or immediate risk may take place. - Occupational health of workers and community may be affected.	- Providing 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 labourers. - Protection devices (ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines. - Proper maintenance of facilities for workers will be monitored. - Provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc; - Ensure strict use of wearing PPE during work activities. - Timely public notification on planned construction works. - Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity & social links. - Provision of proper safety signage at sensitive/accident prone spots.	CC, SC, NHA
9	Running of asphalt mixing plants, crushers	- Air Pollution, - Dust generation from construction machineries	- All equipment, generators, and vehicles used during the project will be properly tuned and maintained in good working condition in order to minimize exhaust emissions. - Imposing speed limits and encouraging more efficient traffic management will reduce the dust emissions. - All project vehicles will be checked regularly to ensure that engines are in sound working condition and are not emitting smoke.	CC, SC,
10	Implementation of Plantation Plan	Clearing of vegetation and trees from the area	- Afforestation activities will be conducted on both sides of the road. - The vegetation will only be cleared from the proposed road site if required. - Compensation for trees required to be cut on account of their coming in the ROW of Highway must be paid to farmers/owners in accordance with market rates.	CC, SC, NHA

Sr.	Project Activity	Impacts	Mitigation	Responsibility
11	Socioeconomic / Local community	- Community disturbance - Community awareness - Skilled and un-skilled jobs for local community.	- All community grievances will be recorded and maintained in a Community Complaint's Register. In addition to this close liaison will be maintained between the community and the site representatives of project proponent throughout the project activities. - Maximum number of unskilled and semi-skilled jobs will be reserved for the local communities. - Land compensation activities will be conducted as per rules and regulations of Government of Pakistan. - Awareness and cultural inductions to educate the contractor workforce on the requirement of minimizing social interaction with local communities; - Unnecessary interaction of local population with the non-local project staff will be avoided. - Discharging firearms will be explicitly prohibited. - Communities will be informed about the project activities and possible disturbance in advance.	CC, SC, NHA
12	Landscaping, Decommissioning and rehabilitation of raw material sites.	- Land degradation. - Abandoned borrow pits. - Proper disposal of stockpile and spoil areas.	- All materials from stockpile areas to be removed and the area to be landscaped. - All waste and surplus materials at spoil areas to be collected and disposed at designated places and not dumped within the road reserve. - Replant vegetation on reserve, diversion route upon completion - Quarry pits to be covered with soil and thus creating farming land.	CC, SC,
13	Reserved or protected areas	- Alignment is passing through reserved forest areas which will disturb the natural protected environment of the project area. - Habitat loss will be done	- Proponent shall visit district forest offices for further details and coordination and further approval procedure in case they want to proceed with same design of the alignment. - However, it shall be ensured by the proponent that no or minimum loss to the natural biodiversity will be done for the proposed project. - Strict mitigation and control measures shall be adopted to minimize the impacts on natural environment.	CC, SC, NHA
CC = Construction Contractor, SC = Supervision Consultant, NHA = National Highway Authority				

Table 8-3: Management and Monitoring Plan – Operational Phase

Sr.	Project Activity	Impacts	Mitigation	Responsibility
1	Road maintenance	Deterioration of existing roads and associated structures and accidents of hazardous material.	- Monitor and maintain drainage structures and ditches including culverts. Clean out culverts and side channels when they begin to fill with sediment and lose their effectiveness. - Fill mud holes and potholes with good quality gravel; remove fallen trees and limbs obscuring roadways. - Monitoring and cleaning of concrete pads, drains, and oil/water pits in areas where vehicle and equipment maintenance and fuelling occur.	NHA
2	Spillage	Oil spill may occur which could cause an accident.	- In case of any accidental spillage, emergency plan should be implemented. - Relevant department should coordinate on spillage emergency.	NHA
3	Waste Management	- Generated waste resulting from various operations. - Oil pollution.	- Provide appropriate options for waste management. - Assess opportunities for reducing solid waste generation in particular of hazardous and undesirable materials (oils and grease). - Dumping of oil residuals and any other waste to be done in designated areas only. - Encourage segregation of waste from the source and use the 3R waste management approach: Reduce, Reuse and Recycle. - Design provisional waste material storage for the sorted-out waste at the site (e.g. spoil area).	NHA
4	Road Safety	- Increase of road and related accidents. - Occupational injuries.	- Maintain provisions for road safety e.g. through installing signage and awareness information on road condition such as black spots etc. - Encroachments upon road reserve to be avoided. - Provide facilities for accidental spillages to combat risk. - Enforcement of speed limits, installation of speed guns and enforcement of penalties for the violators.	Highway police & NHA

NHA = National Highway Authority

8.9. Communication and Documentation

An effective mechanism for storing and communicating environmental information during the project is an essential requirement of an EMP. The key features of such mechanism are:

- Precise recording and maintenance of all information generated during the monitoring
- Communicating the information to a central location
- Processing the information to produce periodic reports
- Providing information and answering queries on monitoring originating from various researchers and stakeholders.

8.9.1 Meetings and Reporting

The purpose of the meetings will be to present the environmental management plan to the senior staff of the project team, contractors and stakeholders and discuss its implementation.

Meetings will be held to discuss the environmental conditions of the operation, non-compliances noted by the field supervision consultant (Environmental Engineer), and their remedial measures. Minutes of the meeting will be recorded in the form of action tracking register.

The purpose of the meeting will be to review the weekly or monthly performance of the project activities by reviewing the number of non-conformances and the environmental incidents that occurred during the week/month.

Weekly and monthly reports will be communicated to the project proponent management and senior members of the contractors. The report will include:

- Summary of weekly/monthly project activities.
- Non-compliances observed and mitigation measures taken or required.

8.9.2 Social Complaints Register

The project proponent Field Environmental Representative will maintain a register of complaints regarding environmental issues received from local communities and measures taken to mitigate these concerns.

8.9.3 Change Record Register

All changes to the EMP or the project will be handled through the Change Management Plan provided in Section 8.13 of the EMP. These changes will be registered in a Change Record Register.

8.9.4 Photographic Record

Project proponent will maintain a photographic record of all areas to be used during the project. As a minimum the photographic record will include the photographs of project areas prior to and after activities (restoration). Project proponent will ensure that a photographic record including the following is maintained.

- All areas used by the project activities; before use, during use and after restoration.
- Key non-compliances.
- Key project activities.

8.9.5 Audit Reports

Project proponent will keep a record of all audits and inspections commissioned or undertaken by the company to check conformance with the EMP.

8.10. Environmental Monitoring and Reporting

Environmental monitoring can be categorized into two types: 1)- compliance monitoring and 2) - effects monitoring. The environmental monitoring programme is summarized in **Table 8.4** which identify the roles and responsibilities of project monitoring, further described in detail in following section.

8.10.1 Compliance Monitoring

Compliance monitoring will be carried out to ensure compliance with the requirements of the EIA. The objectives of the EIA compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractors or any other person associated with the project.
- Verify that the activities are undertaken in compliance with the **EIA** and other conditions identified by project proponent.

- Document and communicate the observations to the concerned person(s) at project proponent so that any corrective measures, if required, can be taken timely.
- Maintain a record of all incidents of environmental significance and related actions and corrective measures.

Compliance monitoring will be the responsibility of all teams involved in the project activities i.e. Project proponent and the contractors. Project proponent staff and contractors will carry out the inspections on a set frequency.

8.10.2 Effects Monitoring

To monitor actual impacts of the project on selected sensitive receptors so that impacts not anticipated in the EIA or impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.

Considering the environmental conditions of the project area and the assessment of potential impacts of the project made in the EIA, the following environmental parameters will be monitored at locations identified during the construction phase (e.g. location of asphalt plants, construction camps etc.).

Considering the receptors with less environmental impact, the proposed location is tentative and based on current field survey finding, situation may vary at the time of construction.

- **Air Quality Monitoring** – Air quality monitoring will be done during the construction and operation phase of the project at the representative locations. Ambient air quality parameters will include: NO_x, SO_x, CO, PM₁₀, Smoke.
- **Water Quality Monitoring** – Ground and surface water quality monitoring will be done during the construction and operation phase of the project at the representative locations.
- **Groundwater Quality Parameters:** Total Coliforms, Total Colonial Count, Faecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium.
- **Wastewater Quality Parameters:** pH, DO, TSS, Alkalinity, BOD⁵, COD, Turbidity.
- **Noise Monitoring** - The monitoring will be carried out at key locations covering all receptors.

8.10.3 Monitoring Roles and Responsibilities

Monitoring Plan has been provided separately for pre-construction, construction and operations phase of the proposed project activities in **Table 8.1**, **Table 8.2** and **Table 8.3** respectively while detailed environmental monitoring plan with budget is provided in **Table 8.4**.

Supervision Consultant

Supervision Consultant will involve the Environmental Specialist/ Monitoring Consultant and Resident Engineer for compliance and effect monitoring described above. The Resident Engineer will overlook the performance of contractor to make sure that the contractor is carrying out the work in accordance with EMP. The Environmental Specialist will prepare bi-annual environmental monitoring reports. The Monitoring Consultant (MC) on the other hand will carry out the environmental monitoring and report to NHA for adequacy of the monitoring program as specified in EMP. The MC will also induct a Technical Training Consultant to educate the Contractor's and NHA's staff.

Table 8-4: Environment Monitoring Plan and Budgeting (one year period)

Component	Parameters	Frequency	Responsibility	Duration	Cost (PKR)
Air Quality (Stationary Source Emissions)	CO, NO ₂ , SO ₂ , PM	Quarterly or as required	EE of CC	-	250,000/-
Ambient Air Quality	CO, NO ₂ , SO ₂ , Ozone, PM ₁₀ , PM _{2.5} , Lead, SPM	Quarterly or as required	EE of CC	24 hours	607,500/-
Ground Water Quality	Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium, Arsenic	Quarterly or as required	EE of CC	-	540,000/-
Surface & Wastewater Quality	pH, Dissolved Oxygen, TSS, TDS, Alkalinity, BOD ₅ , COD, Turbidity, Oil & Grease	Quarterly or as required	EE of CC	-	540,000/-
Noise Level	-	Quarterly or as required	EE of CC	24 hours	150,000/-
Total					2,087,500/-
Operation Phase					
Air Quality (Stationary Source Emissions)	CO, NO ₂ , SO ₂ , PM	Quarterly or as required	NHA	-	202,202/-
Ambient Air Quality	CO, NO ₂ , SO ₂ , Ozone, PM ₁₀ , PM _{2.5} , Lead, SPM	Quarterly or as required	NHA	24 hours	280,000/-

<i>Component</i>	<i>Parameters</i>	<i>Frequency</i>	<i>Responsibility</i>	<i>Duration</i>	<i>Cost (PKR)</i>
Ground Water Quality	Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium, Arsenic	Quarterly or as required	NHA	-	200,000/-
Surface & Wastewater Quality	pH, Dissolved Oxygen, TSS, TDS, Alkalinity, BOD ₅ , COD, Turbidity, Oil & Grease	Quarterly or as required	NHA	-	160,000/-
Noise Level	-	Quarterly or as required	NHA	24 hours	60,000/-
Total					920,202/-
Grand Total					3,009,720/-

8.11. Environmental Mitigation (Plantation) Cost

To minimize the negative impacts arising due to increased vehicular activity on the proposed ROW and to enhance the landscape of the project area, the mitigation measures would include plantation along the whole stretch of the proposed project as a noise barrier. Following plantation plan would be followed:

Minimum Requirement:

- Two rows of plants (one row on each side) will be raised of the proposed Bypass. Plant to plant distance will be kept as 6 meters, so there will be 166 plants in one row of one Km length. Total road stretch is approximately 20 km in length, therefore, number of plants to be raised on both sides (one row on each side) will be 3,652.
- The project involved around 762 trees cutting in this project and minimum 10 trees will be planted against each tree cut so around 7620 trees are to be required for.

Desirable requirement:

- Four rows of plants (two rows on each side) will be raised of the proposed project. Therefore, the number of plants, which can be raised along the entire length of the route are $(3652 \times 2) 7,304$.

These plants are to be planted along the side roads and within the loops. Native species would be planted, and no invasive/ exotic species would be introduced. The number of trees effected during the project shall be replaced by 10 times more plantation along this highway.

The project involved around 762 trees cutting in this project and minimum 10 trees will be planted against each tree cut so around 7620 trees are to be required for plantation as compensation to the tree cut however, the total tree to be planted along the road are with minimum requirements are 3,652 and 7620. The remaining required trees will be donated and planted in the hospitals, schools and other public places of the project area. So, in this case total cost would be calculated for the required 12730 trees/shrubs plantation PKR 19,251,833/-.

8.12. Environmental Training

Environmental training will help to ensure that the requirements of the EIA and EMP are clearly understood and followed by all project personnel throughout the project period.

Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness.

8.12.1 Objectives of the Training Programme

The key objective of training programme is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related controls specified in the EIA and EMP.

8.12.2 Roles and Responsibilities

Project proponent Field Environmental Representative and the contractor's Environmental Engineer will primarily be responsible for providing training to all project personnel on potential environmental issues of the project. Contractor will prepare a project specific training manual for this purpose. Contractors on their part will be required to provide induction training/ briefing to all their staff before the start of any activity in the project area.

8.12.3 Training Topic

The training modules will include air, noise and water pollution monitoring, social awareness, Environmental Laws, Environmental Quality Standards usage of personal protection equipment's, and health and safety related issues on the construction site.

The contractor will train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria etc.) and in general health and safety matters, and on the specific hazards of their work. Training should also consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation.

8.13. Grievance Redress Mechanism (GRM)

In order to receive and facilitate the resolution of project affected people's (PAP's) concerns, complaints and grievances about the Project's environmental performance, a Grievance Redress Mechanism (GRM) will be established by NHA for this Project. The GRM will address the PAPs' concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the PAPs at no costs and without retribution. The GRM will be coordinated by the designated NHA Officer with portfolio for environmental matters in liaison with the public representative at the district level. The mechanism will not impede access to the country's judicial or administrative remedies. The PAPs will be fully informed of their rights and of the procedures for addressing complaints verbally and in writing during consultations. A mechanism will be established to address / resolve the PAPs concerns or grievances due to project related social and environmental issues. Under this GRM, a Grievance Redressal Committee (GRC) / Environmental Committee (EC) will be constituted and established at each district level which will review all the grievance cases. The GRC will be composed of the representatives of NHA, supervision consultants and PAP representatives.

8.13.1 Regulatory Requirement for Grievance Redress Mechanism

The Pakistan EPA, under Regulation 6 of the IEE/EIA Regulations 2000, has issued a set of guidelines of general applicability and sectoral guidelines indicating specific assessment requirements. Under the regulations and guidelines, no specific requirements are laid out for developing a grievance redress mechanism for projects. However, under its Guidelines for Public Consultation, 1997 and ADB's Safeguard Policy Statement 2009, the proponent is required to consult stakeholders during the implementation phase of the project. In this regard, it is stated that the representatives of local community partake in the monitoring process to promote a stable relationship between the project management and the community.

8.13.2 Framework for Grievance Redress Mechanism

NHA will assist the project affected communities/villages to identify local representatives to act as Grievance Focal Persons (GFPs). The GFPs will be

responsible for i) acting as community representatives in formal meetings between the project team and the local community he/she represents; ii) communicating the community members' grievances and concerns to the contractor during project implementation.

A pre-mobilization public consultation meeting will be convened by NHA's EALS Unit and attended by the GFPs, Supervision Consultant, contractor, Project representative and other interested parties (e.g. district level representatives, NGOs). The grievance redress committee (GRC) will be headed by the Project Director with NHA's DD/AD (land)– depending upon the nature of the complaint - as member and focal person. Besides, the GRC will include the environment staff of the Project Management Unit/Supervision Consultants, environment staff of the contractor and representative of the local community (preferably the relevant GFP).

Under the Project the following will be established or appointed to ensure timely and effective handling of grievances about project environmental performance:

- NHA Director will nominate one assistant director as NHA representative of the GRC and Environmental Specialist of Supervision Consultant shall act as Project Environmental Grievance Officer (PEGO)
- PEGO will be approached by the community members (PAP Representatives) for their grievances against the Project.
- PEGO will review the case on merit basis and address the grievances in accordance with the prevailing rules as per EMP
- PEGO will then refer the case to GRC for final decision, whether to update and make necessary amendments in the EMP
- GRC will review and update with its decision within 30 days of registration of the case.
- If the PAP's are not satisfied with the decision of Project Director, then it can be referred to higher authorities/ relevant Government departments for its resolution. He/she may also submit the complaint to Pak EPA. Punjab EPA should start a system to receive online complain relevant to project.

8.13.3 Operating Principles for GRC

The GRC will operate on the principles of transparency, approachability and accountability. To achieve these, the GRC will be required to:

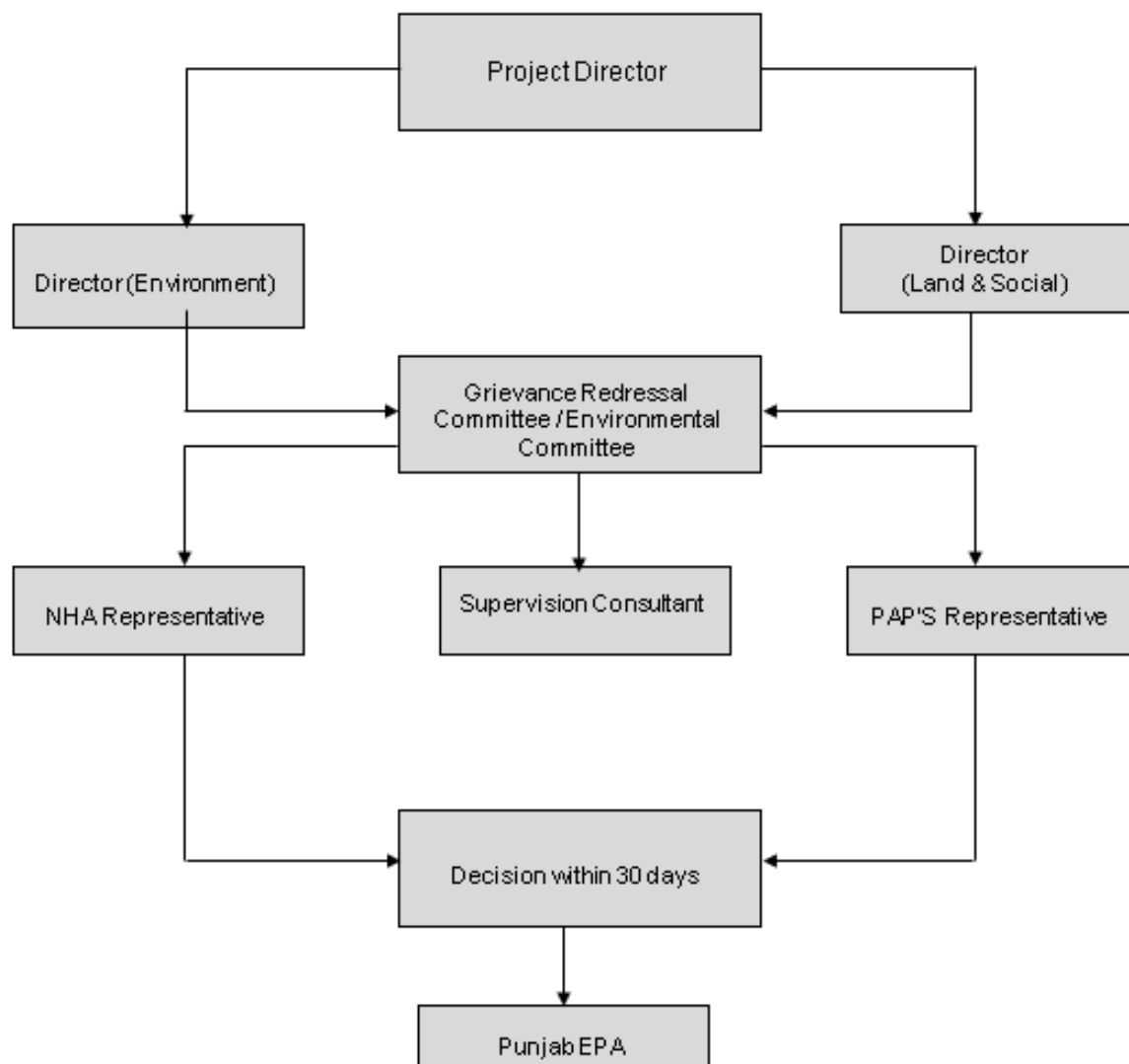
- Be equipped to handle grievances in the local languages;

- Be equipped to work through all possible modes of communication, such as, emails, by-post and face-to-face meetings at site or requiring visits;
- and issues of the female community members.
- Maintain a log of all grievances, with record of the date and time of the complaint logged and stakeholder information, such as, name, designation and contact details;
- Provide opportunity to the stakeholder to revert with their comments on the proposed plan of action;
- Keep the stakeholder informed of the progress in grievance resolution;
- Obtain stakeholder consent on the mechanism proposed to redress the grievance and document consent; and,
- Maintain confidentiality of the stakeholder, if requested so.

8.13.4 Complaints and Grievances

A grievance mechanism will be available to allow a PAP appealing any disagreeable decision, practice or activity arising from noncompliance of EMP during project implementation. Care will always be taken to prevent grievances rather than going through a redressal process. This can be obtained through implementing an updated EMP or corrective action plan to address unpredicted environmental impacts, by ensuring full participation and consultation with the PAPs and by establishing extensive communication and coordination between the community and project office. The flow chart of the proposed redressal mechanism is shown below in Figure 8.1.

Figure 8-1: Organogram of Proposed Grievance Redressal Mechanism



8.14. Change Management Plan

The EIA recognizes that changes in the operations or the EMP may be required during the project activities and therefore a Change Management Plan has been provided to manage such changes. The management of changes is discussed under two separate headings, changes to the EMP and changes to the Operation.

8.14.1 Changes to the EMP

The EIA and the EMP have been developed based on the best possible information available at the time of the EIA study. However, it is possible that during the construction and operation phase some aspects of the EMP may need to be changed owing to their non-applicability in a certain area of operation or the need for

additional mitigation measures based on the findings of environmental monitoring during the construction and operation phase. In such cases following actions shall be taken.

- A meeting will be held between project proponent and the concerned contractor. During the meeting the proposed deviation from the EMP, planning and designing will be discussed and agreed upon by all parties.
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the original EMP clause/plan or design, the change that has been agreed upon, and the reasons for the change.
- The report will be signed by all the parties and will be filed at the site office. A copy of the report will be sent to project proponent and contractor head offices.
- All relevant project personnel will be informed of the change.

8.14.2 Changes to the Operation

The change management system recognizes three orders of changes.

First-Order Change

A first order change is one that leads to a significant departure from the project described or the impacts assessed in the EIA and consequently require a reassessment of the environmental impacts associated with the change. Examples of such change include change in location of the proposed plant.

In such an instance, the environmental impacts of the proposed change will be reassessed, and the results sent to the Punjab EPA for approval.

Second- Order Change

A second-order change is one that entails project activities not significantly different from those described in the EIA, and which may result in project impacts whose overall magnitude would be similar to the assessment made in this report.

In case of such changes, the environmental impact of the activity will be reassessed, additional mitigation measures specified if necessary, and the changes reported to the Punjab EPA.

Third -Order Change

A third-order change is one that is of little consequence to the EIA findings. This type of change does not result in impact levels exceeding those already assessed in the EIA; rather these may be made onsite to minimize the impact of an activity. The only action required in this case will be to record the change in the change record register.

8.15. Environmental Budget Estimate

For an effective implementation of environmental mitigation measures, it is very important to provide sufficient funds for the implementation of environmental mitigation measures (tree plantation cost), monitoring and training. Land acquisition and resettlement (including damages) cost is not included here. National Highways Authority (NHA) is committed to implement all mitigation measures given in this report and will provide required funds in this regard.

Environmental sustainability and compliance are the ultimate goal of the National Highway Authority (NHA) and allocated huge amount as environmental budget for the proposed alignment. The total cost for as environmental budget allocated is **10,000,000-** for this project which include pollution control devices, equipment, tree plantation, water sprinkling, vehicles maintenance to control vehicular emissions, safety trainings, PPEs for the workers, environmental monitoring, environmental mitigations etc. for this project for the time period of two years of construction phase.

The summary of total environmental costs for one year is given in Table 8.5, however, the cost is not limited to the details given below and the total cost for the environmental budget of this project will be the **100000000 rupees/-**.

The table gives two options specifically considering the tree plantation estimation.

Table 8-5: Environmental Budgeting

Description	Cost (PKR)/year
Environmental Monitoring Cost	3,009,720/-
Environmental Training Cost	3,500,000/- (lumpsum)
Environmental Mitigation Cost	2,000,000/- (Lumpsum)
▪ Social Welfare Activities ▪ Compensations to the department for tree cuttings ▪ Environmental Enhancement Measures	47,238,445/- (Lumpsum)
Total cost for the required 12730-tree / Shrubs plantation	19,251,833/-
▪ Salaries of Environmental Professionals ▪ Environmental Cost during Operational Phase ▪ Social Welfare Activities	25,000,000 (Lumpsum)
Total Environmental Budget for Proposed Project	100,000,000 (Lumpsum)

9 Conclusion

The proposed project to which this Environmental Impact Assessment (EIA) relates is entitled as “EIA for Construction of Dera Ghazi Khan Northern Bypass (20 km)”. Proposed bypass has been designed for 4-Lane The proposed project falls in Dera Ghazi Khan, Punjab.

The planned highway will largely contribute to the economic and social development of the project area as well as Pakistan on a larger scale. It will bring more population into the stream of benefits, which in turn will change the social complexion of people around this highway.

This link will bring about further revolution in the road transport and time saving journey for passengers. It will also contribute to ensure smooth and efficient movement of trade, goods and traffic in relatively shorter time.

Where the proposed project will help towards achieving this objective, the environmental study of the project area requires that potential environmental effects due to the proposed project are evaluated, mitigation measures required to minimise or obviate these impacts are assessed, implemented and monitored. Any residual impacts are assessed for their significance. These requirements have been addressed in this EIA, which has covered in detail the following:

- The proposed project activities;
- Alternatives considered in finalizing the project;
- Environmental conditions of the project area;
- Legislative requirements related to the project;
- Potential environmental effects of the proposed project activities on the physical, natural and socio-economic receptors;
- Mitigation and monitoring measures that will help in avoiding or minimizing these impacts.

After assessing the significance of potential impacts, it has been concluded that if the

project activities are carried out as described in this report, and the suggested mitigation measures are implemented, the proposed project will not have a significant impact on the area's natural and socioeconomic environments.

Hence, this EIA concludes that the upon implementation of the mitigation, the residual impacts of the proposed operation will be low and careful implementation of the provided EMP will ensure that environmental impacts are managed and minimized and all statutory requirements are met by the project proponent.

10. References

- 1) Ali, S. I. and Qaiser M. 1995, Flora of Pakistan Fascicles.
- 2) Ali, S. 1996. The Book of Indian Birds. Twelfth edition, Natural History Society & Oxford University Press.
- 3) District Census Report, Pakistan Bureau of Statistics.
- 4) Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991.
- 5) Environmental Health and Safety (EHS) guidelines, International Finance Corporation (IFC) World Bank Group, 2008.
- 6) Government of Pakistan. 1860. The Pakistan Penal Code.
- 7) Government of Pakistan. 1975. The Antiquities Act.
- 8) Government of Pakistan. 1997. Punjab Environmental Protection Act: Amended 2012
- 9) Government of Pakistan. 1997a. Guidelines for Public Consultation. Draft. Pakistan Environmental Protection Agency.
- 10) Government of Pakistan. 1997c. Guidelines for Preparation and Review of Environmental Report. Draft. Pakistan Environmental Protection Agency.
- 11) Government of Pakistan. 1997d. Policy and Procedures for Filing, Review and Approval of Environmental Assessments. Pakistan Environmental Protection Agency.
- 12) IUCN. 1997. Biodiversity Action plan for Pakistan. First Draft. World Conservation Union.
- 13) IUCN. 1998. Model Provincial Wildlife (Protection, Conservation and Management) Act. Draft. World Conservation Union.
- 14) Punjab Environmental Quality Standards (PEQS)
- 15) Pakistan Metrological Department, Pakistan.

ANNEXURES

ANNEXURE – A

EIA PROJECT TEAM

Annex - A: Project Team

Sr. #	Name	Expertise	Role and Responsibility
1.	Ms. Ammara Naqvi	Manager EIA/HSE Expert.	Client coordination, Impact Assessment and Mitigation Measures, Environmental Management Plan, Technical Report Writing.,
2.	Mr. Zeeshan Ismail	Environmentalism	EIA Expert, Legal framework review and Stakeholder consultation Environmental Baseline, Project Alternatives, Technical Report Writing.
3.	Mr. Syed Ejaz Hussain	Environmentalism	EIA Expert, Environmental Baseline, Project Alternatives, Socio-economic baseline data collection, Public Consultation, Field Visits and Social Surveys, Technical Report Writing Baseline Data collection, Technical Report Writing.
4.	Mr. Aamir Aziz	Environmentalism/GIS Expert	GIS mapping. Technical Report Writing.
5.	Ms. Ramsha	Environmentalism	Baseline survey and public consultations
6.	Mr. Maqbool Alam	Field Officer	Environmental Monitoring
7.	Mr. Zulfiqar Ahmad	Field Officer	Ambient Air, Water and soil baseline
8.	Mr. Babar	Field Officer	Ambient Air, Water and soil baseline
9.	Ms. Mahpara	Chemist	Water analysis
10.	Ms. Zoha	Microbiologist	Water analysis (microbial testing).

ANNEXURE – B
PUNJAB ENVIRONMENTAL
QUALITY STANDARDS

EXTRA ORDINARY ISSUE

REGISTERED No. L-7532



The Punjab Gazette

PUBLISHED BY AUTHORITY

LAHORE MONDAY AUGUST 15, 2016

**GOVERNMENT OF THE PUNJAB
LAW AND PARLIAMENTARY AFFAIRS DEPARTMENT**

**NOTIFICATION
(120 of 2016)**

12th 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

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 *	$\leq 3^{\circ}\text{C}$	$\leq 3^{\circ}\text{C}$
2	pH value (H^{+})	6-9	6-9
3	Biochemical Oxygen Demand (BOD_5) at 20°C ⁽¹⁾	80	250
4	Chemical Oxygen Demand (COD) ⁽¹⁾	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^{-})	1000	1000
10	Fluoride (as F^{-})	10	10
11	Cyanide (as CN^{-}) total	1.0	1.0
12	An-ionic detergents (as MBAs) ⁽²⁾	20	20
13	Sulfate (SO_4^{2-})	600	1000

No	Parameter	Into Inland Waters	Into Sewage Treatment
1	2	3	4
14	Sulfide (S^{2-})	1.0	1.0
15	Ammonia (NH_3)	40	40
16	Pesticides ⁽³⁾	0.15	0.15
17	Cadmium (Cd) ⁽⁴⁾	0.1	0.1
18	Chromium (trivalent and hexavalent) ^{(4) (1)}	1.0	1.0
19	Copper (Cu) ⁽⁴⁾	1.0	1.0
20	Lead (Pb) ⁽⁴⁾	0.5	0.5
21	Mercury (Hg) ⁽⁴⁾	0.01	0.01
22	Selenium (Se) ⁽⁴⁾	0.5	0.5
23	Nickel (Ni) ⁽⁴⁾	1.0	1.0
24	Silver (Ag) ⁽⁴⁾	1.0	1.0
25	Total Toxic metals	2.0	2.0
26	Zinc (Zn)	5.0	5.0
27	Arsenic (As) ⁽⁴⁾	1.0	1.0
28	Barium (Ba) ⁽⁴⁾	1.5	1.5
29	Iron (Fe)	8.0	8.0
30	Manganese (Mn)	1.5	1.5
31	Boron (B) ⁽⁴⁾	6.0	6.0
32	Chlorine (Cl_2)	1.0	1.0

Explanations:

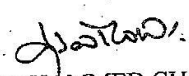
1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Provincial Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10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

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°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

Punjab Environmental Quality Standards for Muncipal And Liquid Industrial Effluents

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**GOVERNMENT OF THE PUNJAB
LAW AND PARLIAMENTARY AFFAIRS DEPARTMENT**

**NOTIFICATION
(122 of 2016)**

12th 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:

DR SYED ABUL HASSAN NAJMEE

Secretary

Government of the Punjab
Law and Parliamentary Affairs
Department

Price Rs. 10.00 Per Page

(1197)

**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:

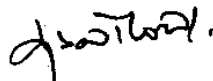
Punjab Environmental Quality Standards for Ambient Air

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

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
	1 hour	15µg/m ³	
Lead (Pb)	Annual Average*	1 µg/m ³	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5µg/m ³	
Carbon Monoxide (CO)	8 hours**	5 mg/m ³	Non Dispersive Infra Red (NDIR) method
	1 hour	10 mg/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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LAHORE MONDAY AUGUST 15, 2016

**GOVERNMENT OF THE PUNJAB
LAW AND PARLIAMENTARY AFFAIRS DEPARTMENT**

**NOTIFICATION
(121 of 2016)**

12th 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

**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:

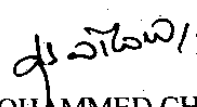
Punjab Environment Quality Standards for Noise

No.	Category of Area/Zone	Effective from 1 st July, 2010		Effective from 1 st 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.


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

ANNEXURE – C
ENVIRONMENTAL
MONITORING REPORTS

October 10, 2021
Page 01 of 09

Ambient Air Quality

Client : Prime Engineering and Testing Consultants Pvt Ltd
Address : 744, Street 49, G-11-2, Islamabad
Nature of Monitoring : Ambient Air
Sampling Point : Tuansa Bypass DG Khan
Date of Intervention : July 26-27, 2021

Sr. #	Time	CO (mg/m ³)	NO (µg/m ³)	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	O ₃ (µg/m ³)
1.	15:00	2.1	14.2	22.1	15.3	12.7
2.	16:00	2.2	16.3	23.6	14.4	11.4
3.	17:00	2.0	15.6	25.4	13.2	12.1
4.	18:00	1.9	14.4	22.7	15.5	11.4
5.	19:00	2.0	14.5	27.8	14.2	10.6
6.	20:00	2.1	13.6	26.4	12.7	11.3
7.	21:00	1.8	12.7	26.2	14.2	11.7
8.	22:00	1.9	14.4	24.6	13.1	12.1
9.	23:00	2.2	15.0	24.6	12.0	11.7
10.	00:00	1.9	14.4	23.1	13.3	11.6
11.	01:00	1.8	15.3	22.2	11.2	12.3
12.	02:00	2.1	13.6	24.6	14.7	12.7
13.	03:00	1.8	13.2	22.8	13.2	11.3
14.	04:00	2.1	12.1	23.2	12.6	9.7
15.	05:00	1.9	11.2	21.4	14.4	9.2
16.	06:00	2.3	12.6	24.2	13.5	8.5
17.	07:00	2.1	14.4	21.7	14.6	7.1
18.	08:00	2.1	16.6	22.1	13.5	8.7
19.	09:00	2.2	15.2	21.8	14.2	11.6
20.	10:00	2.1	16.5	22.5	13.1	11.0
21.	11:00	2.3	17.7	23.0	15.7	12.3
22.	12:00	2.2	15.7	24.4	15.4	12.6
23.	13:00	2.1	14.6	24.2	16.5	14.6
24.	14:00	2.3	16.2	25.5	16.2	13.4
Average Concentration		2.06	14.58	23.75	14.02	11.31

October 10, 2021
Page 02 of 09

Average Obtained Concentrations of Priority Pollutants

Parameter	Methodology / Technique	Unit	Monitoring Duration	LDL	Average Obtained Concentration	Limits as per PEQS
Nitrogen Oxide (NO)	US EPA Designated Method RFNA-1289-074	µg/m ³	24Hours	0.75	14.58	40 (µg/m ³) For 24 Hours
Nitrogen Dioxide (NO ₂)	US EPA Designated Method RFNA-1289-074	µg/m ³	24Hours	0.75	23.75	80 (µg/m ³) For 24 Hours
Sulfur Dioxide (SO ₂)	US EPA Designated Method ESQA-0486-060	µg/m ³	24 Hours	1.3	14.02	120 (µg/m ³) For 24 Hrs
Carbon Monoxide (CO)	US EPA Designated Method RFCA-0981-054	mg/m ³	24 Hours	0.1	2.06	5 (mg/m ³) For 8 Hours
Ozone (O ₃)	USEPA Designated Method EQOA-0880-047	µg/m ³	24 Hours	1.96	11.31	130 (µg/m ³) For 01 Hrs
Particulate Matter (PM ₁₀)	ISO 21501-4:2007	µg/m ³	24 Hours	1.00	121.6	150 (µg/m ³) For 24 Hrs
Particulate Matter (PM _{2.5})	ISO 21501-4:2007	µg/m ³	24 Hours	1.00	23.0	35 (µg/m ³) For 24 Hrs
Suspended Particulate Matter (SPM)	High Volume Sampler	µg/m ³	24 Hours	1.00	351.9	500 (µg/m ³) For 24 Hrs

µg/m³: micrograms per cubic meter

mg/m³: miligram per cubic meter

LDL: Lowest Detection Limit

PEQS: Punjab Environmental Quality Standards

SGS PAKISTAN (PVT.) LTD

Monitored By

Mr. Zulfiqar/Mr. Shoaib

Laboratory / Field In charge

Mr. Maqbool Alam

Chief Analyst / DH

Mr. Ali Hashim

October 10, 2021
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Noise Level Monitoring

Client : Prime Engineering and Testing Consultants Pvt Ltd
Address : 744, Street 49, G-11-2, Islamabad
Nature of Monitoring : Ambient Air
Sampling Point : Tuansa Bypass DG Khan
Date of Intervention : July 26-27, 2021

Sr. #	Time	Noise Level (Reading-1)	Noise Level (Reading-2)	Noise Level (Reading-3)
1.	15:00	60.1	61.3	62.1
2.	16:00	58.4	59.7	58.9
3.	17:00	59.6	59.9	58.2
4.	18:00	60.8	59.5	59.8
5.	19:00	63.0	61.4	62.7
6.	20:00	60.9	61.3	62.1
7.	21:00	58.6	59.7	58.9
8.	22:00	49.2	49.7	49.9
9.	23:00	48.8	48.8	48.9
10.	00:00	49.0	49.7	50.3
11.	01:00	51.4	51.4	51.6
12.	02:00	50.1	50.4	50.7
13.	03:00	50.7	51.2	51.5
14.	04:00	49.9	49.7	49.9
15.	05:00	48.0	48.8	48.9
16.	06:00	61.5	59.4	61.2
17.	07:00	59.3	59.6	58.2
18.	08:00	61.1	58.8	59.4
19.	09:00	63.8	59.9	59.7
20.	10:00	63.0	60.4	62.8
21.	11:00	60.9	62.3	62.1
22.	12:00	66.8	65.5	63.3
23.	13:00	62.0	61.4	62.7
24.	14:00	60.9	61.4	62.9

Monitored By
Mr. Zulfikar/Mr. Shoaib

Laboratory / Field In charge
Mr. Maqbool Alam

Chief Analyst / DH
Mr. Ali Hashim

October 10, 2021
Page 04 of 09

Ambient Air Quality

Client : Prime Engineering and Testing Consultants Pvt Ltd
Address : 744, Street 49, G-11-2, Islamabad
Nature of Monitoring : Ambient Air
Sampling Point : Sakhi Sarwar Bypass DG Khan
Date of Intervention : July 27-28, 2021

Sr. #	Time	CO (mg/m ³)	NO (µg/m ³)	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	O ₃ (µg/m ³)
1.	16:00	1.7	13.3	21.1	15.1	13.1
2.	17:00	1.8	14.2	22.4	15.3	11.5
3.	18:00	2.5	12.5	20.6	14.7	13.4
4.	19:00	1.9	12.3	23.7	16.4	12.5
5.	20:00	2.1	14.6	19.6	16.6	11.1
6.	21:00	2.2	13.3	19.4	15.3	12.2
7.	22:00	1.8	14.5	22.7	13.7	9.5
8.	23:00	1.9	13.1	24.4	12.3	10.4
9.	00:00	1.6	12.7	21.7	13.5	11.1
10.	01:00	1.8	14.6	21.8	11.6	12.0
11.	02:00	1.9	14.6	22.7	12.4	13.5
12.	03:00	1.5	11.7	23.4	12.9	11.4
13.	04:00	1.7	14.3	22.2	13.3	10.1
14.	05:00	1.9	14.0	19.1	14.6	11.8
15.	06:00	1.6	12.4	19.7	13.1	9.7
16.	07:00	2.0	14.1	21.3	13.5	8.9
17.	08:00	2.1	14.5	22.1	12.1	8.4
18.	09:00	2.3	12.2	23.6	11.3	10.3
19.	10:00	2.2	14.3	23.3	11.1	10.7
20.	11:00	2.1	16.3	20.6	11.4	10.3
21.	12:00	2.2	15.6	24.5	13.6	11.5
22.	13:00	2.1	14.8	23.4	11.1	13.6
23.	14:00	2.4	15.7	24.7	14.2	11.4
24.	15:00	2.1	13.8	23.1	12.3	12.7
Average Concentration		1.97	13.89	22.12	13.39	11.29

October 10, 2021
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Average Obtained Concentrations of Priority Pollutants

Parameter	Methodology / Technique	Unit	Monitoring Duration	LDL	Average Obtained Concentration	Limits as per PEQS
Nitrogen Oxide (NO)	US EPA Designated Method RFNA-1289-074	µg/m ³	24Hours	0.75	13.89	40 (µg/m ³) For 24 Hours
Nitrogen Dioxide (NO ₂)	US EPA Designated Method RFNA-1289-074	µg/m ³	24Hours	0.75	22.12	80 (µg/m ³) For 24 Hours
Sulfur Dioxide (SO ₂)	US EPA Designated Method ESQA-0486-060	µg/m ³	24 Hours	1.3	13.39	120 (µg/m ³) For 24 Hrs
Carbon Monoxide (CO)	US EPA Designated Method RFCA-0981-054	mg/m ³	24 Hours	0.1	1.97	5 (mg/m ³) For 8 Hours
Ozone (O ₃)	USEPA Designated Method EQOA-0880-047	µg/m ³	24 Hours	1.96	11.29	130 (µg/m ³) For 01 Hrs
Particulate Matter (PM ₁₀)	ISO 21501-4:2007	µg/m ³	24 Hours	1.00	139.7	150 (µg/m ³) For 24 Hrs
Particulate Matter (PM _{2.5})	ISO 21501-4:2007	µg/m ³	24 Hours	1.00	32.6	35 (µg/m ³) For 24 Hrs
Suspended Particulate Matter (SPM)	High Volume Sampler	µg/m ³	24 Hours	1.00	463.5	500 (µg/m ³) For 24 Hrs

µg/m³: micrograms per cubic meter

mg/m³: miligram per cubic meter

LDL: Lowest Detection Limit

PEQS: Punjab Environmental Quality Standards

SGS PAKISTAN (PVT.) LTD

Monitored By

Mr. Zulfiqar/Mr. Shoaib

Laboratory / Field In charge

Mr. Maqbool Alam

Chief Analyst / DH

Mr. Ali Hashim

October 10, 2021
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Noise Level Monitoring

Client : Prime Engineering and Testing Consultants Pvt Ltd
Address : 744, Street 49, G-11-2, Islamabad
Nature of Monitoring : Ambient Air
Sampling Point : Sakhi Sarwar Bypass DG Khan
Date of Intervention : July 27-28, 2021

Sr. #	Time	Noise Level (Reading-1)	Noise Level (Reading-2)	Noise Level (Reading-3)
1.	16:00	56.1	55.2	55.7
2.	17:00	54.6	54.7	53.9
3.	18:00	52.2	52.5	51.6
4.	19:00	50.5	50.6	51.9
5.	20:00	49.1	49.1	49.7
6.	21:00	48.9	48.3	50.4
7.	22:00	51.6	51.7	50.9
8.	23:00	54.3	53.6	55.8
9.	00:00	54.9	54.0	53.4
10.	01:00	53.6	53.9	55.2
11.	02:00	55.2	55.5	52.8
12.	03:00	53.4	53.8	53.0
13.	04:00	52.7	53.6	55.9
14.	05:00	50.9	50.5	50.6
15.	06:00	51.3	51.1	52.9
16.	07:00	52.5	52.3	51.2
17.	08:00	55.7	54.1	55.1
18.	09:00	56.3	55.5	56.7
19.	10:00	57.6	56.0	56.9
20.	11:00	58.6	57.8	58.9
21.	12:00	59.3	58.7	59.3
22.	13:00	58.2	59.4	58.6
23.	14:00	59.3	58.4	57.7
24.	15:00	59.1	59.0	59.5

Monitored By
Mr. Zulfiqar/Mr. Shoaib

Laboratory / Field In charge
Mr. Maqbool Alam

Chief Analyst / DH
Mr. Ali Hashim



[ANALYTICAL REPORT]

[DRINKING WATER ANALYSIS]

[MULTIPLE PARAMETER ANALYSIS]

PREPARED FOR:

[PRIME ENGINEERING AND TESTING CONSULTANTS PVT LTD]

CLIENT DETAILS

LABORATORY DETAILS

Client	Prime Engineering and Testing Consultants Pvt Ltd	Manager	Ali Hashim
Address	744, Street 49, G-11-2, Islamabad	Laboratory Address	Chemical, Environmental & Microbiological Laboratory Plot No. 07, Din Muhammad Town, 19-KM Off Multan Road, Lahore.
Contact	Mr. Amir A Ghor, Director	Telephone	+92 42 38104135-40
Telephone	+ 09203005035536	Fax	+92 42 37515420
Fax	-	Email	ali.hashim@sgs.com
Email	primengg@gmail.com	SGS Reference	I&E-LHR-603/2021 (Boss Order No. 5012772)
Project	(not specified)	Sample Collected	16-07-2021
Order Number	(not specified)	Analysis Completion Date	06-08-2021
Samples	Drinking Water Sample	Date Reported	09-08-2021
Sample Collected By	Mr. Zeeshan	Sample Technique	Grab Samples

COMMENTS

This report is not valid for any negotiation.
The remaining portion of the chemical sample (s) will be disposed off after one week unless otherwise instructed. (Conditions Apply)
Uncertainty of the test can be provided upon request.

SIGNATORIES

Sample Analyzed By	Laboratory In-Charge (QA/QC)	Chief Analyst / DH
Mr. Mubashir Ahmad / Ms. Zoha / Mr. Ali Zeeshan	Ms. Mahpara Alam	Mr. Ali Hashim

Sample No.	I&E-LHR-603/2021-01				
Client ID	Tuanse Bypass				
Sample Matrix	Drinking Water Sample				
Sample Date / Time	16-07-21 09:00				
Sample Receipt Date / Time	19-07-21 16:45				
Sampled By	SGS				
Parameter	Units	LOR	Results	Limits as per NSDWQ For DW	Remarks

Turbidity based on APHA 2130 B 23rd Edition

Turbidity	NTU	1.0	<1.0	<5 NTU	C
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pH based on APHA 4500H⁺ B 23rd Edition

*pH @ 25 ^o C	pH unit	0.1	7.45	6.5 – 8.5	C
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Color based on APHA 2120 B & C 23rd Edition (Lovibond Mth No. 203)

Color	Pt-Co	5.0	<5.0	≤15 TCU	C
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Odour In House (Organoleptic)

Odour	-	-	Non Objectionable	Non Objectionable	C
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Taste In House (Physical)

Taste	-	-	Non Objectionable	Non Objectionable	C
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Total Dissolved Solid based on APHA 2540 C 23rd Edition

*Solids, Total Dissolved (TDS)	mg/L	5.0	459	<1000	C
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Total Suspended Solid based on APHA 2540 D 23rd Edition

*Solids, Total Suspended (TSS)	mg/L	5.0	<5.0	-	-
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Total Hardness based on APHA 2340 C 23rd Edition

*Hardness, Total as CaCO ₃	mg/L	1.0	272	<500	C
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Nitrate, Nitrogen (NO₃) based on APHA 4500-NO₃-B 23rd Edition

(NO ₃ ⁻ -N)	mg/L	1.0	<1.0	≤50	C
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Nitrite Nitrogen (NO₂⁻) based on APHA 4500-NO₂-B 23rd Edition

(NO ₂ ⁻ -N)	mg/L	0.01	<0.01	≤3	C
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Alkalinity, Bi-Carbonate based on APHA-2320 B 23rd Edition

Alkalinity, Bi-Carbonate	mg/L	1.0	272	-	-
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Alkalinity, Carbonate based on APHA-2320 B 23rd Edition

Alkalinity, Carbonate	mg/L	1.0	<1.0	-	-
-----------------------	------	-----	------	---	---

Cyanide based on APHA 4500 CN⁻ E 23rd Edition

Cyanide (CN ⁻)	mg/L	0.05	<0.05	≤0.05	C
----------------------------	------	------	-------	-------	---

Chloride based on APHA-4500Cl⁻ B 23rd Edition

*Chloride	mg/L	0.5	25.25	<250	C
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Fluoride based on APHA 4500 F⁻ B,D 23rd Edition

Fluoride F ⁻	mg/L	1.0	<1.0	≤1.5	C
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Sulfate based on APHA 4500 SO₄⁻² C 23rd Edition

*Sulfate (SO ₄ ⁻²)	mg/L	5.0	76.55	-	-
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Metals by AAS/ICP-OES based on APHA 3111B/3120 B 23rd Edition

^Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C
^Antimony (Sb)	mg/L	0.005	<0.005	≤0.005	C
^Aluminum (Al)	mg/L	0.005	0.007	≤0.2	C
^Barium (Ba)	mg/L	0.005	0.045	0.7	C
^Boron (B)	mg/L	0.005	0.088	0.3	C

Sample No.	I&E-LHR-603/2021-01				
Client ID	Tuansé Bypass				
Sample Matrix	Drinking Water Sample				
Sample Date / Time	16-07-21 09:00				
Sample Receipt Date / Time	19-07-21 16:45				
Sampled By	SGS				
Parameter	Units	LOR	Results	Limits as per NSDWQ For DW	Remarks
*Cadmium (Cd)	mg/L	0.01	<0.01	0.01	C
*Copper (Cu)	mg/L	1.0	<1.0	2	C
*Lead (Pb)	mg/L	0.05	<0.05	≤0.05	C
*Iron (Fe)	mg/L	1.0	<1.0	-	-
*Manganese (Mn)	mg/L	0.5	<0.5	≤0.5	C
*Nickel (Ni)	mg/L	0.02	<0.02	≤0.02	C
*Selenium (Se)	mg/L	0.005	<0.005	0.01	C
Calcium (Ca)	mg/L	1.0	45.0	-	-
Magnesium (Mg)	mg/L	1.0	13.06	-	-

Mercury by ICP-OES based on APHA 3112 B 23rd Edition

*Mercury (Hg)	mg/L	0.001	<0.001	≤0.001	C
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Total Colony Count Pour Plate Technique APHA 9215 B 23rd Edition

*Total Colony Count	CFU/ml	-	2.26 x 10 ⁴	-	-
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Total coliform Membrane Filtration Technique APHA 9222 B 23rd Edition

*Total coliform	CFU/100ml	-	Absent	0 CFU/100ml	C
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Faecal coliform (E.coli) Membrane Filtration Technique APHA 9222 D 23rd Edition

* Faecal coliform (E.coli)	CFU/100ml	-	Absent	0 CFU/100ml	C
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Faecal streptococci Enterococci Membrane Filtration Technique APHA 9230 C 23rd Edition

*Faecal Streptococci/ Enterococci	CFU/100ml	-	Absent	-	-
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Sample No.	I&E-LHR-603/2021-02				
Client ID	Sakhi SARwar Bypass				
Sample Matrix	Drinking Water Sample				
Sample Date / Time	16-07-21 11:30				
Sample Receipt Date / Time	19-07-21 16:45				
Sampled By	SGS				
Parameter	Units	LOR	Results	Limits as per NSDWQ for DW	Remarks

Turbidity based on APHA 2130 B 23rd Edition

Turbidity	NTU	1.0	<1.0	<5 NTU	C
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pH based on APHA 4500H⁺ B 23rd Edition

*pH @ 25°C	pH unit	0.1	7.40	6.5 – 8.5	C
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Color based on APHA 2120 B & C 23rd Edition (Lovibond Mth No. 203)

Color	Pt-Co	5.0	<5.0	≤15 TCU	C
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Odour In House (Organoleptic)

Odour	-	-	Non Objectionable	Non Objectionable	C
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Taste In House (Physical)

Taste	-	-	Non Objectionable	Non Objectionable	C
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Total Dissolved Solid based on APHA 2540 C 23rd Edition

*Solids, Total Dissolved (TDS)	mg/L	5.0	1298	<1000	NC
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Total Suspended Solid based on APHA 2540 D 23rd Edition

*Solids, Total Suspended (TSS)	mg/L	5.0	<5.0	-	-
--------------------------------	------	-----	------	---	---

Total Hardness based on APHA 2340 C 23rd Edition

*Hardness, Total as CaCO ₃	mg/L	1.0	566	<500	NC
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Nitrate, Nitrogen (NO₃) based on APHA 4500-NO₃-B 23rd Edition

(NO ₃ ⁻ -N)	mg/L	1.0	<1.0	≤50	C
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Nitrite Nitrogen (NO₂) based on APHA 4500-NO₂-B 23rd Edition

(NO ₂ ⁻ -N)	mg/L	0.01	<0.01	≤3	C
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Alkalinity, Bi-Carbonate based on APHA-2320 B 23rd Edition

Alkalinity, Bi-Carbonate	mg/L	1.0	394	-	-
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Alkalinity, Carbonate based on APHA-2320 B 23rd Edition

Alkalinity, Carbonate	mg/L	1.0	<1.0	-	-
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Cyanide based on APHA 4500 CN⁻ E 23rd Edition

Cyanide (CN ⁻)	mg/L	0.05	<0.05	≤0.05	C
----------------------------	------	------	-------	-------	---

Chloride based on APHA-4500Cl⁻ B 23rd Edition

*Chloride	mg/L	0.5	72.84	<250	C
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Fluoride based on APHA 4500 F⁻ B,D 23rd Edition

Fluoride F ⁻	mg/L	1.0	<1.0	≤1.5	C
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Sulfate based on APHA 4500 SO₄²⁻ C 23rd Edition

*Sulfate (SO ₄ ²⁻)	mg/L	5.0	516	-	-
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Metals by AAS/ICP-OES based on APHA 3111B/3120 B 23rd Edition

^Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C
^Antimony (Sb)	mg/L	0.005	<0.005	≤0.005	C
^Aluminum (Al)	mg/L	0.005	<0.005	≤0.2	C
^Barium (Ba)	mg/L	0.005	0.019	0.7	C
^Boron (B)	mg/L	0.005	0.27	0.3	C

Sample No.	I&E-LHR-603/2021-02				
Client ID	Sakhi SARwar Bypass				
Sample Matrix	Drinking Water Sample				
Sample Date / Time	16-07-21 11:30				
Sample Receipt Date / Time	19-07-21 16:45				
Sampled By	SGS				
Parameter	Units	LOR	Results	Limits as per NSDWQ for DW	Remarks
*Cadmium (Cd)	mg/L	0.01	<0.01	0.01	C
*Copper (Cu)	mg/L	1.0	<1.0	2	C
*Lead (Pb)	mg/L	0.05	<0.05	≤0.05	C
*Iron (Fe)	mg/L	1.0	<1.0	-	-
*Manganese (Mn)	mg/L	0.5	<0.5	≤0.5	C
*Nickel (Ni)	mg/L	0.02	<0.02	≤0.02	C
*Selenium (Se)	mg/L	0.005	<0.005	0.01	C
Calcium (Ca)	mg/L	1.0	78.55	-	-
Magnesium (Mg)	mg/L	1.0	41.87	-	-

Mercury by ICP-OES based on APHA 3112 B 23rd Edition

*Mercury (Hg)	mg/L	0.001	<0.001	≤0.001	C
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Total Colony Count Pour Plate Technique APHA 9215 B 23rd Edition

*Total Colony Count	CFU/ml	-	1.37 x 10 ⁴	-	-
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Total coliform Membrane Filtration Technique APHA 9222 B 23rd Edition

*Total coliform	CFU/100ml	-	Absent	0 CFU/100ml	C
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Faecal coliform (E.coli) Membrane Filtration Technique APHA 9222 D 23rd Edition

* Faecal coliform (E.coli)	CFU/100ml	-	Absent	0 CFU/100ml	C
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Faecal streptococci/ Enterococci Membrane Filtration Technique APHA 9230 C 23rd Edition

*Faecal Streptococci/ Enterococci	CFU/100ml	-	Absent	-	-
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FOOTNOTE

IS	Insufficient sample for analysis.
LOR	Limits of Reporting
TCC	Total Colony Count
P/A	Present / Absent
MPN	Most Probable Number
TPC	Total Plate Count
HPC	Heterotrophic Plate count
APC	Aerobic Plate Count
TVA	Total Viable Count & Total Bacteria
FDA	Food & Drug Administration of USA
BAM	Bacteriological Analytical Manual
LNR	Sample Listed, but not received
CFU	Colony Forming Unit
*	This analysis is covered by the scope of accreditation of ISO 17025:2017.
**	Effluent Temperature should not increase ≤ 3 °C from receiving body Temperature
^	Performed by SGS Karachi Lab.
#	Result will follow soon.
C	Parameters are in Compliance with PEQS
NC	Parameters are not in Compliance with PEQS
Environmental	Temperature $25 \pm 5^{\circ}\text{C}$
Condition	Humidity $55 \pm 15\%$
NSDWQ	National Standards for Drinking Water Quality
Sample not Drawn by SGS Pakistan (Pvt.) Ltd.	

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[ANALYTICAL REPORT]

[SURFACE WATER ANALYSIS]

[MULTIPLE PARAMETER ANALYSIS]

PREPARED FOR:

[PRIME ENGINEERING AND TESTING CONSULTANTS PVT LTD]

CLIENT DETAILS

LABORATORY DETAILS

Client	Prime Engineering and Testing Consultants Pvt Ltd	Manager	Ali Hashim
Address	744, Street 49, G-11-2, Islamabad	Laboratory Address	Chemical, Environmental & Microbiological Laboratory Plot No. 07, Din Muhammad Town, 19-KM Off Multan Road, Lahore.
Contact	Mr. Amir A Ghor, Director	Telephone	+92 42 38104135-40
Telephone	+ 09203005035536	Fax	+92 42 37515420
Fax	-	Email	ali.hashim@sgs.com
Email	primengg@gmail.com	SGS Reference	I&E-LHR-603/2021 (Boss Order No. 5012772)
Project	(not specified)	Sample Collected	16-07-2021
Order Number	(not specified)	Analysis Completion Date	06-08-2021
Samples	Surface Water Sample	Date Reported	09-08-2021
Sample Collected By	Mr. Zeeshan Ismail	Sample Technique	Grab Samples

COMMENTS

This report is not valid for any negotiation.
The remaining portion of the chemical sample (s) will be disposed off after one week unless otherwise instructed. (Conditions Apply)
Uncertainty of the test can be provided upon request.

SIGNATORIES

Sample Analyzed By
Mr. Mubashir Ahmad / Mr. Ali Zeeshan

Laboratory In-Charge (QA/QC)
Ms. Mahpara Alam

Chief Analyst / DH
Mr. Ali Hashim

Sample No.	I&E-LHR-603/2021		
Client ID	D.G Cowal		
Sample Matrix	Surface Water Sample		
Sample Date / Time	16-07-21 13:00		
Sample Receipt Date / Time	19-07-21 16:45		
Sampled By	SGS		
Parameters	Units	LOR	Results

Temperature Thermometer

Temperature (at the time of sampling)	°C	-	21
---------------------------------------	----	---	----

pH based on APHA 4500H⁺ B 23rd Edition

*pH @ 25°C	pH unit	0.1	7.61
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Oil & Grease based on USEPA 1664

Oil & grease	mg/L	5.0	<5.0
--------------	------	-----	------

Total Dissolved Solid based on APHA 2540 C 23rd Edition

*Solids, Total Dissolved (TDS)	mg/L	5.0	169
--------------------------------	------	-----	-----

Total Suspended Solid based on APHA 2540 D 23rd Edition

*Solids, Total Suspended (TSS)	mg/L	5.0	1258
--------------------------------	------	-----	------

Chemical Oxygen Demand(COD) based on APHA-5220 D 23rd Edition

*COD	mg/L	5.0	69
------	------	-----	----

Total Phenols based on APHA 5530 D 23rd Edition

Phenols, Total (Phenolic Compounds)	mg/L	0.01	<0.01
-------------------------------------	------	------	-------

Biochemical Oxygen Demand (BOD₅) based on APHA-5210 D 23rd Edition

*BOD ₅ @ 20 °C	mg/L	3.0	20
---------------------------	------	-----	----

Cyanide based on APHA 4500 CN E 23rd Edition

Cyanide CN	mg/L	0.05	<0.05
------------	------	------	-------

Fluoride based on APHA 4500 F- B,D 23rd Edition

Fluoride F ⁻	mg/L	1.0	<1.0
-------------------------	------	-----	------

Sulfate based on APHA 4500 SO₄⁻² C 23rd Edition

*Sulfate (SO ₄ ⁻²)	mg/L	5.0	31.69
---	------	-----	-------

Ammonia based on APHA-4500 NH₃⁻ B/C 23rd Edition

NH ₃	mg/L	5.0	<5.0
-----------------	------	-----	------

Chloride based on APHA-4500Cl⁻ B 23rd Edition

*Chloride	mg/L	0.5	8.74
-----------	------	-----	------

Chlorine based on APHA 4500 Cl B 23rd Edition

Chlorine (Free)	mg/L	1.0	<1.0
-----------------	------	-----	------

Alkalinity, Total as CaCO₃ based on APHA-2320 B 23rd Edition

*Alkalinity, Total as CaCO ₃	mg/L	1.0	102
---	------	-----	-----

Nitrite Nitrogen (NO₂⁻) based on APHA 4500-NO₂-B 23rd Edition

(NO ₂ ⁻ -N)	mg/L	0.01	<0.01
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Sulphide based on APHA 4500 S⁻² F 23rd Edition

Sulphide (S ⁻²)	mg/L	1.0	<1.0
-----------------------------	------	-----	------

Metals by AAS / ICP-OES based on APHA 3111 B / 3120 B 23rd Edition

^Arsenic (As)	mg/L	0.005	<0.001
^Barium (Ba)	mg/L	0.005	0.065
^Boron (B)	mg/L	0.005	0.005



ANALYTICAL REPORT

Report No. 949195

Sample No.				I&E-LHR-603/2021
Client ID				D.G Cowal
Sample Matrix				Surface Water Sample
Sample Date / Time				16-07-21 13:00
Sample Receipt Date / Time				19-07-21 16:45
Sampled By				SGS
Parameters	Units	LOR	Results	
*Cadmium (Cd)	mg/L	0.01	<0.01	
*Chromium (Cr), total	mg/L	0.02	<0.02	
*Copper (Cu)	mg/L	1.0	<1.0	
*Iron (Fe) as total	mg/L	1.0	1.0	
*Lead (Pb)	mg/L	0.05	<0.05	
*Manganese (Mn)	mg/L	0.5	<0.5	
*Nickel (Ni)	mg/L	0.02	<0.02	
^Selenium (Se)	mg/L	0.005	<0.005	
*Silver (Ag)	mg/L	0.1	<0.1	
*Zinc (Zn)	mg/L	1.0	<1.0	
Sodium (Na)	mg/L	1.0	9.90	
Potassium (K)	mg/L	1.0	10.97	

Mercury by ICP-OES based on APHA 3112 B 23rd Edition

^Mercury (Hg)	mg/L	0.001	<0.001	
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FOOTNOTE

IS	Insufficient sample for analysis.
LOR	Limits of Reporting
TCC	Total Colony Count
P/A	Present / Absent
MPN	Most Probable Number
TPC	Total Plate Count
HPC	Heterotrophic Plate count
APC	Aerobic Plate Count
TVA	Total Viable Count & Total Bacteria
FDA	Food & Drug Administration of USA
BAM	Bacteriological Analytical Manual
LNR	Sample Listed, but not received
CFU	Colony Forming Unit
*	This analysis is covered by the scope of accreditation of ISO 17025:2017.
**	Effluent Temperature should not increase ≤ 3 °C from receiving body Temperature
^	Performed by SGS Karachi Lab.
#	Result will follow soon.
C	Parameters are in Compliance with PEQS
NC	Parameters are not in Compliance with PEQS
Environmental	Temperature $25 \pm 5^{\circ}\text{C}$
Condition	Humidity $55 \pm 15\%$
NSDWQ	National Standards for Drinking Water Quality
Sample not Drawn by SGS Pakistan (Pvt.) Ltd.	

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Chemical, Environmental & Microbiological Laboratory

TEST REPORT

Job No.: I&E – LHR – 603 / 2021 (Boss Order No. 5012772)

Client Name / Address: Prime Engineering and Testing Consultants Pvt Ltd / 744, Street 49, G-11-2, Islamabad

Description Of Sample: Soil Sample (As Stated)

Marking (If Any): Mentioned Below **No. of Samples:** 01

Sample Condition Upon Receipt: Satisfactory **Sample Collection Date:** July 16, 2021

Sr. #	Parameters	Method	Unit	LDL	Tuansse Bypass
1.	pH @ 25 °C	USEPA 904SC	-	0.1	8.92
2.	Conductivity, Electrical	ISO 11265:1994	mmhos/cm	1.0	<1.0
3.	Grease & Oil	Based on USEPA 9071B	% by wt	-	0.0016
4.	Silver	USEPA 3050B	mg/kg	00.50	<00.50
5.	^Arsenic	USEPA 3050B	mg/kg	00.50	1.4
6.	Cadmium	USEPA 3050B	mg/kg	00.50	<00.50
7.	Chromium	USEPA 3050B	mg/kg	00.50	<00.50
8.	^Mercury	USEPA 7471B	mg/kg	0.050	<0.050
9.	Lead	USEPA 3050B	mg/kg	00.50	8.093
10.	Zinc	USEPA 3050B	mg/kg	00.50	19.978
11.	^Barium	USEPA 3050B	mg/kg	00.50	54
12.	^Selenium	USEPA 3050B	mg/kg	00.50	<00.50
13.	Chloride	In-House Method	mg/kg	1.0	192.848
14.	Phosphorous	Based on APHA 4500 P B/C	mg/kg	00.50	00.858
15.	Potassium (K)	USEPA 3050B	mg/kg	00.50	4851.86
16.	**Total Nitrogen (TKN)	In-House Titrimetric	mg/kg	1.00	112.0

Detection Limit -: Not Defined <: Less Than ppm: parts per million

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- " With reference to Upland areas
- ^Test conducted at Sub-Contracted Lab SGS Karachi.
- *Water Soluble

For and on behalf of,

SGS PAKISTAN (PVT.) LTD

E(QA)

SH

Chemical, Environmental & Microbiological Laboratory

TEST REPORT

Job No.: I&E – LHR – 603 / 2021 (Boss Order No. 5012772)

Client Name / Address: Prime Engineering and Testing Consultants Pvt Ltd / 744, Street 49, G-11-2, Islamabad

Description Of Sample: Soil Sample (As Stated)

Marking (If Any): Mentioned Below **No. of Samples:** 01

Sample Condition Upon Receipt: Satisfactory **Sample Collection Date:** July 16, 2021

Sr. #	Parameters	Method	Unit	LDL	Sakhi Sarwar Bypass
1.	pH @ 25 °C	USEPA 9045C	-	0.1	8.93
2.	Conductivity, Electrical	ISO 11265:1994	mmhos/cm	1.0	<1.0
3.	Grease & Oil	Based on USEPA 9071B	% by wt	-	0.0011
4.	Silver	USEPA 3050B	mg/kg	00.50	<00.50
5.	^Arsenic	USEPA 3050B	mg/kg	00.50	<00.50
6.	Cadmium	USEPA 3050B	mg/kg	00.50	<00.50
7.	Chromium	USEPA 3050B	mg/kg	00.50	<00.50
8.	^Mercury	USEPA 7471B	mg/kg	0.050	<0.050
9.	Lead	USEPA 3050B	mg/kg	00.50	7.194
10.	Zinc	USEPA 3050B	mg/kg	00.50	9.161
11.	^Barium	USEPA 3050B	mg/kg	00.50	16
12.	^Selenium	USEPA 3050B	mg/kg	00.50	<00.50
13.	Chloride	In-House Method	mg/kg	1.0	144.63
14.	Phosphorous	Based on APHA 4500 P B/C	mg/kg	00.50	0.482
15.	Potassium (K)	USEPA 3050B	mg/kg	00.50	669.96
16.	**Total Nitrogen (TKN)	In-House Titrimetric	mg/kg	1.00	84

Detection Limit -: Not Defined <: Less Than ppm: parts per million

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- " With reference to Upland areas
- ^Test conducted at Sub-Contracted Lab SGS Karachi.
- *Water Soluble

For and on behalf of,

SGS PAKISTAN (PVT.) LTD

E(QA)

SH

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**ANNEXURE – D
STAKEHOLDER
CONSULTATION /SURVEY
FORMS**



**Social Survey for Environmental Impact Assessment
(EIA) Study for DG Khan Northern Bypass (Approx.
20km**

Dated: 14-7-2021

Introduction:

National Highway Authority (NHA) being the proponent of this project is planning for Construction of DG Khan northern bypass (Approx. 20km) Project.

Construction of DG Khan Northern bypass was imperative keeping in view the ever-increasing traffic flow coming from Karachi Port on Indus Highway (N-55) and passing through D.G. Khan city. The city, situated at the junction of Indus Highway and national highway (N-70), is the central point of four provinces with traffic coming from all sides. Similarly, stone crushing plants built along the national highway and the D.G. Khan cement factory generate big flow of heavy traffic for the supply of crushed stone, sand and cement to the Southern Punjab and other parts of the country. This is resulting frequent blockage of heavy traffic on N-75 that passes through the heart of the city, much to the inconvenience of both the commuters and the city residents.

Personal Information:

Name	Mohammad Majeed		Education	Under Matric	
Profession	Shop (Tyre Puncture)		Contact	—	
Address	Tuansa Bypass		Age	35	
Gender	Male ☒		Female		
Marital Status	Single		Married ☒		
Average Income	>20k ☒	>40k	>60k	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour Service		Small Business Shops ☒		Agriculture Technicians	
Availability of civic and health facilities?	Primary School ☒ College		Secondary School THQ		Road Gas	Water Supply Sewerage
Average income of the people in this area	20k ☒	30k	40k	50k	60k	



Major crops in this area?	Cotton, Maize, wheat, Sugarcane, corn
Nearest Health Facility	Basic Health Unit

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes	No ☒
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☒	No
Will this project be helpful in development and improving quality of life of this area?	Yes ☒	No
Do you face any problem (Environmental/Social) with this project?	Yes	No ☒
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes	No ☒
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes	No ☒
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes	No ☒
What kind of alternatives are you expecting as compensation to your loss?		
Money ☒ Alternate land/home ☒ Any other		
Are you in favor of this project?	Yes ☒	No
Any Other Comments/Suggestion:		
Proposed project is ok		



Social Survey for Environmental Impact Assessment
(EIA) Study for DG Khan Northern Bypass (Approx.
20km

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Personal Information:

Name	Marzha Hussain		Education	Graduation	
Profession	Agriculture		Contact	0345-0668832	
Address	Zagiani wala		Age	28	
Gender	Male ☒		Female ☐		
Marital Status	Single ☒		Married ☐		
Average Income	>20k ☒	>40k ☐	>60k ☐	>80k ☐	100k ☐

Demographic Information of the Project Area

Prominent source of income in this area?	Labour ☒ Service ☐		Small Business ☒ Shops ☐		Agriculture ☒ Technicians ☐	
Availability of civic and health facilities?	Primary School ☒ College ☐		Secondary School ☒ THQ ☐		Road ☒ Gas ☐	Water Supply ☒ Sewerage ☐
Average income of the people in this area	20k ☒	30k ☐	40k ☐	50k ☐	60k ☐	



Major crops in this area?	Cotton, Maize, Sugarcane, wheat, corn
Nearest Health Facility	Bareilly Health Center

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes	No ☒
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes	No ☒
Will this project be helpful in development and improving quality of life of this area?	Yes ☒	No
Do you face any problem (Environmental/Social) with this project?	Yes	No ☒
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes	No ☒
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☒	No
What economic or social benefits are you expecting from this project? Cotton Sprinkling		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes	No ☒
What kind of alternatives are you expecting as compensation to your loss? Money ☒ Alternate land/home ☒ Any other		
Are you in favor of this project?	Yes ☒	No
Any Other Comments/Suggestion:		



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Personal Information:

Name	Habib Ullah		Education	Under Metric	
Profession			Contact	-	
Address	Bestiwal, DG. Khan		Age	45	
Gender	Male ☒		Female		
Marital Status	Single		Married ☒		
Average Income	>20k	>40k ☒	>60k	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour Service ☒		Small Business Shops ☒		Agriculture Technicians	
Availability of civic and health facilities?	Primary School ☒ College		Secondary School ☒ THQ		Road Gas	Water Supply Sewerage
Average income of the people in this area	20k	30k ☒	40k	50k	60k	



Major crops in this area?	wheat, corn, Sugar Cane, cotton
Nearest Health Facility	Basic Health Unit

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes	No ☒
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☒	No
Will this project be helpful in development and improving quality of life of this area?	Yes ☒	No
Do you face any problem (Environmental/Social) with this project?	Yes ☒	No
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes ☒	No
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☒	No
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☒	No
What kind of alternatives are you expecting as compensation to your loss? Money ☒ Alternate land/home ☒ Any other		
Are you in favor of this project?	Yes ☒	No
Any Other Comments/Suggestion:		



Social Survey for Environmental Impact Assessment
(EIA) Study for DG Khan Northern Bypass (Approx.
20km

Dated: 15-7-21

Introduction:

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Personal Information:

Name	Muhammad Saleem	Education	Graduation		
Profession	Worker	Contact	0311-6852854		
Address	DG Khan	Age			
Gender	Male ☒	Female ☐			
Marital Status	Single ☒	Married ☐			
Average Income	>20k ☒	>40k ☐	>60k ☐	>80k ☐	100k ☐

Demographic Information of the Project Area

Prominent source of income in this area?	Labour Service ☒	Small Business Shops ☒	Agriculture Technicians ☐		
Availability of civic and health facilities?	Primary School ☒ College ☐	Secondary School ☒ THQ ☐	Road ☒ Gas ☐	Water Supply ☒ Sewerage ☐	
Average income of the people in this area	20k ☒	30k ☒	40k ☐	50k ☐	60k ☐



Major crops in this area?	Cotton, wheat, Corn, Sugarcane
Nearest Health Facility	DHQ, B4 Khom

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes ☒	No ☐
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☐	No ☒
Will this project be helpful in development and improving quality of life of this area?	Yes ☐	No ☒
Do you face any problem (Environmental/Social) with this project?	Yes ☐	No ☒
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes ☐	No ☒
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☐	No ☒
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☐	No ☒
What kind of alternatives are you expecting as compensation to your loss?		
☒ Money ☒ Alternate land/home ☐ Any other		
Are you in favor of this project?	Yes ☒	No ☐
Any Other Comments/Suggestion:		
Start this project ASAP.		



**Social Survey for Environmental Impact Assessment
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20km**

Dated: 15-7-2021

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Personal Information:

Name	Mahamud Kallu	Education	Under Matric		
Profession	Agriculture, livestock	Contact	—		
Address	Mouza Bhokra, DG Khan	Age	55		
Gender	Male ☒	Female	☐		
Marital Status	Single ☒	Married	☐		
Average Income	>20k ☒	>40k ☐	>60k ☐	>80k ☐	100k ☐

Demographic Information of the Project Area

Prominent source of income in this area?	Labour ☒ Service ☐	Small Business ☒ Shops ☐	Agriculture ☐ Technicians ☐		
Availability of civic and health facilities?	Primary School ☒ College ☐	Secondary School ☐ THQ ☐	Road ☐ Gas ☐	Water Supply ☐ Sewerage ☐	
Average income of the people in this area	20k ☒	30k ☐	40k ☐	50k ☐	60k ☐



Major crops in this area?	Cotton, wheat, Sugarcane
Nearest Health Facility	District Hospital, Basic Health Unit

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes	No ☒
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☒	No
Will this project be helpful in development and improving quality of life of this area?	Yes ☒	No
Do you face any problem (Environmental/Social) with this project?	Yes	No ☒
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes	No ☒
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes	No ☒
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes	No ☒
What kind of alternatives are you expecting as compensation to your loss?		
Money ☒ Alternate land/home ☒ Any other		
Are you in favor of this project?	Yes ☒	No
Any Other Comments/Suggestion:		



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(EIA) Study for DG Khan Northern Bypass (Approx.
20km**

Dated: 15-7-2021

Introduction:

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Personal Information:

Name	Mr. Mehboob		Education	Under Matric	
Profession	Daily wages worker		Contact		
Address	DG Khan		Age	42	
Gender	Male ☒		Female		
Marital Status	Single		Married ☒		
Average Income	>20k ☒	>40k	>60k	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour Service ☒		Small Business Shops ☒		Agriculture Technicians ☒	
Availability of civic and health facilities?	Primary School ☒ College ☒		Secondary School ☒ THQ ☒		Road Gas ☒ Water Supply ☒ Sewerage ☒	
Average income of the people in this area	20k ☒	30k	40k	50k	60k	



Major crops in this area?	cotton, wheat, Sugarcane
Nearest Health Facility	Govt. Hospital, DHQ,

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes ☒	No ☐
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☐	No ☒
Will this project be helpful in development and improving quality of life of this area?	Yes ☒	No ☒
Do you face any problem (Environmental/Social) with this project?	Yes ☒	No ☐
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes ☒	No ☐
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☐	No ☒
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☒	No ☐
What kind of alternatives are you expecting as compensation to your loss?		
Money ☒ Alternate land/home ☒ Any other ☐		
Are you in favor of this project?	Yes ☒	No ☐
Any Other Comments/Suggestion:		



Social Survey for Environmental Impact Assessment
(EIA) Study for DG Khan Northern Bypass (Approx. 20km)

Dated: 15-7-21

Introduction:

National Highway Authority (NHA) being the proponent of this project is planning for Construction of DG Khan northern bypass (Approx. 20km) Project.

Construction of DG Khan Northern bypass was imperative keeping in view the ever-increasing traffic flow coming from Karachi Port on Indus Highway (N-55) and passing through D.G. Khan city. The city, situated at the junction of Indus Highway and national highway (N-70), is the central point of four provinces with traffic coming from all sides. Similarly, stone crushing plants built along the national highway and the D.G. Khan cement factory generate big flow of heavy traffic for the supply of crushed stone, sand and cement to the Southern Punjab and other parts of the country. This is resulting frequent blockage of heavy traffic on N-75 that passes through the heart of the city, much to the inconvenience of both the commuters and the city residents.

Personal Information:

Name	Mr. Azhar		Education	Master	
Profession	Teacher		Contact	-	
Address	DG Khan		Age	32	
Gender	Male ☒		Female		
Marital Status	Single		Married ☒		
Average Income	>20k	>40k ☒	>60k	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour ☒		Small Business ☒		Agriculture ☒	
	Service ☒		Shops ☒		Technicians ☒	
Availability of civic and health facilities?	Primary School ☒		Secondary School ☒		Road ☒	
	College ☒		THQ ☒		Gas ☒	
Average income of the people in this area	20k		30k ☒		40k	
					50k	
					60k	



Major crops in this area?	wheat, Sugarcane, Maize, Corn.
Nearest Health Facility	Hospitals, DHAQ

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes	No ☒
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☒	No
Will this project be helpful in development and improving quality of life of this area?	Yes ☒	No
Do you face any problem (Environmental/Social) with this project?	Yes	No ☒
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes	No ☒
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes	No ☒
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☒	No
What kind of alternatives are you expecting as compensation to your loss?		
Money ☒ Alternate land/home ☒ Any other ☐		
Are you in favor of this project?	Yes ☒	No
Any Other Comments/Suggestion:		



**Social Survey for Environmental Impact Assessment
(EIA) Study for DG Khan Northern Bypass (Approx.
20km**

Dated: 16-7-21

Introduction:

National Highway Authority (NHA) being the proponent of this project is planning for Construction of DG Khan northern bypass (Approx. 20km) Project.

Construction of DG Khan Northern bypass was imperative keeping in view the ever-increasing traffic flow coming from Karachi Port on Indus Highway (N-55) and passing through D.G. Khan city. The city, situated at the junction of Indus Highway and national highway (N-70), is the central point of four provinces with traffic coming from all sides. Similarly, stone crushing plants built along the national highway and the D.G. Khan cement factory generate big flow of heavy traffic for the supply of crushed stone, sand and cement to the Southern Punjab and other parts of the country. This is resulting frequent blockage of heavy traffic on N-75 that passes through the heart of the city, much to the inconvenience of both the commuters and the city residents.

Personal Information:

Name	Dr. Abdul Kareem		Education	Dr. MBBS	
Profession	Doctor		Contact	0335-6572090	
Address	Chit Dagir		Age	40	
Gender	Male ☒		Female		
Marital Status	Single		Married ☒		
Average Income	>20k	>40k	>60k ☒	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour ☒ Service		Small Business ☒ Shops		Agriculture ☒ Technicians	
	Primary School ☒ College		Secondary School ☒ THQ		Road ☒ Gas	
Availability of civic and health facilities?	Water Supply ☒ Sewerage		Road ☒ Gas		Water Supply ☒ Sewerage	
Average income of the people in this area	20k	30k ☒	40k	50k	60k	



Major crops in this area?	Maize, corn, Sugarcane
Nearest Health Facility	Pvt & Govt. hospitals

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes ☒	No ☐
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☐	No ☒
Will this project be helpful in development and improving quality of life of this area?	Yes ☐	No ☒
Do you face any problem (Environmental/Social) with this project?	Yes ☒	No ☐
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes ☒	No ☐
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☒	No ☐
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☒	No ☐
What kind of alternatives are you expecting as compensation to your loss?		
Money ☒ Alternate land/home ☒ Any other ☐		
Are you in favor of this project?	Yes ☒	No ☐
Any Other Comments/Suggestion:		



Social Survey for Environmental Impact Assessment (EIA) Study for DG Khan Northern Bypass (Approx. 20km

Dated: 16-7-21

Introduction:

National Highway Authority (NHA) being the proponent of this project is planning for Construction of DG Khan northern bypass (Approx. 20km) Project.

Construction of DG Khan Northern bypass was imperative keeping in view the ever-increasing traffic flow coming from Karachi Port on Indus Highway (N-55) and passing through D.G. Khan city. The city, situated at the junction of Indus Highway and national highway (N-70), is the central point of four provinces with traffic coming from all sides. Similarly, stone crushing plants built along the national highway and the D.G. Khan cement factory generate big flow of heavy traffic for the supply of crushed stone, sand and cement to the Southern Punjab and other parts of the country. This is resulting frequent blockage of heavy traffic on N-75 that passes through the heart of the city, much to the inconvenience of both the commuters and the city residents.

Personal Information:

Name	<u>Mohamud Zaam</u>		Education	<u>Matric</u>	
Profession	<u>Agriculture</u>		Contact	<u>0343-2202002</u>	
Address	<u>Chit Dagar</u>		Age	<u>35</u>	
Gender	Male ☒		Female ☐		
Marital Status	Single ☐		Married ☒		
Average Income	>20k	>40k ☒	>60k	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour ☒ Service		Small Business ☒ Shops		Agriculture Technicians
Availability of civic and health facilities?	Primary School ☒ College	Secondary School ☒ THQ	Road ☒ Gas	Water Supply ☒ Sewerage	
Average income of the people in this area	20k	30k ☒	40k	50k	60k



Major crops in this area?	Wheat, Corn, Sugarcane
Nearest Health Facility	Hospital, Basic Health Unit, PHC,

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes ☒	No ☐
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☐	No ☒
Will this project be helpful in development and improving quality of life of this area?	Yes ☐	No ☒
Do you face any problem (Environmental/Social) with this project?	Yes ☒	No ☐
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes ☒	No ☐
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☒	No ☐
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☒	No ☐
What kind of alternatives are you expecting as compensation to your loss?		
☒ Money ☒ Alternate land/home ☐ Any other		
Are you in favor of this project?	Yes ☒	No ☐
Any Other Comments/Suggestion:		



**Social Survey for Environmental Impact Assessment
(EIA) Study for DG Khan Northern Bypass (Approx.
20km**

Dated: 17-7-21

Introduction:

National Highway Authority (NHA) being the proponent of this project is planning for Construction of DG Khan northern bypass (Approx. 20km) Project.

Construction of DG Khan Northern bypass was imperative keeping in view the ever-increasing traffic flow coming from Karachi Port on Indus Highway (N-55) and passing through D.G. Khan city. The city, situated at the junction of Indus Highway and national highway (N-70), is the central point of four provinces with traffic coming from all sides. Similarly, stone crushing plants built along the national highway and the D.G. Khan cement factory generate big flow of heavy traffic for the supply of crushed stone, sand and cement to the Southern Punjab and other parts of the country. This is resulting frequent blockage of heavy traffic on N-75 that passes through the heart of the city, much to the inconvenience of both the commuters and the city residents.

Personal Information:

Name	Mr. Gulam Shahid		Education	Matric	
Profession	Business		Contact	0333-8782111	
Address	Basti Hussain		Age	40	
Gender	Male ☒		Female ☐		
Marital Status	Single ☒		Married ☐		
Average Income	>20k	>40k ☒	>60k	>80k	100k

Demographic Information of the Project Area

Prominent source of income in this area?	Labour ☒	Small Business ☒		Agriculture	
	Service	Shops		Technicians	
Availability of civic and health facilities?	Primary School ☒	Secondary School ☒		Road	Water Supply
	College	THQ		Gas	Sewerage
Average income of the people in this area	20k ☒	30k	40k	50k	60k



Major crops in this area?	wheat, corn, Sugarcane, Maize
Nearest Health Facility	DHQ, BHU, Pvt. Hosp, Tal

Public Perception about Proposed Project

Do you know that NHA is going to Construct DG Khan Northern Bypass road?	Yes ☒	No ☐
Do you feel that this will help people in providing better economical/financial facilities by providing more jobs chances?	Yes ☐	No ☒
Will this project be helpful in development and improving quality of life of this area?	Yes ☐	No ☒
Do you face any problem (Environmental/Social) with this project?	Yes ☒	No ☐
If Yes, Explain:		
Does this project intercept with any social taboo/norms of the area?	Yes ☒	No ☐
Do you think there will be any kind of health problems due to waste and air pollution caused by this project?	Yes ☒	No ☐
What economic or social benefits are you expecting from this project?		
If NHA want to acquire your land/home/shops etc. for the proposed project, will you be agreed to sale your property (land, shop, home)	Yes ☒	No ☐
What kind of alternatives are you expecting as compensation to your loss?		
Money ☒ Alternate land/home ☒ Any other ☐		
Are you in favor of this project?	Yes ☒	No ☐
Any Other Comments/Suggestion:		