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CONSTRUCTION OF LINK CONNECTING FEROZPUR ROAD (ARFA TOWER) WITH PINE AVENUE ALONG SATU KATLA DRAIN LAHORE

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

Executing Agency

LAHORE DEVELOPMENT AUTHORITY

(LDA)

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CONSTRUCTION OF LINK CONNECTING FEROZPUR ROAD (ARFA TOWER) WITH PINE AVENUE ALONG SATU KATLA DRAIN LAHORE

ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)

Project Proponent
LAHORE DEVELOPMENT AUTHORITY

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LIST OF ABBREVIATIONS

CTMP	Construction Traffic Management Plan
EA	Environmental Approval
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
GFPs	Grievance Focal Points
GoP	Government of Pakistan
HSE	Health Safety Environment
IEE	Initial Environmental Examination
LDA	Lahore Development Authority
M&E	Monitoring and Evaluation
MVEs	Motor Vehicle Examiners
NCS	National Conservation Strategy
NGOs	Non–Government Organizations
NOC	No Objection Certificate
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
OSHA	Occupational Safety and Health Administration
PEPA	Punjab Environmental Protection Act
PKR	Pak Rupees
PPE	Personal Protective Equipment
PSQCA	Pakistan Standards Quality Control Authority
PEQS	Punjab Environmental Quality Standards
RAR	Refined Activity Rate
SH & E	Safety Health & Environment
TEPA	Traffic Engineering & Transport Planning Agency
UNCED	United Nations Conference on the Environment and Development
WASA	Water and Sanitation Agency

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EXECUTIVE SUMMARY

TITLE & LOCATION OF PROJECT

Construction of Link Connecting Ferozpur Road (Arfa Tower) with Pine Avenue along Satu Katla Drain Lahore

A BRIEF OUTLINE OF THE PROPOSAL

The proposed project will start from Ferozpur Road near Arfa Karim opposite SOS Village and will follow the existing route of Satukatla Drain, thereby running parallel to 2.7km along this route reached Peco Road. Entry and exit from the route are provided on Peco Road. The proposed Alignment will then cross Peco Road, a major arterial, and traverse along Drain Passes Township Area. It will then run parallel through the Industrial area and reach Madre-e-Milat Road and then crosses. Nazaria-e-Pakistan Avenue. Then it runs parallel to the Wapda Town and terminates on Khayaban-e- Jinnah near Kader Topbash Chowk. In order to facilitate the commuters, Entry, and exit have also been proposed on major sub-urban arterials i.e. Peco Road, Madre-e- Milat Road and other major crossings. The route will be constructed over and along the existing Satukatla Drain, where ample ROW of the drain is available, running across the city.

Traffic congestion has been worsening day by day resulting in long traffic queues causing increased traveling time and environmental degradation of the city. The proposed project will facilitate the through traffic to access commercial hubs, offices, schools, business places, and residences, etc. in a reduced travel time and vehicle operating costs hence decreasing fuel consumption and noise & air pollution.

The objectives of the project are to:

(a) This project will help in reducing traffic jams/congestion at the intersections.
(b) This will result in a reduction in Vehicle Operating Costs (VOC) and at the same time alleviate noise and air pollution up to a certain extent.
(c) To reduce travel time.
(d) Job Opportunities for local people would be created.
(e) Safe movement of pedestrians across the road would be possible

ENVIRONMENTAL BASELINE

The existing environmental conditions around the proposed project have been considered in physical, biological, and socio-economic aspects. The methodology used for the EIA preparation included the collection and review of relevant documents and firsthand data including policy and previous study documents, use of satellite imagery and Google Earth, onsite environmental, ecological, and social investigation, consultation with public and stakeholders, and undertaking the social impact assessment and analysis.

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The district of Lahore is divided into two parts. The low-lying alluvial soil is along the Ravi River and the upland in the east. Upland is a plain slope from north-east to south-west.

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Alluvium is soil or sediments deposited by a river or other running water. The alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas, where more particles are dropped, are called alluvial or floodplains, and the dropped particles are called alluvium. Seasonal climatic conditions must be considered for the design and execution of the Project. The climate including air, temperature, precipitation, humidity, and evaporation is an influencing factor, affecting the construction of the plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered. The Project Area has an extreme climate: it has hot summers and cold winters. The summer starts in April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months

The Lahore division is a part of the Punjab Province of Pakistan. Geologically, this area is a part of the lower Indus Basin. The name "Punjab" itself is indicative of the healthy presence and importance of rivers in this area. The word "Punjab" comes from 'Punj-aab' meaning five rivers. The five rivers of Punjab were Sutlej, Bias, Ravi, Jhelum, and Chenab Rivers. It is to be noted here that the Bias River has discontinued flowing in Pakistan, as discussed later. This blessing has resulted in cultivation on the mast part of the land in Punjab as well as in the study area. Groundwater quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria-free. The status of the quality of groundwater both in the country and Punjab Province is shown in fig. The water quality in the upper 50 meters zone of the subsoil is generally brackish. For the city's drinking purposes water is abstracted from the groundwater aquifer using tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of the city population is consuming groundwater for drinking purposes. Groundwater is available at a depth ranging between 15 to 23m below the natural surface level

There are some schools, academies, mosques and one church is present along the project routes that may be affected by the project activities. But the impacts can be reduced by implementing the mitigation measures. The baseline of air quality, water quality (both surface and groundwater), and noise levels were monitored and the parameters were found to be within the limits.

In general, various kinds of common trees and shrubs were found planted in the project area. Local bird species were observed flying in the area, on the trees, bushes, and electricity lines. The result analysis of a socio-economic survey of the proposed project area indicates that the majority of the people are living in a joint family system (63%) and in cemented houses (98.5%). The majority of the community members (98%) are Muslims.

The Consultant has employed a participatory bottom-up transparent and consultative approach in the preparation of the Environmental Impact Assessment (EIA) report.

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Various qualitative and quantitative data collection tools were used to develop an environmental baseline for the proposed area.

Different parameters are monitored at the project site as mentioned;

- Air quality
- Noise
- Water quality

The results of monitored parameters are provided in the ***Annexure***

THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING THE CONSTRUCTION PHASE

Impacts

The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.

- Soil erosion due to Construction activities, earthwork, cut and fill, stockpiles, etc.
- Contamination of soil due to leakage/spillage of oil, bituminous and non–bituminous debris generated from demolition and road construction
- Dust Generation due to construction activities and transport, storage, and handling of construction materials.
- Noise from construction activities and operation of equipment and heavy machinery
- Sourcing of water during Construction
- Construction waste and debris may affect local people.
- Safety of Workers and accident risk from construction activities
- Approach/hindrance problems for the residents/business owners and movement of the people will be disturbed during construction activities.
- Construction will pose a burden on the existing natural resources

Mitigation

- Low embankments will be protected by planting vetiver grass that can flourish in relatively dry conditions.
- Soil contamination by asphalt will be minimized by placing all containers in caissons
- Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil.
- Unloading of loose and fine materials through covered vehicles.
- All equipment is to be timely serviced and properly maintained
- Arrangements shall be made by the contractor that the water availability and supply to nearby communities remain unaffected
- Dumping sites will be selected away from residential areas and water bodies
- Dumping sites must be having an adequate capacity equal to the amount of debris generated.
- Safe work practices will be followed and applied by the contractor.
- At the construction site, fluorescent and retro refectory signage will be used

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- Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out
- One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction

THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING THE OPERATIONAL PHASE

Impacts

- Accident risks associated with traffic movement
- Lack of maintenance during the operational phase can cause harm
- Noise generation

Mitigation

- All safety features provided in the main approach roads such as guide rails, and speed bumps, will be maintained and kept in good condition.
- Traffic control measures, including speed limits, will be forced strictly
- Implementation of HSE Plans during the maintenance period.
- Ban on the use of pressure horns;
- Proper implementation of inspection and maintenance programs for vehicles

POSITIVE IMPACTS DURING THE OPERATIONAL PHASE

- The air quality will improve due to the smooth flow of traffic
- The noise level will decrease because of smooth traffic flow

PROPOSED MONITORING PLAN

The monitoring program is designed to assess the effective implementation of the Environmental Impact Assessment (EMP). A monitoring Program (MP) provides important information that allows for more effective planning and an adaptive response based on the assessment of the effectiveness of mitigation measures. The monitoring of various parameters will help to determine the extent to which project operation activities cause environmental disturbance.

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ENVIRONMENTAL MONITORING PLAN

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
CONSTRUCTION PHASE					
Vegetation Clearance	Construction site	Visual inspection of loss of vegetation, soil erosion & instability, surface water pollution, and occupational health of workers and community	Weekly	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air)	Contractor, LDA through Approved Monitoring Agency
Excavation of earth	Construction site and camp site	Visual inspection for soil erosion & stability	Weekly	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Dust Emissions	Construction site and camp site	Visual inspection during construction activities Transportation of materials	Weekly	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Storage and handling of materials	Material storage facility and construction camp	Visual inspection of storage facilities	Monthly	To minimize any risk of accident	LDA through Approved Monitoring Agency

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ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
Traffic Safety	Construction site and camp site	Visual inspections	Monthly	To avoid the accidents	LDA through Approved Monitoring Agency
Ambient Air Monitoring	Construction site, camp site, batching plant Material storage & active sites	PM_{10} SO_x as SO_2, NO_x as NO_2, CO	Quarterly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Noise Level	Construction Site	Using a noise level meter (minimum dB and maximum dB)	Quarterly	To meet the **Noise Standards**	LDA through Approved Monitoring Agency
Ground & Drinking Water Quality	Construction Site	By analyzing pH, TDS, Chloride, Fluoride, Colour, NO_3–, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	Quarterly	To meet the **PEQS** Drinking Water quality Guidelines	LDA through Approved Monitoring Agency

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ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
Solid Waste	Construction camps and construction sites	A visual inspection that solid waste will be disposed of at the designated site Waste generation rate, Waste composition, Recyclables and non-recyclables, Hazardous waste.	Weekly	Minimize impacts on the Environment	LDA through Approved Monitoring Agency
Occupational health & safety	Construction Site	Proper provision of PPEs to workers	Daily	To avoid any risk to human health	HSE Officer
OPERATIONAL PHASE					
Ambient Air Monitoring	Road	PM_{10} SO_x as SO_2, NO_x as NO_2, CO	Quarterly (During operation)	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air) **&WHO** (World Health Organization)	LDA through Approved Monitoring Agency
Noise Level	Road	Using a noise level meter (minimum dB and maximum dB)	Quarterly (During operation)	To meet the **Noise Standards**	LDA through Approved Monitoring Agency

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ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
Water Quality	Road	By analyzing pH, TDS, Chloride, Fluoride, Colour, NO_3-, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	Quarterly (During operation) &End of summer before the onset of Monsoon every year.	To meet the PEQS Drinking Water quality Guidelines	LDA through Approved Monitoring Agency

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Consultation Outcomes

Overall, people expressed their wish for the construction of the road and their support for the proposed project. The proposed project construction was welcomed by the people as it will reduce traffic congestion and minimize other road hazards along the selected road section. Local communities demanded that they should be part of a continuous consultation process, together with other stakeholders, during different stages of the project including design, construction, and operation

Conclusion

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 upon implementation of the mitigation, the residual impacts of the proposed operation will be the 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.

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

This EIA report is being prepared to fulfill the legal requirements of the Punjab Environment Protection Act 1997 (PEPA Amended 2012) for obtaining the Environmental Approval (EA) for the project "Construction of Link Connecting Ferozpur Road (Arfa Tower) with Pine Avenue along Satu Katla Drain Lahore". The other relevant regulations and guidelines considered while preparing this EIA report include:

(a) Policy and procedures for filing, review, and approval of environmental assessments.
(b) Guidelines for the preparation and review of environmental reports
(c) Guidelines for public participation.
(d) Guidelines for sensitive and critical areas.
(e) Detailed sectoral guidelines.

Different environmental aspects like physical, biological, and other related features of the project during regular occupancy are highlighted in this EIA report. The necessary measures to be adopted to mitigate negative environmental impacts on any segment of the environment in and around are also described. All the important project-related information is also provided as desired by the Guidelines for the Preparation of IEE / EIA reports–1997, based on which the present report has been prepared. This report will also help the decision makers to issue the desired Environmental Approval (EA) / No Objection Certificate (NOC).

1.2 IDENTIFICATION PROJECT & PROPONENT

Project Name: Construction of Link Connecting Ferozpur Road (Arfa Tower) with Pine Avenue along Satu Katla Drain Lahore

Sponsoring Agency: HUD&PHED

Project Proponent
Chief Engineer -I

Lahore Development Authority – LDA

467-D-II Ground Floor New Building, Johar Town, Lahore, Pakistan

1.3 DETAIL OF CONSULTANT

M/S ***Integrated Environment Consultants*** (IEC) has been entrusted with the preparation of an EIA report regarding the proposed project. The IEC corresponding address is Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman Chowk Lahore, Pakistan.

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Email: *inemvconsultants@yahoo.com*

Web: *www.iec-consultants.com*

1.4 PERSONS PERFORMING THE EIA STUDY (TEAM MEMBERS)

The EIA study of the proposed project has been conducted according to Environmental Assessment Procedures-1997, Review of IEE, and EIA Regulation-2022 as prescribed by the Federal Environmental Protection Agency (Pak-EPA), Government of Pakistan. The study team which completed the EIA Report consists of the following Experts

Table 1-1 Lists of Experts Performing EIA

Name	Qualification	Status In Project
Mr. Ahtasham Raza	M.Phil, Ph.D. Scholar, (Environmental Sciences)	Team In-charge
Mr. Adnan Sharif	Postgraduate (Environmental Law)	Project Manager
Mr. Mehmood Amjad	B.S (Environmental Sciences)	Monitoring In-charge
Ms. Iram Naz	M.Sc. Water Resource Management	Team Member
Dr. Gulnaz Malik	Ph.D. (Environmental Science)	Team Member

1.5 BRIEF DESCRIPTION OF THE NATURE, SIZE, AND LOCATION OF THE PROJECT

This Environmental Impact Assessment (EIA) Study is being carried out for the proposed project. The construction of the route is a partially controlled route, a four (04) lane dual carriageway, which will result in a partially signal-free flow of traffic by facilitating the commuters intending to travel towards major routes of the southern part of Lahore.This about 11.0 Km long proposed route will connect Main Ferozepur Road, Peco Road, Madre-e-Milat Road, Nazaria-e-Pakistan, etc. to Khayaban-e-Jinnah near Kader Topbash Chowk. This will primarily serve the areas of Kot Lakhpat, Township, Green Town, Wapda Town, and other highly populated areas of South Western Part of Lahore. The other features include the construction of entry/exit on major arterials crossing the alignment.

The Route will start from Ferozpur Road near Arfa Karim opposite SOS Village and will follow the existing route of Satukatla Drain, thereby running parallel to 2.7km along this route reached Peco Road. Entry and exit from the route are provided on Peco Road. The proposed Alignment will then cross Peco Road, a major arterial, and traverse along Drain Passes Township Area. It will then run parallel through the Industrial area and reach

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Madre-e-Milat Road and then crosses. Nazaria-e-Pakistan Avenue. Then it runs parallel to the Wapda Town and terminates on Khayaban-e-Jinnah near Kader Topbash Chowk.

In order to facilitate the commuters, Entry, and exit have also been proposed on major sub-urban arterials i.e. Peco Road, Madre-e-Milat Road and other major crossings.

The project is of a very important nature to overcome the traffic of Southern Lahore, especially for those who want to move from the Eastern to the Western side of the city.

Table 1-2: Project Brief

Major Component	Four-Lane Dual Carriageway
Approved Project Cost	PKR Million. 6,780.358/-
Approved Gestation	5 Months Till October 2023
Approval Forum	PDWP
Scope of work details	No of Lanes = 2 (either side) with Frontage roads Lane Width = 3.3 m Inner Shoulder = 0.3 m Outer Shoulder = 0.3 m
Environmental Impact	• Significant reduction in Carbon Emissions • Extensive tree plantation

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2.0 SCREENING OF PROJECT

According to the review of the Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) Regulation 2022, this project falls in ***Schedule–II, Section–D "Transport", Sub–Section–2 "Highways, Motorways, Expressways or Major Ways "*** for which Environmental Impact Assessment (EIA) Report is required.

Therefore, to fulfill the legal requirements of Section–12 of the Punjab Environment Protection Act–1997 (PEPA Amended 2012), the proponent is required to submit the EIA Report to the Environmental Protection Agency, Government of Punjab, to obtain the required Environmental Approval (EA).

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3.0 SCOPING OF PROJECT

3.1 SPACIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Spatial boundaries for projects related to the environmental effects and cumulative effects for Valued Environmental Components. It depends on the Project Development Area and Local and Regional Assessment Area.

The Route will start from Ferozpur Road near Arfa Karim opposite SOS Village and will follow the existing route of Satukatla Drain, thereby running parallel to 2.7km along this route reached Peco Road. Entry and exit from the route are provided on Peco Road. The proposed Alignment will then cross Peco Road, a major arterial, and traverse along Drain Passes Township Area. It will then run parallel through the Industrial area and reach Madre-e-Milat Road and then crosses. Nazaria-e-Pakistan Avenue. Then it runs parallel to the Wapda Town and terminates on Khayaban-e- Jinnah near Kader Topbash Chowk. In order to facilitate the commuters, Entry, and exit have also been proposed on major sub-urban arterials i.e. Peco Road, Madre-e- Milat Road and other major crossings. The route will be constructed over and along the existing Satukatla Drain, where ample ROW of the drain is available, running across the city.

Temporal boundaries are based on the timings and duration of project activity that will happen during the construction and operational phase. The proposed project will be completed in 5 months till October 2023. Construction will be done in an environmentally friendly manner that will not harm any existing boundaries and surroundings of the project area. While during the operational phase, all the operational activities will be done to meet the PEQS.

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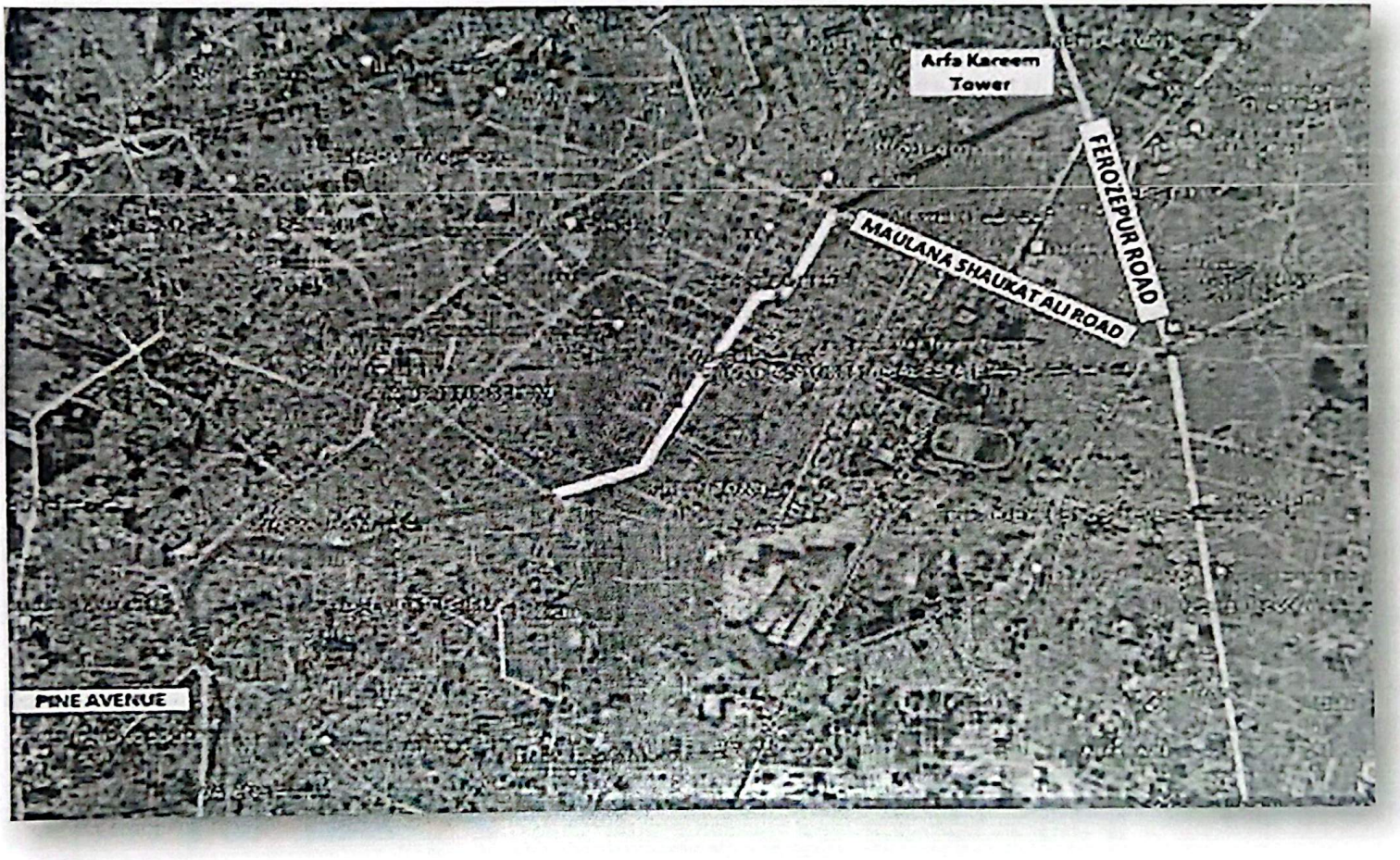


Figure 3-1 Location of Project Area

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3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The regular survey and background studies were conducted to identify the stakeholders. People of surroundings were gathered who are likely to be affected, focus group meetings were conducted by the representatives. They were all briefed about the project's whereabouts in a non-technical and understandable way.

Table 3-1 Issues and Concerns raised during Consultation

Sr. no	Issues/concerns	
1.	**Traffic**	▪ Traffic congestion at Bedian Road Junction has been worsening day by day ▪ long traffic queries of the vehicles during peak hours causing increased travelling time ▪ Cause environmental degradation of the city. ▪ The public cannot go to their destination in the required time.
2.	**Public Safety**	▪ Secure site fencing to avoid any incidents ▪ Clear ingress and egress signage ▪ Clear working hours and notifications to the public regarding excessively noisy activities ▪ Provide secure alter routes to nearby residents ▪ Maintaining accessible routes for the disabled community
3.	**Site Logistics**	▪ Site ingress and egress ▪ Erosion and sediment control ▪ Cut-down on any utility during excavation
4.	**Neighboring Properties**	▪ Limiting noise, dust

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

The following impacts are considered to be significant and proper mitigation and maintenance plans for these are made

- Air pollution
- Noise Pollution
- Top Soil Removal
- Health and safety of workers
- Accidents due to transportation of construction material
- Accidental spillages of oil to surface water during operation

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4.0 CONSIDERATION OF ALTERNATIVES

No Project Option

The No-build alternative does not meet the purpose and need as the severity of the structural deficiencies precludes their being addressed satisfactorily by repair or maintenance work.

The No Project Option is the least preferred from the socio-economic and partly environmental perspective since if the project is not done.

4.1 SITE ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

The proposed project is the construction of a link connecting Ferozpur road (arfa tower) with Pine Avenue along Satu Katla Drain Lahore.

The site is considered suitable both in terms of environment and physical constraints. As the land use on the project site is already on existing roads. The proposed project will help in managing traffic flow resulting in a reduction in time delays and air pollution. Smooth flow of traffic will also help in lesser wear and tear of vehicles. Hence, there is no need for alternative sites as the current project has all possible aspects.

4.2 ENVIRONMENTAL ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

Without Project Scenario

The project aims to a construct a four (04) lane dual carriageway, which will result in a partially signal-free flow of traffic. The purpose of the proposed project is to rehabilitate and widen the road from Arfa Kareem Tower to Chatri Chowk (Pine Avenue) on both sides of the Satukatla drain. With present and projected high traffic volumes, the capacity of the present highway is insufficient for handling the high volume of traffic and calls in for improvements to a 2 lane carriageway with hard shoulder. The road has many roadside settlements and the traffic flow is seriously impacted by severe conflicts between the local and the through traffic. The population growth, increase in traffic volumes and the economic development along the corridor would continue to occur and will worsen the already critical situation. The existing unsafe conditions and the adverse environmental consequences in terms of the environmental quality would continue to worsen in the absence of the proposed improvements. Therefore, the no-action alternative is neither a reasonable nor a prudent course of action for the proposed project, as it would amount to failure to initiate any further improvements and impede economic development.

With Project Scenario

The 'with project scenario' is found to have a positive impact in the long run on social, environmental, economic and financial issues. This scenario includes the rehabilitation and widening of the road from Arfa Kareem Tower to Chatri Chowk (Pine Avenue) on both sides of the Satukatla drain. The scenario is economically viable and will improve the existing conditions. It, would thereby, contribute to the development and enhance the growth potential of the area. The project envisages the development within the existing

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ROW. In spite of the various development benefits likely to accrue due to the project, as is the case of every road development project, the project would be accompanied by certain impacts on the natural, social and environmental components.

Alternative access and utilities to existing facilities may need to be provided during construction or staged construction to allow access and maintain the utilities would be required. Sometimes, top-down construction rather than bottom-up construction can help to ameliorate the disruption and reduce its duration. Rigid excavation support systems and ground improvement techniques may be required to minimize potential settlements and lateral ground deformations, and their impact on adjacent structures. When excavation and dewatering are near the contaminated ground, special measures may be required to prevent the migration of the groundwater-contaminated plume into the excavation or adjacent basements. Dust suppression and wheel washing facilities for vehicles leaving the construction site are often used, especially in urban areas. Excavation methods are available that can limit suspended solids in the water to acceptable levels. Existing fauna and flora and other ecological issues should be investigated to determine whether environmentally and ecologically adverse consequences are likely to ensue.

Excavation may encounter contaminated soils or ground water. Such soils may need to be processed or disposed of in a contained disposal facility, which may also have to be capped to meet environmental regulations. Provisions would need to address public health and safety and meet regulatory requirements. The potential impacts on the various environmental components can be avoided through good environmental practices. Wherever avoidance of negative impact has not been possible, appropriate mitigation and enhancement actions will be worked out to effectively offset the environmental damages inflicted due to the project.

Keeping in view the analysis of the alternative options, the construction of link and improvement and widening of the existing road with the proposed design features appear to be the best option.

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5.0 DESCRIPTION OF PROJECT

Describes type & category of project, its objectives location & layout, features of site related to vegetation, project schedule of implementation, and complete description of project related to its process and steps. The restoration plan and its rehabilitation are also mentioned in this chapter.

5.1 OBJECTIVES OF PROJECT

The objectives of the project are to:

- The proposed project route will serve as a partially uninterrupted route for commuters traveling from South- Eastern part of Lahore through Ferozepur Road, Peco Road, Madre-e-Milat Road, Nazaria-e-Pakistan, etc. to Khayaban-e- Jinnah near Kader Topbash Chowk.
- The project is of significant importance, especially for citizens who intend to exit from Ferozepur Road or need access to major parts of Southern Lahore using the above major part of the road.
- The route will be constructed over and along the existing Satukatla Drain, where ample ROW of the drain is available, running across the city.
- The project would provide a significant reduction in the routine traffic jams on major roads of the city which will significantly improve environmental pollution with lesser vehicular emissions on the existing road network.

5.2 LOCATION AND SITE LAYOUT OF THE PROJECT

The construction of the route is a partially controlled route, a four (04) lane dual carriageway, which will result in a partially signal-free flow of traffic by facilitating the commuters intending to travel towards major routes of the southern part of Lahore.

The proposed route will connect Main Ferozepur Road, Peco Road, Madre-e-Milat Road, Nazaria-e-Pakistan, etc. to Khayaban-e-Jinnah near Kader Topbash Chowk. This will primarily serve the areas of Kot Lakhpat, Township, Green Town, Wapda Town, and other highly populated areas of the South Western Part of Lahore. The other features include the construction of entry/exit on major arterials crossing the alignment

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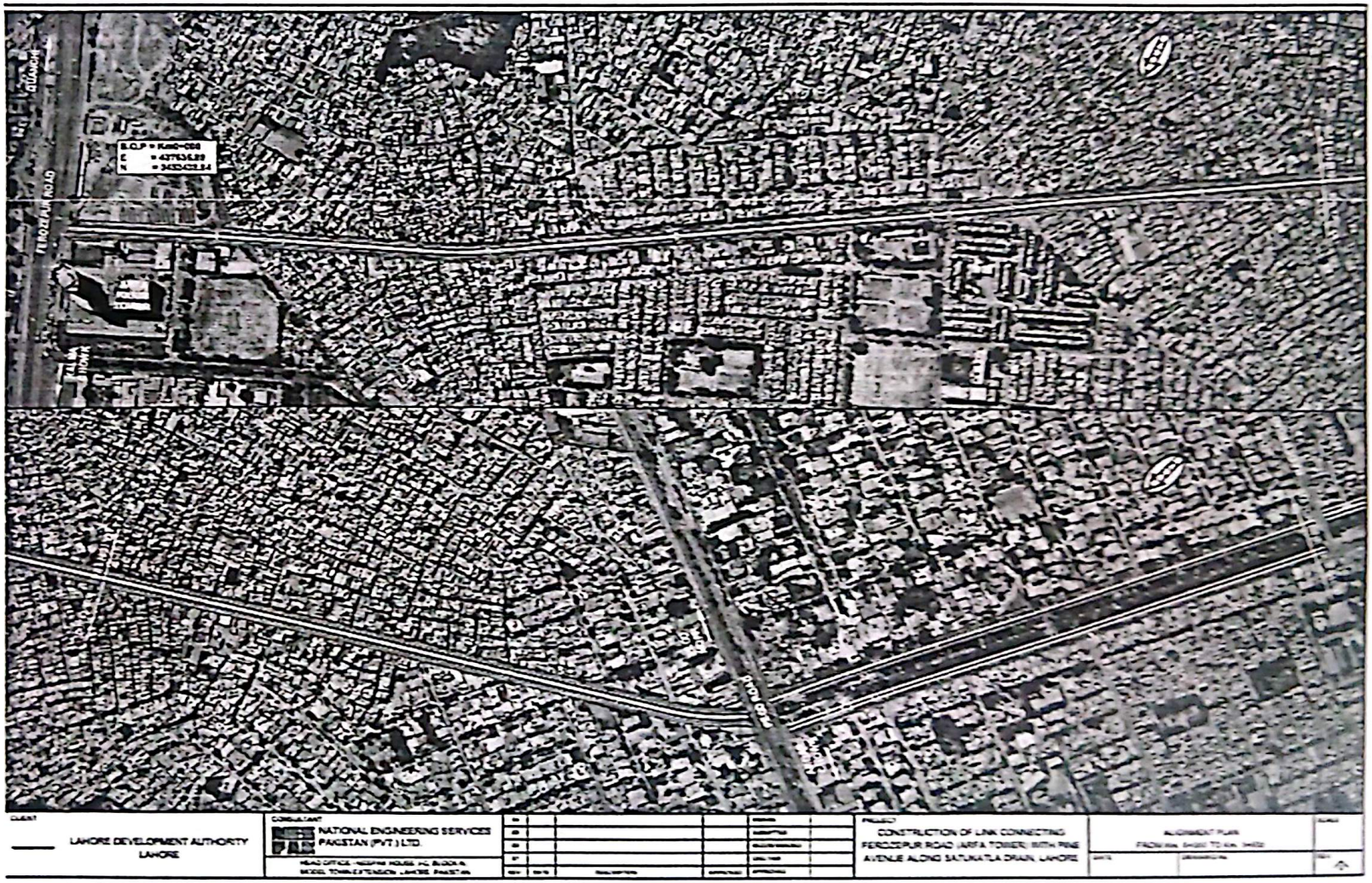


Figure 5-1: Alignment Plan from 0+000 to Km 3+600

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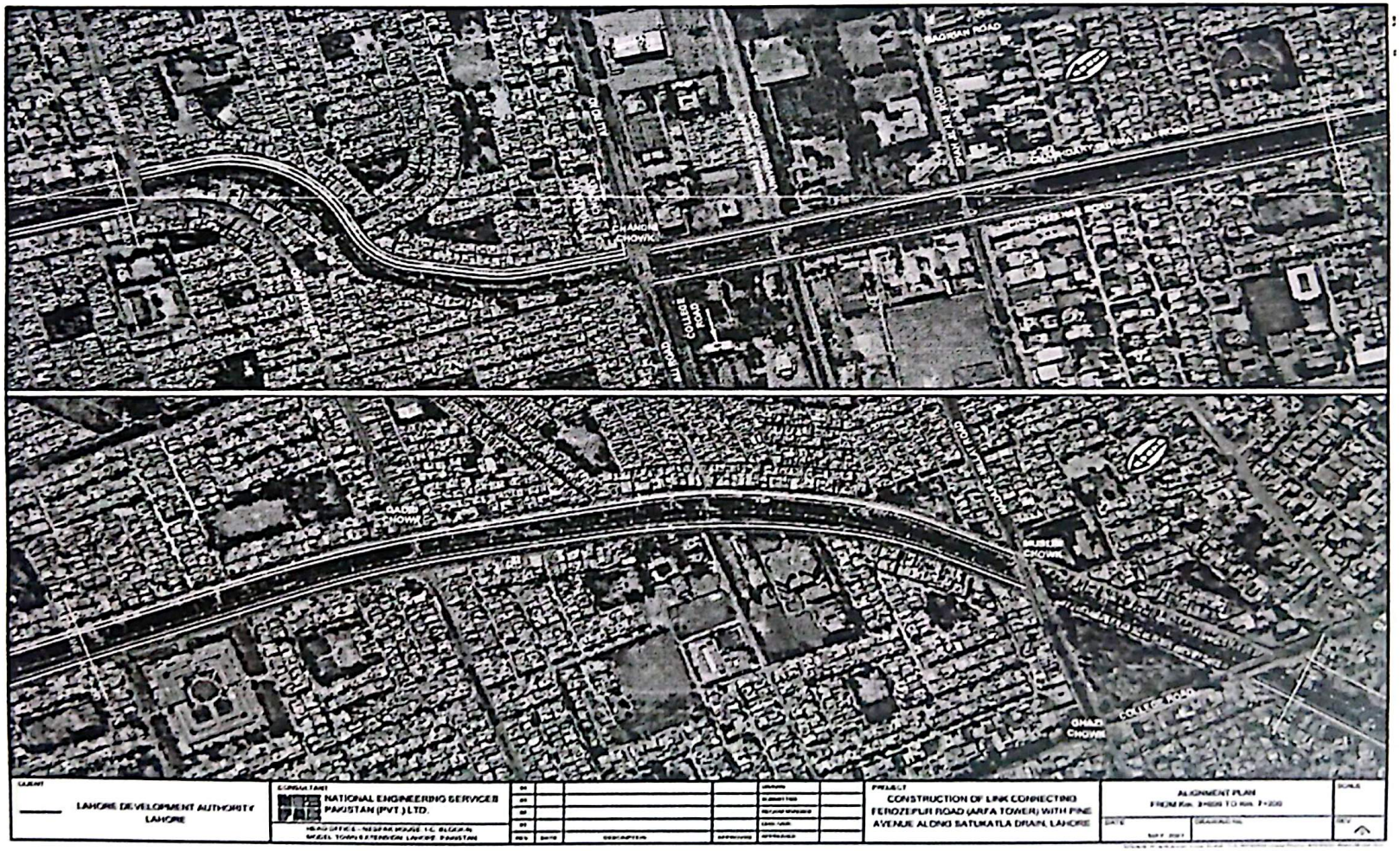


Figure 5-2: Alignment Plan from 3+600 to Km 7+200

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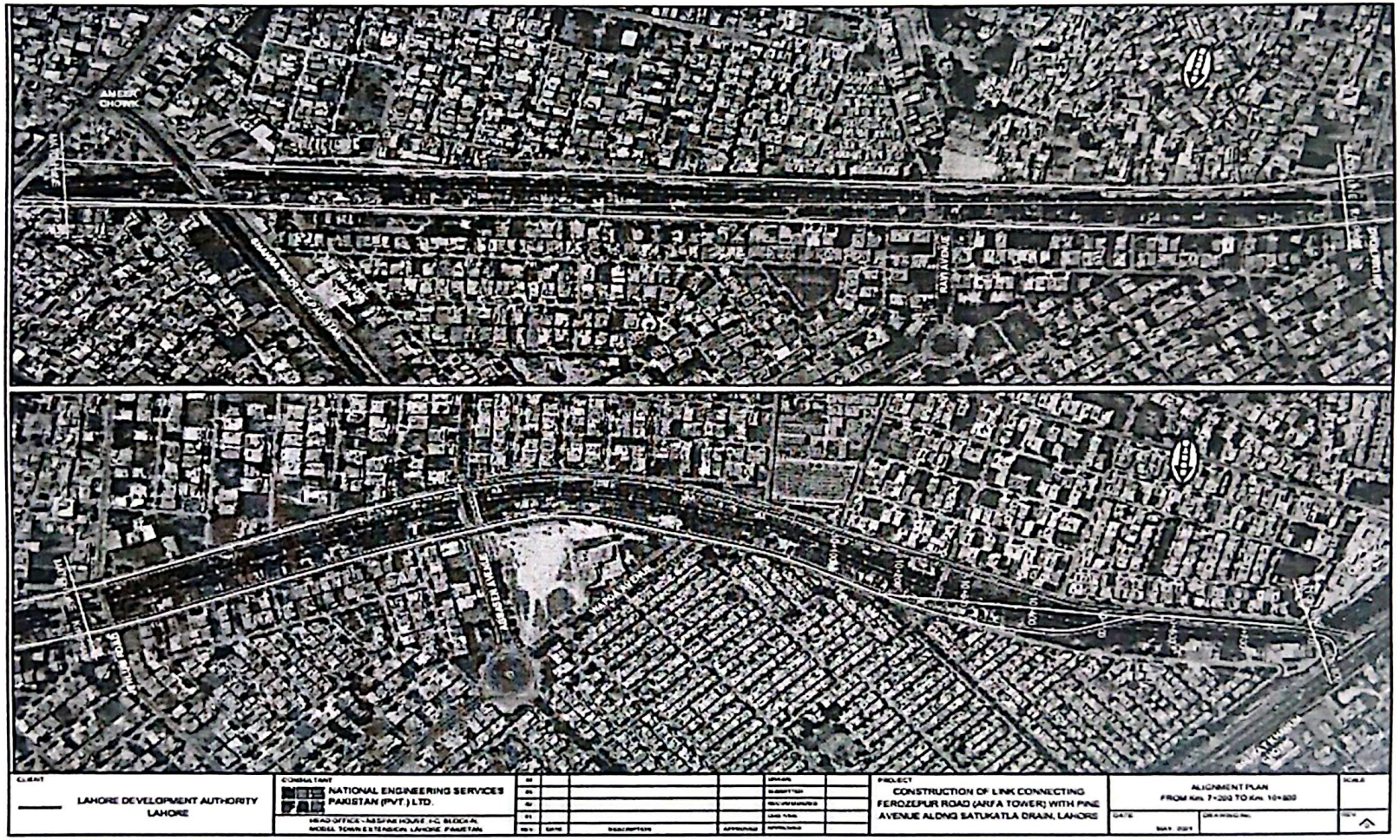


Figure 5-3: Alignment Plan from 7+200 to Km 10+800

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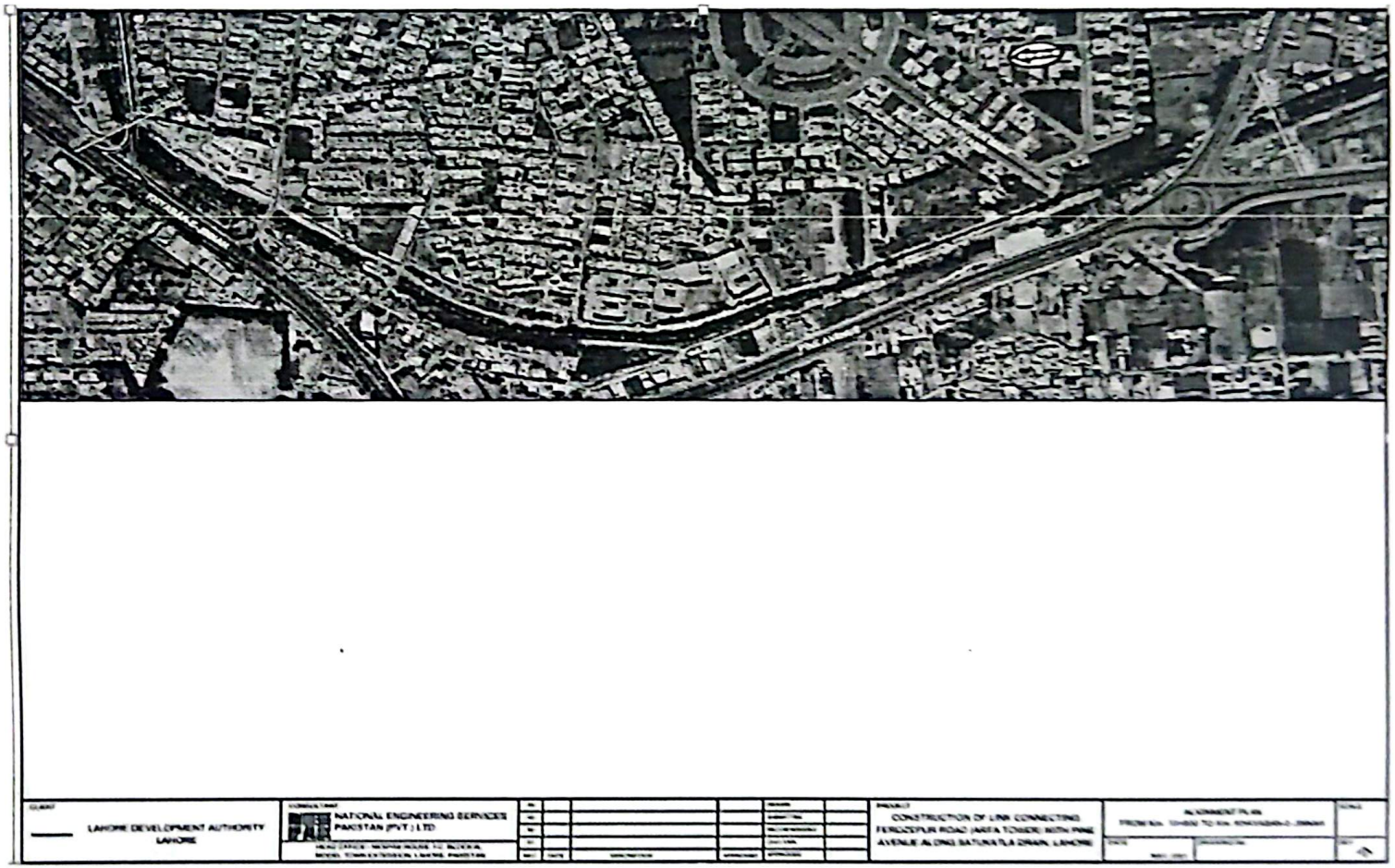


Figure 5-4: Alignment Plan from 10+800 to Km Khyaban-e-Jinnah

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5.3 LAND USE ON THE SITE

5.4 The proposed link is needed to be constructed on the existing road due to the high population and extensive traffic issues in the project area. A team of Consultant experts has visited the site to obtain basic information on the project area. The project would provide a significant reduction in the routine traffic jams at major roads of the city which will significantly improve environmental pollution with lesser vehicular emissions on the existing road network. The land use on the site is explained through photos of the site provided below

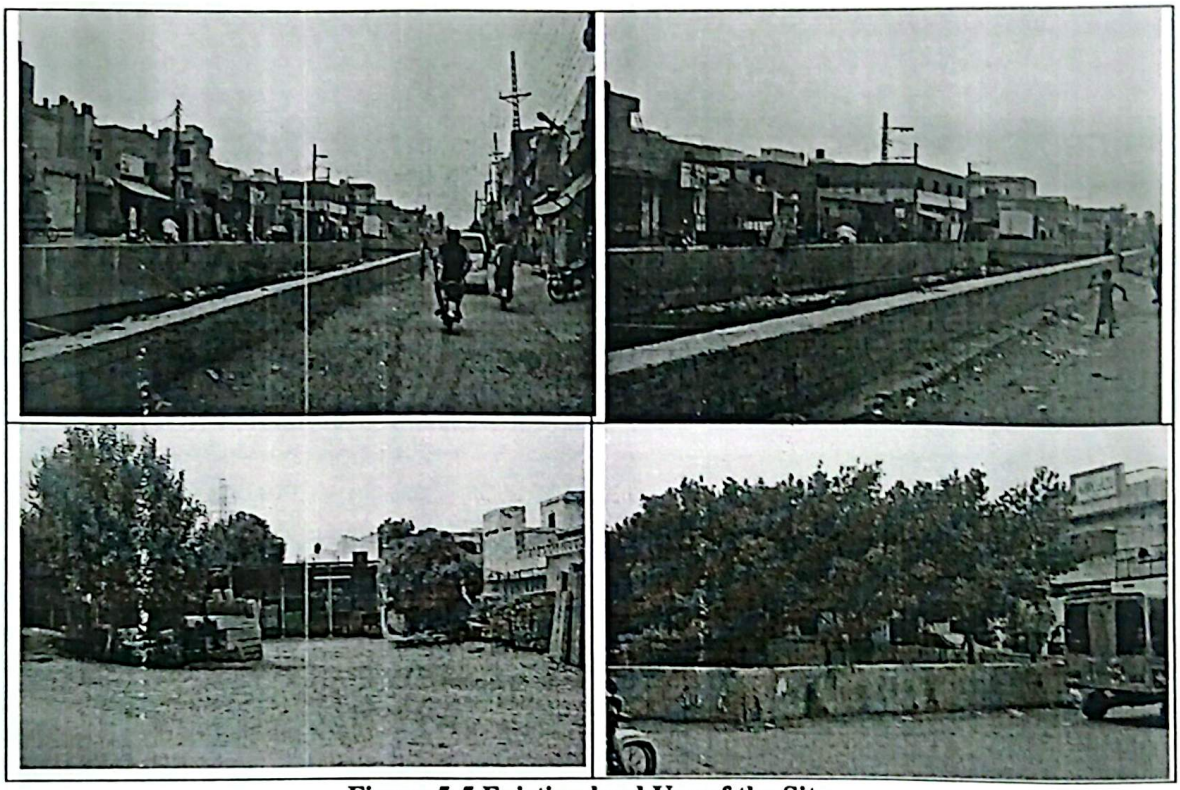


Figure 5-5 Existing land Use of the Site

5.5 LAND ACQUISITION

There will be no land acquired for the proposed project as the Link Connecting Ferozpur Road (Arfa Tower) with Pine Avenue along Satu Katla Drain Lahore will be constructed on already existing road.

5.6 ROAD ACCESS

The construction of link route will connect Main Ferozepur Road, Peco Road, Madre-e-Milat Road, Nazaria-e-Pakistan, etc. to Khayaban-e-Jinnah near Kader Topbash Chowk. This will primarily serve the areas of Kot Lakhpat, Township, Green Town, Wapda Town, and other highly populated areas of South Western Part of Lahore. The other features include the construction of entry/exit on major arterials crossing the alignment.

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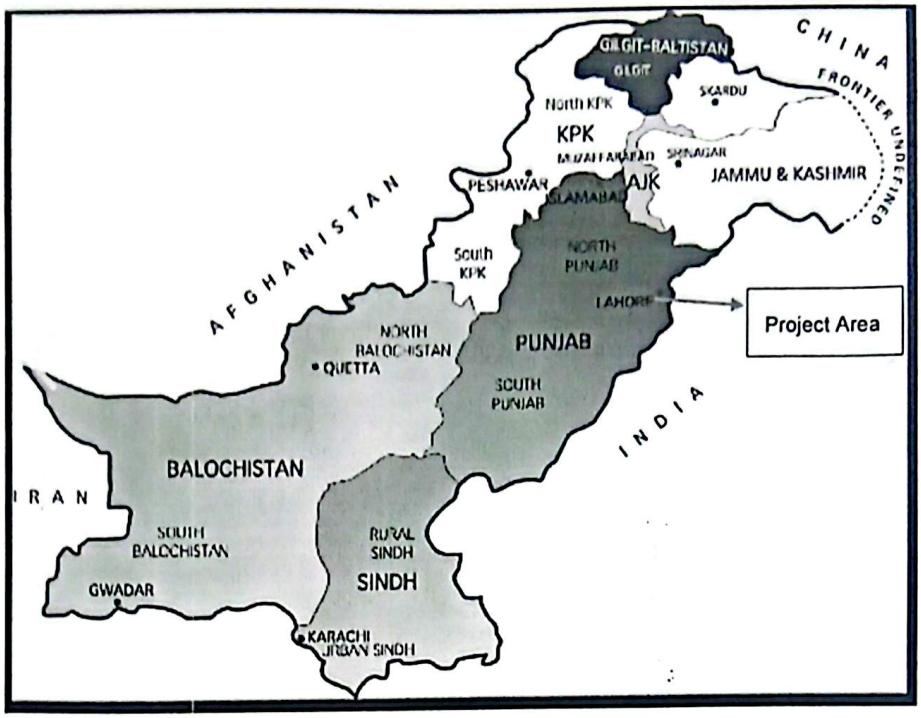


Figure 5-6: Map of Pakistan Locating Project Area

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5.7 VEGETATION FEATURES OF THE SITE

The aim of the proposed project is to rehabilitate and widen the road from Arfa Kareem Tower to Chatri Chowk (Pine Avenue) on both sides of the Satukatla drain. There are many small and large trees present along the Satu Katla drain. But these tress will not be removed. After the completion of the project proper landscaping and tree plantation will be carried out to ensure aesthetic value and avoid soil degradation

5.8 COST AND MAGNITUDE OF OPERATION

The project cost is Rs. 6,780 Million approx. The Project shall be funded by Government of Punjab. The breakup of rough costs, is given below;

Table 5-1: Project Cost Estimate Summary

Sr#	Description	Amount (Rs.)
1.	Earthwork and Allied Activities	168,203,589
2.	Subbase and Base	960,033,736
3.	Surface Courses & Pavement	356,122,596
4.	Structure (Nullah Covering)	3,558,414,886
5.	Drainage & Erosion Works (Open Nullah Re-aligningand protection works)	29,251,518
6.	Drainage & Erosion Works (Re-aligning Nullah BrickWalls)	108,896,009
7.	Ancillary Works	139,040,431
8.	General Items	-
9.	Electrical Works (P.S)	150,000,000
	Total Construction Cost =	5,469,962,765
10.	Contingencies @ 2% of Construction Cost	109,399,255
11.	Rehabilitation of Sewerage System from Sattu katla Disposal station to S Block Model town ExtensionLahore	602,458,590
12.	Shifting of Services (LESCO, SNGPL & PTCL)	150,000,000
13.	Consultancy Charges for Design Services @ 1.2 % ofTotal Construction Cost	65,639,553
14.	Consultancy Charges for Construction Supervision Services @ 2% of Total Construction Cost (Man monthBasis)	109,399,255
15.	5% Punjab Sales Tax (PST)	273,498,138
	Total Project Cost =	6,780,357,557

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5.9 SCHEDULE OF IMPLEMENTATION

The project will be completed in 5 months.

CONSTRUCTION OF LINK CONNECTING FEROZPUR ROAD (ARFA TOWER) WITH PINE AVENUE ALONG SATU KATLA DRAIN LAHORE

IMPLEMENTATION SCHEDULE

SR. NO	DESCRIPTION	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14	WEEK 15	WEEK 16
	CIVIL WORKS																
1	Earthworks																
2	Sub-Base/Base																
3	Surfacing																
4	Structures (Covering of Nullah Portion)																
5	Electrical Works (Road Lighting)																
6	Pavement Markings and Studs																

5.10 PROJECT DESCRIPTION

The provincial highway department estimates around 1265 km of roads in Lahore city. As the capacity of existing roads is getting insufficient to accommodate the rapid growth in terms of several vehicles, it is becoming essential to improve the existing road network to avoid traffic congestion and subsequent delays.

The construction of the route is a partially controlled route, which will result in a partially signal-free flow of traffic by facilitating the commuters intending to travel towards major routes of the southern part of Lahore.

The proposed four (04) lane dual carriageway will connect Main Ferozepur Road, Peco Road, Madre-e-Milat Road, Nazaria-e-Pakistan, etc. to Khayaban-e-Jinnah near Kader Topbash Chowk. This will primarily serve the areas of Kot Lakhpat, Township, Green Town, Wapda Town, and other highly populated areas of the South Western Part of Lahore. The other features include the construction of entry/exit on major arterials crossing the alignment.

The Route will start from Ferozpur Road near Arfa Karim opposite SOS Village and will follow the existing route of Satukatla Drain, thereby running parallel to 2.7 km along this route to reach Peco Road. Entry and exit from the route are provided on Peco Road. The proposed Alignment will then cross Peco Road, a major arterial, and traverse along Drain Passes Township Area. It will then run parallel through the Industrial area and reach Madre-e-Milat Road and then cross. Nazaria-e-Pakistan Avenue. Then it runs parallel to Wapda Town and terminates on Khayaban-e- Jinnah near Kader Topbash Chowk. To

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facilitate the commuters, Entry, and exit have also been proposed on major sub-urban arterials i.e. Peco Road, Madre-e- Milat Road, and other major crossings. The route will be constructed over and along the existing Satukatla Drain, where ample ROW of the drain is available, running across the city.

5.10.1 Economic Justification

A major part of the economic benefits from the project implementation is expected to be in the form of VOC savings. The proposed project will help in reducing traffic jams/congestion. This will result in a reduction in Vehicle Operating Costs (VOC), Vehicle Travel Time (VTT) and at the same time alleviate noise and air pollution up to a certain extent.

VOC Savings (Million Rs.)

Years	Total VOC Savings
2024*	784.98
2034	1195.09
2044	1760.53

Annual travel time costs have been worked out both without and with project conditions and a summary of travel time cost savings to the facility users is given below

VTT Savings (Million Rs.)

Years	Total VTT Savings
2024*	258.88
2034	429.00
2044	724.60

Total project benefits are summarized as under

Total Project Benefits (Million Rs.)

Years	Total Project Benefits
2024*	1043.86
2034	1624.09
2044	2485.13

Results of the Analysis

Economic Indicators	At 12% Discount Rate
- Present Worth of Benefit (Million Rs)	9568.10
- Present Worth of Costs (Million Rs)	5789.05
- Net Present Value (Million Rs)	3779.05
- B/C Ratio	1.65
- EIRR (Percent)	20.37

The results given above indicate that the proposed road is economically viable as the calculated rate of return is well above 12 percent. The project should therefore be implemented as planned.

5.10.2 Sectoral Specific Information

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The Geometric Design of the project is governed by prevalent standard codes for highway design. The Geometric design parameters are given below:

No of Lanes = 2 (either side) with Frontage roads

Lane Width = 3.3 m

Inner Shoulder = 0.3 m

Outer Shoulder = 0.3 m

Median = NJB/Curb

Pavement Structure

Asphaltic Wearing Course = 5 cm

Asphaltic Base Course = 09 cm

Water Bound Macadam = 25 cm

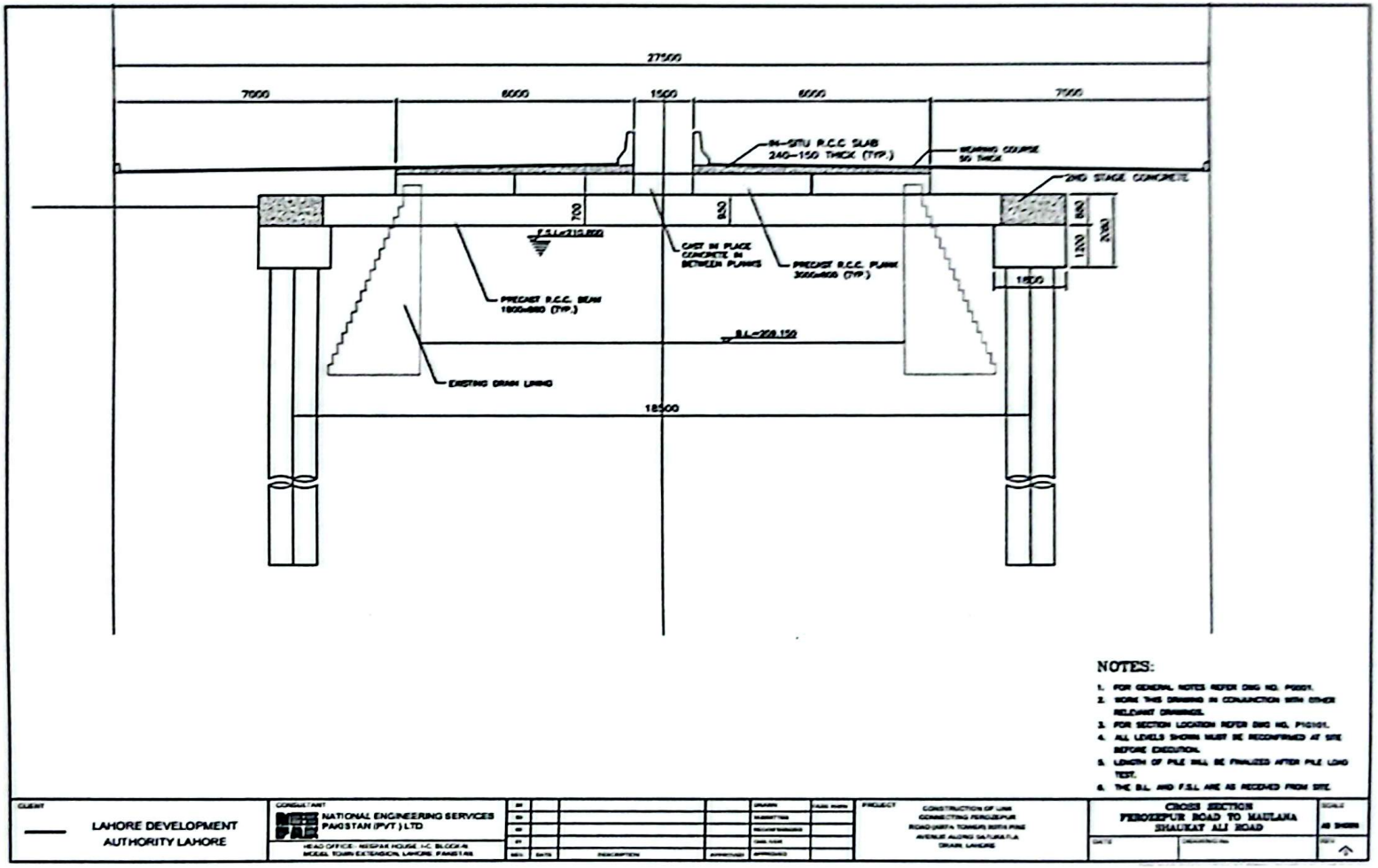
Sub base = 20 cm

Subgrade CBR 8%

5.10.3 Typical Road Cross Section

The Cross Section of the proposed route is given below.

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27500
7000
6000
1500
6000
7000
IN-SITU R.C.C. SLAB
240–150 THICK (TYP.)
WEARING COURSE
50 THICK
2ND STAGE CONCRETE
700
830
830
2700
1200
1500
F.S.L.=215.800
CAST IN PLACE
CONCRETE IN
BETWEEN PLANKS
PRECAST R.C.C. PLANK
PRECAST R.C.C. BEAM
1800x880 (TYP.)
B.L.=208.150
EXISTING DRAIN LINING
18500
NOTES:
1. FOR GENERAL NOTES REFER DWG NO. P0001.
2. WORK THIS DRAWING IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS.
3. FOR SECTION LOCATION REFER DWG NO. P10101.
4. ALL LEVELS SHOWN MUST BE RECONFIRMED AT SITE BEFORE EXECUTION.
5. LENGTH OF PILE WILL BE FINALIZED AFTER PILE LOAD TEST.
6. THE B.L. AND F.S.L ARE AS RECEIVED FROM SITE.
CLIENT
LAHORE DEVELOPMENT AUTHORITY LAHORE
CONSULTANT
NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD
HEAD OFFICE: NESPAK HOUSE, I-C, BLOCK-9, MODEL TOWN EXTENSION, LAHORE, PAKISTAN
PROJECT
CONSTRUCTION OF LINK CONNECTING FEROZEPUR ROAD (ARFA TOWER) WITH PINE AVENUE ALONG SATU KATLA DRAIN, LAHORE
CROSS SECTION
FEROZEPUR ROAD TO MAULANA SHAUKAT ALI ROAD
SCALE
AS SHOWN

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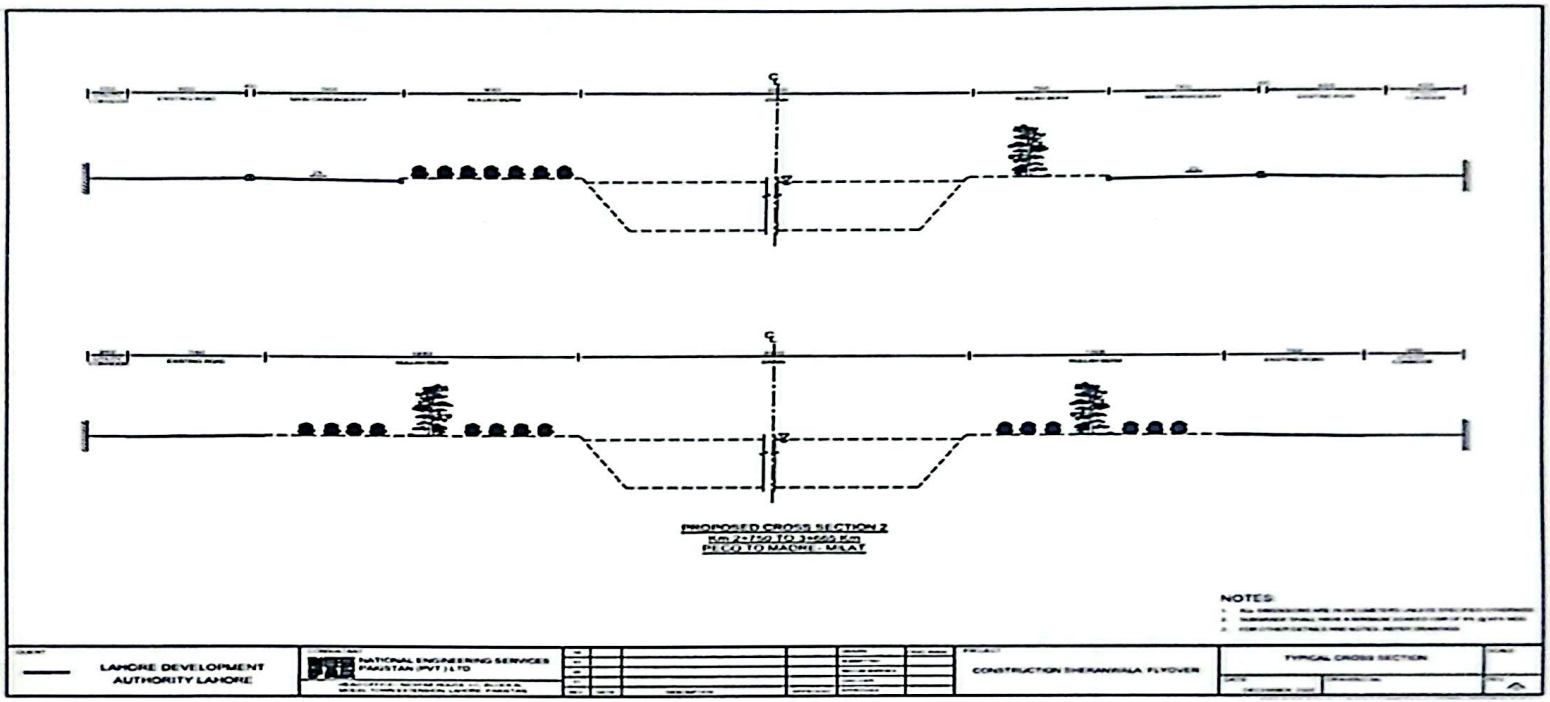


Figure – 5-7: Typical Cross Section

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5.10.4 Construction Camp

Campsites will be selected keeping in view the availability of adequate areas for establishing campsites, asphalt, and batching plant site, including parking areas for machinery, stores, and workshops, access to local markets, and an appropriate distance from sensitive areas in the vicinity. The area requirement for construction camps will depend upon the deployed manpower and the type and quantity of machinery mobilized. Because of the area required, the contractors will have to acquire land on lease from private landowners, unless the appropriate area would not be possible to locate campsites within the ROW. Keeping in view the following criteria guidelines, the Contractor has to identify the construction camp sites before the start of the construction activities

- There should be no resettlement issue for the location of the camps;
- The campsite should be away from residential areas and sensitive receptors;
- Selection of sites for construction camps shall be near the project area having proper access to the nearby main link road;
- The camps must be located in a place where the drainage from and through the camps will not threaten any domestic or public water supply;
- Campsite must be adequate in size to prevent overcrowding of necessary structures;
- The campsite should consider avoiding any damage to property, vegetation, irrigation, and drinking water supply systems;
- The campsite must not be subject to periodic flooding; and
- There should not be any ecologically sensitive areas e.g. wildlife sanctuaries, game reserves, national parks, forest areas, etc. near the construction camp.
- Detail of camp establishment and its management is attached in annexure

5.10.5 Construction Equipment

The List of Machinery and Equipment required for the proposed project is provided in Table 5-2.

Table 5-2: Machinery and Equipment Required for Project

Sr. No.	Machinery & Equipment
1.	Dump Truck
2.	Front End Loader
3.	Dozer
4.	Grader
5.	Vibratory Roller
6.	Water Tanker

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Sr. No.	Machinery & Equipment
7.	Aggregate Spreader
8.	Three Wheel Rollers
9.	Asphalt Plant
10.	Paver
11.	Asphalt Distributor
12.	Batching Plant
13.	Concrete Transit Truck
14.	Concrete Pump
15.	Excavator
16.	Water Pump
17.	Cranes
18.	Vibrator
19.	Generator
20.	Concrete Mixer

5.10.6 Management Structure and Manpower Requirements

The manpower required during the construction and operation of the proposed highway is presented in the table given below: LDA staff shall ensure quality as per standards

Table 5-3 Manpower during Administrative Implementation of the Project

SR #	Posts	Designation	Job Description	Qualifications	Skills	Experience
1	1	DG, LDA	Administration	PAS	Administrative	20
2	1	CE-1, LDA	Engineering	Engineering	Engineering	30

Table 5-4 Manpower during Execution and Operations of the Project

SR #	Posts	Designation	Job Description	Qualifications	Skills	Experience
1	1	DG, LDA	Administration	PAS	Administrative	20
2	1	CE-1, LDA	Engineering	Engineering	Engineering	30

5.10.7 Machinery Maintenance and Equipment Yards

Machinery and equipment yards will be sited near work camps. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled

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and will have a gate provided with ample security staff the work base machinery and equipment yard will be provided. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and will have a gate provided with ample security staff.

5.10.8 Material Depots

Near work bases material depots will be required for storing construction materials. They will include temporary sheds for storing cement, steel, and asphalt and open space for storing stones, shingles, and bricks. The material depots will be walled and the gate will be provided with ample security. A storekeeper will keep account of incoming and outgoing material.

5.10.9 Machinery Repair Workshops

With a large number of vehicles and other similar machinery, a repair workshop is essential. The contractor may establish their workshop.

5.10.10 Approach to Work Bases

Since work bases will be established close to the road sections under can provide easy access to them. Public or private land (with the consent of the owner and/or locals) can be used for providing supplementary access roads and paths to work bases.

5.10.11 Camp Offices

Adjacent to labor camps and to work bases, the contractor will be allowed to set up a camp office to run his day-to-day field affairs. For that, the public or private land can be used by the contractor.

5.10.12 Security Arrangements

Given the prevailing field condition, security staff is necessary. Enough security will be required at the Work Base, Labor Camp, Material Store, Equipment Yards, and location of the work in progress on the work site. Coordination will be necessary with nearby law enforcement agencies.

5.10.13 Health Care

With a large number of laborers and employees working on the project of road construction, minor accidents are expected to take place on all construction sites. A dispensary will be set up by the contractor. For major cases, the patients will be shifted to the District Hospital under a pre-coordinated arrangement.

5.10.14 Labor Reporting Office

Along the road and in work bases special areas will be marked where the labor can gather at the time of pick and drop, emergency, or briefing. Those places will be marked and kept open and clean and as per requirement equipped with a public address system.

5.10.15 Labor Transport

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Almost all of the unskilled labor will be employed from local sources. A contractor will provide vehicle(s), to pick up and drop local labor every day. This will also keep the camps less pressurized and more manageable

5.10.16 Work Uniform and Health Safety Equipment

Road construction is a special job and the labor working on such work requires special protective uniforms and special HSE measures. It will be ensured that the labor engaged in breaking stones, handling bricks, mixing concrete, or mixing and laying asphalt will have long boots, overall dresses, goggles, gloves, ear mufflers, Safety Jackets, safety hats, etc. As an overall HSE measure, all construction workers and anyone going into the construction area will use the necessary PPEs.

5.10.17 Signage

During construction suitable signboards and traffic signs will be displayed on the construction site in particular and on the entire road length in general. This will help in forestalling any possible accidents.

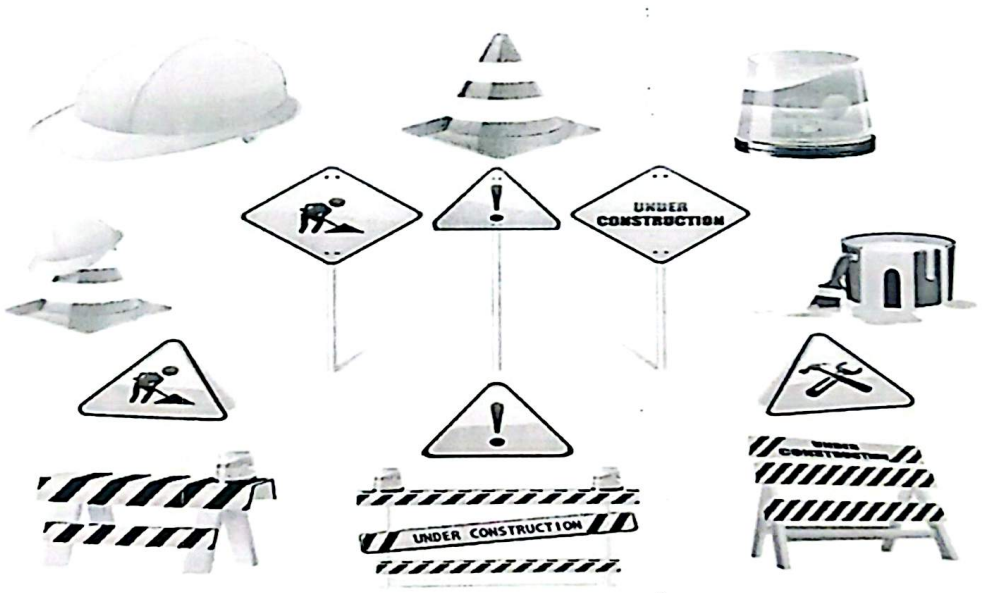


Figure – 8 1: Road Safety Signs

5.10.18 Lighting and Illumination

Suitable lighting arrangements will be made by the contractor over all work base, work sites, camp site, machinery yard, and material depots. This can help the contractor with extended working hours as well as security. If a local electric supply is not available, electricity generators will have to be arranged in all spots where lighting is required.

5.10.19 Environmental Training

Capacity building can be achieved through on–the–job training, short–courses, training workshops, lectures, educational visits, and seminars. Such interactions include leading

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team members of LDA, EPA, consultants, construction managers/supervisors, and other related agencies on road-related environmental issues.

5.10.20 Awareness Raising

Awareness about roads related current and potential environmental threats for the public at large and roadside dwellers, in particular, requires due attention; the aspect neglected in the past. Enhanced education in road-related environmental issues and awareness raising can be achieved through campaigns by; Visual graphics, Print media, Seminars & workshops.

5.11 TRAFFIC ANALYSIS

The main objective of traffic studies is to assess the volumes and composition of traffic load likely to use Road from Arfa Kareem Tower (SMA Hai Road) to Chatri Chowk (Pine Avenue) along Satukatla drain.

5.11.1 Scope of the project

The project aims to rehabilitate and widen the road from Arfa Kareem Tower to Chatri Chowk (Pine Avenue) on both sides of the Satukatla drain. This will enhance the quality of road and alleviate traffic issues along the Satukatla drain.

5.11.2 Traffic Volume on Project Road

In order to assess the traffic volumes on the project road, traffic counting survey was carried out on the existing road. Table 5.5 shows the existing classified two-way daily traffic volume observed on the road. Table 5.6 shows the two-way peak hour volume observed on the road

Table 5-5 Two-Way Daily Traffic (VPD) for Year 2023

Vehicle Mode	Two-way VPD (Year 2023)
Motor Cycle	31,167
Rickshaw	7,685
Car/Jeep/Taxi/Pickup	16,041
Hiace Wagon	574
Mini Bus	308
Bus	201
Loader Pickup	496
Truck 2-axle	509
Truck 3-axle	27
Truck 4-axle	0

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Truck 5-axle	1
Tractor Trolley	31
Total	**57,013**

Table 5-6 Two-way Peak hour traffic (VPH) for year 2023

Vehicle Mode	Two-way VPH (Year 2023)
Motor Cycle	2,182
Rickshaw	538
Car/Jeep/Taxi/Pickup	1,123
Hiace Wagon	40
Mini Bus	22
Bus	14
Loader Pickup	35
Truck 2-axle	36
Truck 3-axle	2
Truck 4-axle	0
Truck 5-axle	0
Tractor Trolley	2
Total	**3,994**

5.11.3 Capacity Analysis

Passenger Car Units (PCUs)

Capacity of the road (from Arfa Kareem tower to Pine Avenue) was analyzed using Highway Capacity Software (HCS) for present traffic volumes. The capacity analysis for the road from Arfa Kareem tower to Pine Avenue was performed separately for two scenarios. In the first scenario, the analysis was based on the present peak hour's Passenger Car Units per hour per direction on a median separated single carriageway. In the second scenario, the analysis performed on both the present as well future peak hour's Passenger Car Units per hour per direction on a 2-lanes dual carriageway. Assuming 72 kph (45 mph) as Free Flow Speed (FFS) in HCS software. Table 5.7 shows the results of this capacity analysis.

.Table 5-7 Two-way Peak hour traffic (VPH) for year 2023

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	Present Peak hour Passenger Cars Per Hour Per Direction (Pc / Hour / Dir)	LOS (year 2023)	Future Peak hour Passenger Cars Per Hour Per Direction (Pc / Hour / Dir)	LOS (year 2033)
Median separated single carriage way	1552	D	Nil	Nil
2-Lane dual carriageway	776	B	995	C

Above Table Shows that LOS (2023) for 2-Lanes dual carriageway is B for year2023 and LOS (2033) is C

5.12 RESTORATION/REHABILITATION AT THE END OF PROJECT LIFE

There will be no matter of rehabilitation as the proposed project is already road. There will not be any let regarding safety factors as applicable from time to time for such projects on all accounts. However, at the end of the life of the road it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time take all safety precautions to protect human life and property around the project site.

Debris or any other wastes resulting from demolishing will be disposed of in an environmentally sustainable fashion. The materials capable of recycling/reuse will be either sold in the market or to be reused for other suitable purposes.

After completion; all construction matrix, debris, and garbage will be removed immediately from the site within the minimum possible time under safe conditions. Any minor spillover of these materials will be cleared adequately. The land, if and where pitted will be adequately leveled. On the whole, the project site and the area in its near vicinity will be made neat and clean. This guideline discusses factors influencing successful site rehabilitation and restoration of disturbed areas.

5.12.1 Site Rehabilitation

Site rehabilitation should ensure that all disturbed areas caused by construction and maintenance activities are restored, leaving a stable environment that is conducive to the establishment of landscapes characteristic to the area.

5.12.2 Rehabilitation Hierarchy

In developing the rehabilitation objectives, indicators and completion criteria for the borrow pits and access roads, the following hierarchy has been used to prevent or minimize environmental harm:

- Avoid disturbance that will require rehabilitation

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- Reinstate land to pre-disturbance condition as closely as reasonable and feasible, to facilitate pre-disturbance land use, or otherwise as agreed with the landholder
- Propose lower value land use as required and as agreed with the landholder.

5.12.3 Rehabilitation Objectives

The objectives of this rehabilitation strategy are to:

- Ensure a final landform is produced that is safe, stable and non-polluting, as well as free draining and compatible with the post construction phase land use
- Ensure topsoil and subsoil are managed to conserve the seedbank, nutrients, and to encourage the establishment of proposed revegetation
- Ensure that disturbed areas are to be rehabilitated as close as reasonably practicable to their pre-disturbance condition or otherwise as agreed with the landholder □ ensure that rehabilitation works comply with and are undertaken as per relevant regulatory requirements
- Establish a set of indicators and a rehabilitation monitoring program to ensure successful rehabilitation
- Establish agreed criteria where rehabilitation is deemed successful by relevant authorities and key stakeholders

5.12.4 Restoration

Restoration aims to get a seed mix that will provide an initial protective canopy cover using short-lived annual grasses backed up by grass species that are likely to be durable and persistent. It is an important component since vegetation acts to reduce dust and wind erosion, suppress weed infestations and provide protection to exposed surfaces from raindrop impacts and erosion processes.

5.12.5 Monitoring

To achieve continuous improvement and ensure the activities specified in contracts are being adhered to, regular monitoring should be undertaken with emphasis placed on the continuity between site characteristics and the adjacent landscapes.

5.12.6 Rehabilitation of Affected Areas

Rehabilitation should be done in accordance with the site's Environmental Management Plan (Construction and Maintenance). There are many areas affected by road construction and maintenance activities that require rehabilitation, the major areas being borrow pits, stockpile sites, campsites, and sidetracks.

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6.0 DESCRIPTION OF ENVIRONMENT

This chapter describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other agencies namely the Health Department, Irrigation Department, Meteorological Department, Forest offices, and prevailing environmental laws and environmental quality standards etc.

6.1 STUDY AREA

For an EIA study, it is imperative to delineate the area where the potentially significant impacts of the proposed Project are envisaged. The Study Area is the area within which the potentially significant adverse environmental and social impacts of the proposed intervention are envisaged. In light of this, potential impacts on the existing environment have to be considered in a larger geographical area than the proposed "Project Area" depending upon the extent of direct/indirect impacts.

In the criteria, critical parameters of physical (wind direction and speed, topography), ecological, and social (location of settlements, other receptors, and existing land use resources) domains of the environment for the proposed Project have been considered. Study Area includes the actual proposed Project boundary or the area which is considered to be acquired for the Project, as well as the area in the surroundings in which potential adverse impacts may be foreseen due to the implementation of the proposed Project like the location of construction camp, residential and nonresidential buildings, workshops, etc.

6.2 PHYSICAL RESOURCES

6.2.1 Topography

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The district of Lahore is divided into two parts. The low-lying alluvial soil is along the Ravi River and the upland in the east. Upland is a plain slope from northeast to southwest. The lowlands are generally inundated during the monsoon season by the Ravi River, flowing in the west of the district along its boundary with district Sheikhupura. Figure 6.1 represents the topography of the area.

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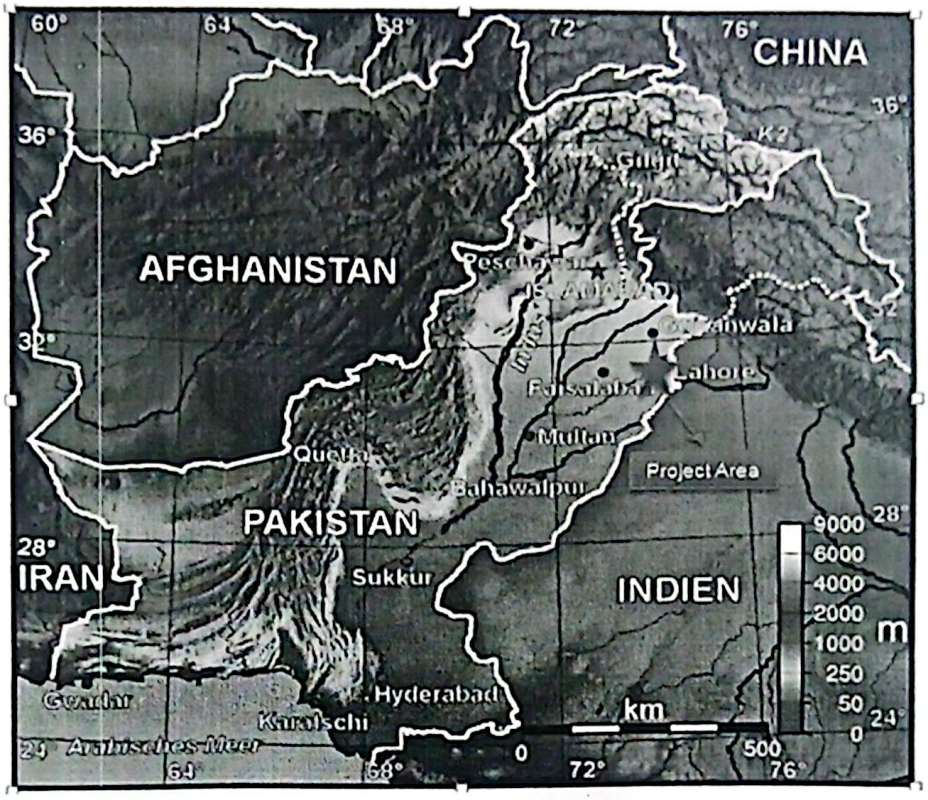


Figure 6-1 Topographic Map of the Study Area

6.2.2 Soil

The soil is different and generally inclined to be dry. However, it is rich in potential plant nutrients. Rainfall is low and groundwater is saline and brackish at the shallow depth and irrigation is largely dependent on the canals. The chemical quality of groundwater in the district varies with depth. However, the sweet potable water is available in a belt five to twenty miles wide paralleling the Ravi River.

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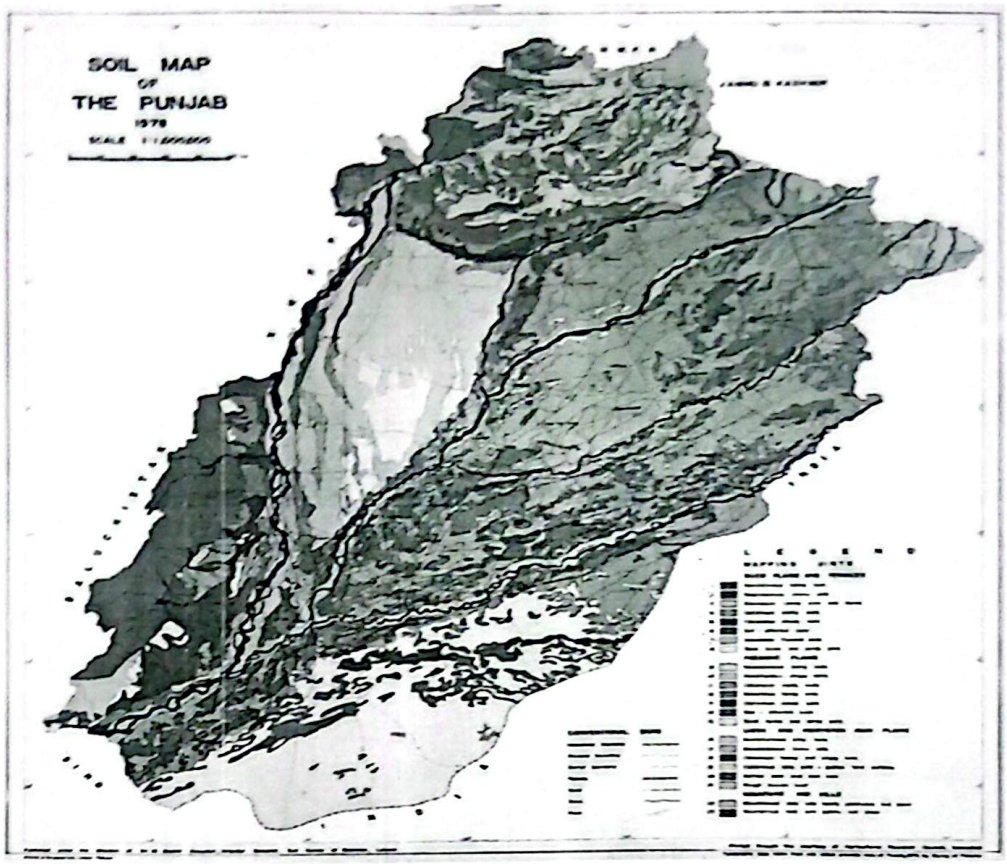


Figure 6-2: Soil Map of Punjab

Alluvium is soil or sediments deposited by a river or other running water. The alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas, where more particles are dropped, are called alluvial or floodplains, and the dropped particles are called alluvium.

6.2.3 Climate and Meteorology

Seasonal climatic conditions must be considered for the design and execution of the Project. The climate including air, temperature, precipitation, humidity, and evaporation is an influencing factor, affecting the construction of the plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered. The Project Area has an extreme climate: it has hot summers and cold winters. The summer starts in April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months.

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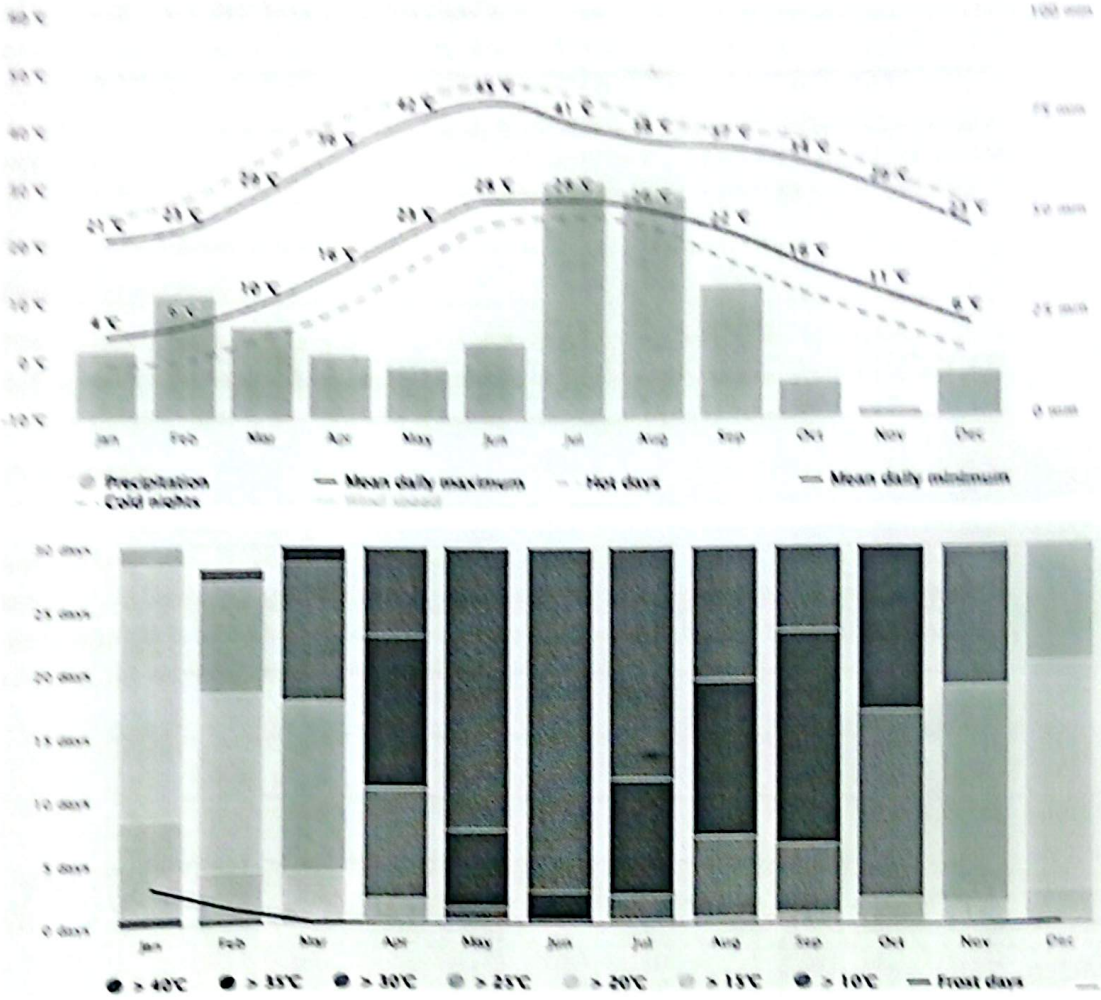


Figure 6-3 Temperature profile of Lahore[1]

The winter season lasts from November to March. December, January, and February are the coldest months. The mean maximum and mean minimum temperature ranges from 19.8°C to 5.9°C in January. Temperatures in the Project Area vary from 5.9 °C to 40.4 °C.

6.2.3.1 Pre-Monsoon Season

Pre-monsoon refers to the period from April to June before the setting in of the monsoon. This is the hottest and the driest season, with persistent dry and hot winds. The daytime temperature rises to 40° C. The flows in the river begin to rise simultaneously due to snow-melt water in the high mountains. The water table falls to the maximum depth

6.2.3.2 Monsoon Season

Monsoon is the main rainy period, which starts at the beginning of July, reaches its climax in August, and gradually, subsides in September. High-intensity Rainfall causes soil

[1] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/lahore_pakistan_1172451

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erosion which is a function of erosivity and erodibility. The cool monsoon winds followed by heavy showers lower the temperature to a great extent. The part of rain percolates into the soil and is conserved in the subsoil and the part ads to the groundwater. The conserved moisture in the soils is generally sufficient to rejuvenate the vegetation. All plants grow rapidly and mature towards the end of the season. With the start of the monsoon season, the rivers flow at their peak level. The groundwater level is improved toward the end of the season in September and October.

6.2.3.3 Post-Monsoon Season

Post-monsoon season refers to autumn (October-November). The temperature starts falling but the extreme aridity prevents plants to flower early and sets seed toward mid-season. Groundwater level rises as a result of infiltration from rainfall.

6.2.3.4 Precipitation

In Lahore, precipitation amounts to 630 millimeters (24.8 inches) per year: so, it is at an intermediate level. It ranges from 4 mm (0.2 in) in the driest month (November) to 200 mm (7.9 in) in the wettest one (July). The precipitation diagram for Lahore shows how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated

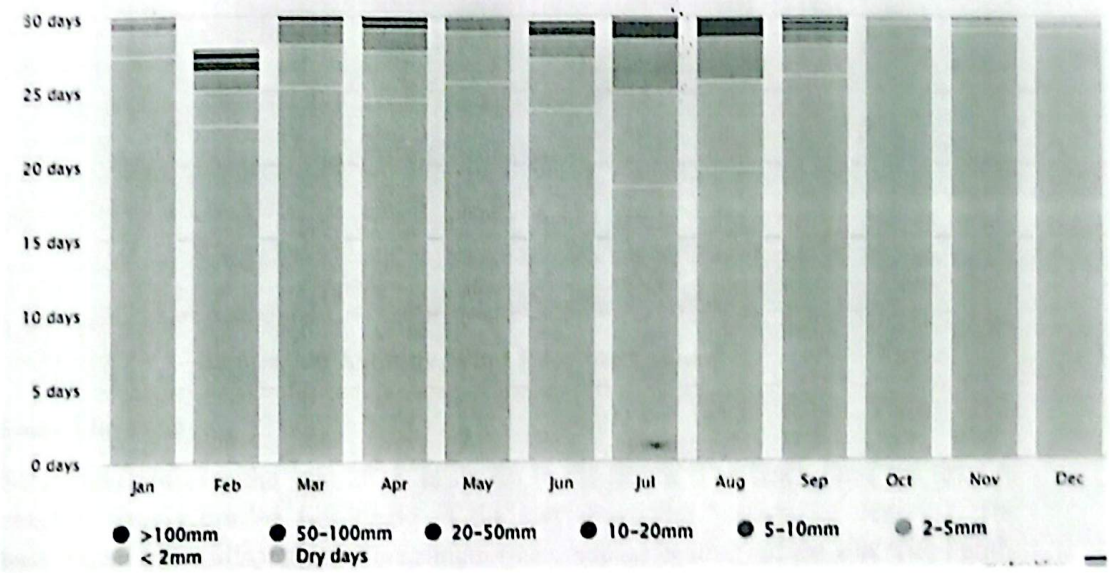


Figure 6-4 Precipitation Amount of Lahore

6.2.3.5 Winter Season

Winter refers to the period from December to January. The lowest temperatures (< 20C) and cold winds characterize this season. The plants become dormant and most of them dry out. Most of the trees shed their leaves and few remain green or partly green. Sometimes this season becomes severe due to cold Siberian winds. Groundwater level declines in this season due to low flows in the rivers and no or little rains which usually fall in light showers causing little soil erosion.

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6.2.3.6 Spring Season

Spring refers to the period from February to March. Temperatures become pleasant. The mean maximum temperature is 27oC with the highest precipitation of 41.2 mm and relative humidity of 57.6 percent. Some light showers of rain may also fall without generating runoff. The vegetation sprouts again because of conserved moisture from winter and spring rains, if any. The water table starts falling

In winter (November-February) the predominant direction is West and North West, in summer (March-June) the predominant direction is South-East while in Monsoon/ summer season (July-October) the predominant direction is South East. A seasonal-wise wind rose indicating wind direction and speed is shown in the following Figures

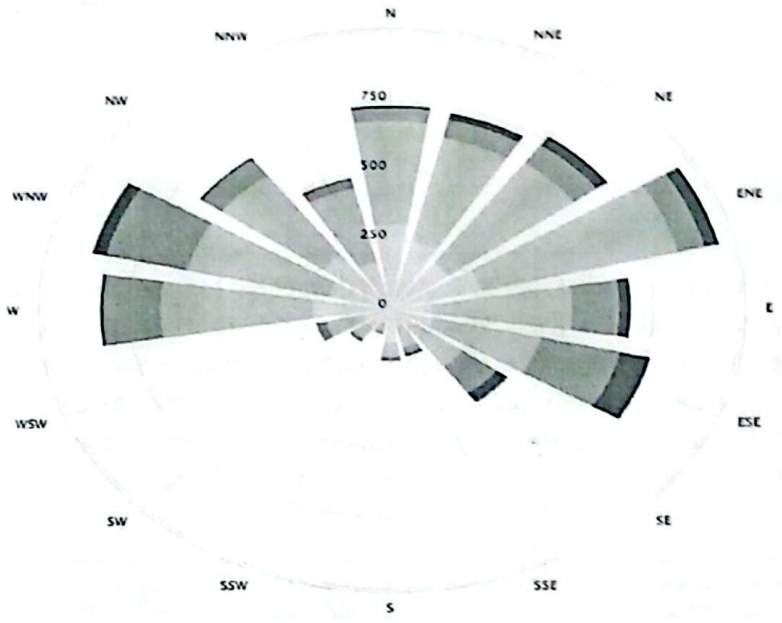


Figure 6-5 Average Wind Rose for Lahore[2]

6.2.3.7 Solar Elevation

Solar elevation over the year 2022, is shown in the figure. The black lines are lines of constant solar elevation (the angle of the sun above the horizon, in degrees). The background color fills indicate the azimuth (the compass bearing) of the sun. The lightly tinted areas at the boundaries of the cardinal compass points indicate the implied intermediate directions (northeast, southeast, southwest, and northwest).

[2] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/lahore_pakistan_1172451

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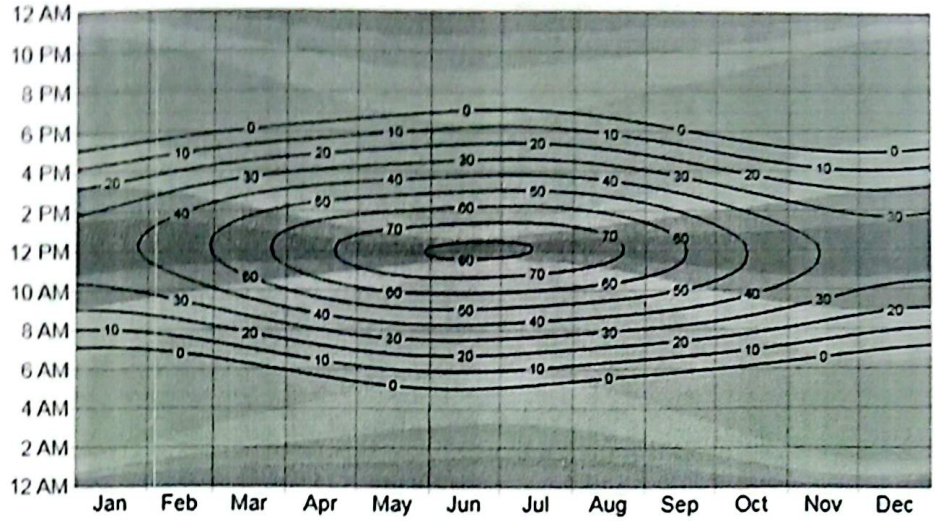


Figure 6-6 Solar Elevation Profile of Lahore

6.2.4 Surface Water & Ground Water

Hydrology

The Lahore division is a part of the Punjab Province of Pakistan. Geologically, this area is a part of the lower Indus Basin. The name "Punjab" itself is indicative of the healthy presence and importance of rivers in this area. The word "**Punjab**" comes from 'Punj-aab' meaning five rivers. The five rivers of Punjab were Sutlej, Bias, Ravi, Jhelum, and Chenab Rivers. It is to be noted here that the Bias River has discontinued flowing in Pakistan, as discussed later. This blessing has resulted in cultivation on the mast part of the land in Punjab.

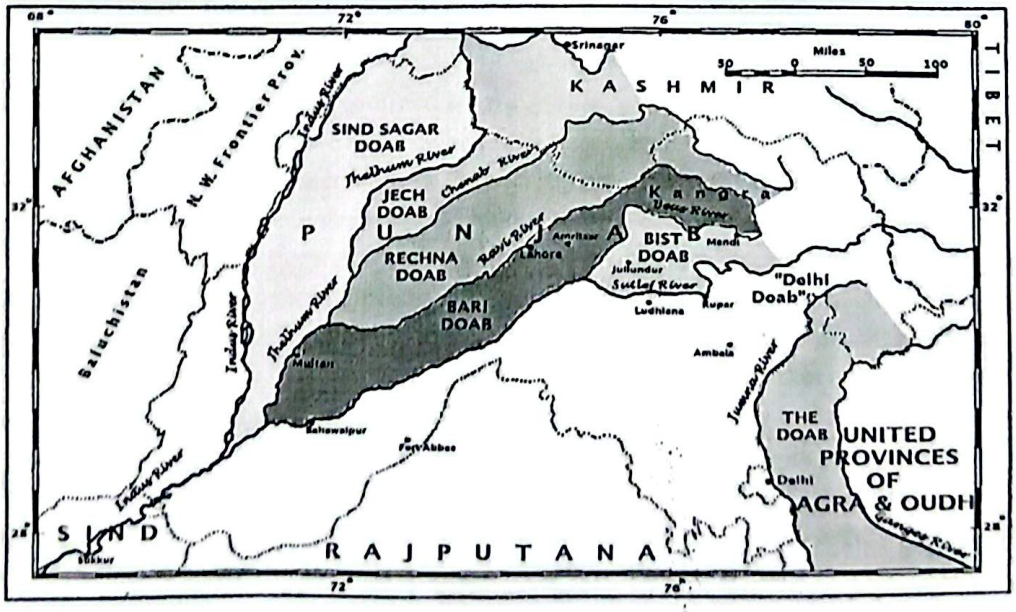


Figure 6-7 Watershed of Punjab

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The only river that passes from Lahore is the Ravi River. The slope of the land in the planned area is to the southwest, which directs the rivers to flow in this path. The average slope of the area is 0.32m/km. Ravi has a major contribution to the glorious history of the study area. All the "historical assets" of Lahore, including but not limited to Lahore Fort, Badshahi Mosque, and Kamran ki Baradari, were built adjacent to the Ravi River.

As per the Indus basin treaty of 1960, six major rivers were divided between Pakistan and India. As per the treaty, the rights of Eastern Rivers (Sutlej, Bias, and Ravi) were allocated to India, while the rights of Western Rivers (Chenab, Jehlum, and Indus) were reserved with Pakistan. Since the Indus Basin treaty, India has completed a series of structures to store and divert water from upstream and use it for the generation of electricity and irrigation. These interventions have put a stop to ecological and sustainable flows in these rivers, thereby depriving the downstream areas of Pakistan, including Lahore of naturally available water for irrigation. The Ravi allocated to India, still flows seasonally through the study area while the Bias River has discontinued flowing. Furthermore, the planned area has an abundance of water in the form of a groundwater aquifer. The aquifer of Lahore District is broadly viewed as a single contiguous, unconfined aquifer. The presence of alluvial soil, frequent flooding, and excessive rains in this region for hundreds of years have enriched this aquifer with an abundance of water.

Surface Water

No rivers exist in the vicinity; however, stormwater drains cross the route for disposal into the Ravi River. Water from River Ravi, flowing on the northwestern side of the city of Lahore, is being used for other purposes other than drinking purposes. River Ravi receives almost all the municipal/ industrial wastes from the city of Lahore. The potential value as a recreational water body and breeding place for fish is threatened by municipal and industrial pollution.

Groundwater

Groundwater quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria-free. The status of the quality of groundwater both in the country and Punjab Province is shown in the figure. The water quality in the upper 50 meters zone of the subsoil is generally brackish. For the city's drinking purposes water is abstracted from the groundwater aquifer using tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of the city population is consuming groundwater for drinking purposes. Groundwater is available at a depth ranging between 15 to 23m below the natural surface level. According to Master Plan-2030 for the city of Lahore, the mean average decline in groundwater is about 2.03 feet per year. The water table contour map for the Year-2000 is exhibited in Figure 6.9. It is noted from the exhibit that groundwater is at a greater depth in the central part of the city where abstraction is more than the recharge and close to surface waters i.e. Ravi River and Canal, the situation is in the reverse order.

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6.2.5 Geology

The geological history of Lahore along with that of the Punjab is linked with the uplift of the Himalayas in the Tertiary times, where a subsiding through a fore deep was formed adjoining the mountains. The alluvium mostly derived from the Himalayan ranges has been deposited in the Punjab geosynclines by the present and the ancestral tributaries of the Indus river system. The exposed Lahore alluvial complex of Pleistocene and recent age represents the latest phase of sedimentation and subsidence. Nearly all the deposits underlying the city of Lahore and the surrounding area are the products of events that evolved during the Pleistocene and recent geological times. The study of logs of boreholes and tube wells conducted in and around Lahore shows that the alluvium consists principally of fine to medium sand, silt, and clay. Associated with the fine-grained strata are concretionary zones of nodules of Kankar and silty clay, occasionally containing beds of reddish and ferruginous material. Drilling data obtained from several deep wells shows the absence of thick horizons of clay within the alluvium. Clay lenses occur only locally and have little horizontal continuity. In 1961 bedrock (mica schist) was struck at 1,274 feet depth near Niaz Beg (Table 1) after which the drilling was abandoned by Water and Power Development Authority (WAPDA). In subsequent years drilling operations in and around Lahore did not exceed 800 feet in depth. At present our knowledge of the deep geological formations underlying beneath the city of Lahore is incomplete.

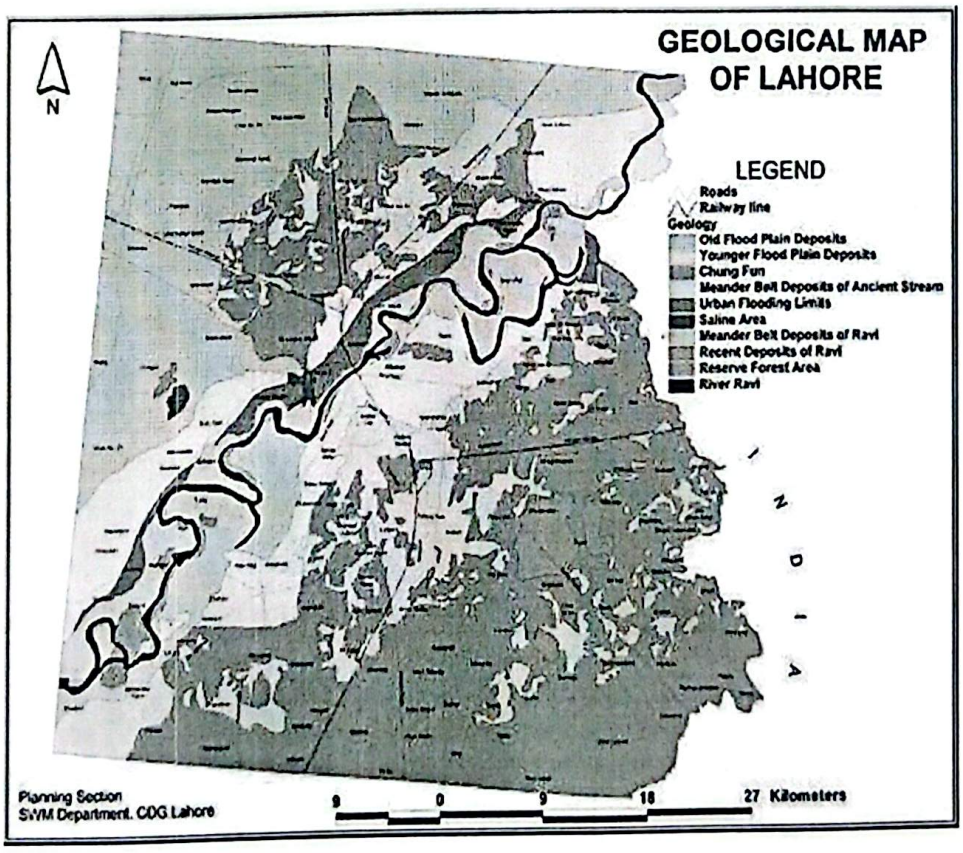


Figure 6-9 Geographical Map of Lahore

6.2.6 Seismology

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Pakistan Building Code distributes the country into 4 zones, fig. The project site falls in Low Hazard Zone with seismic factor ground acceleration g/10 or less, as such structural design of buildings and others will follow the applicable criteria for the zone. Seismic details are a very important consideration for any planning activity. As it directly lays an impact on the construction of the site.

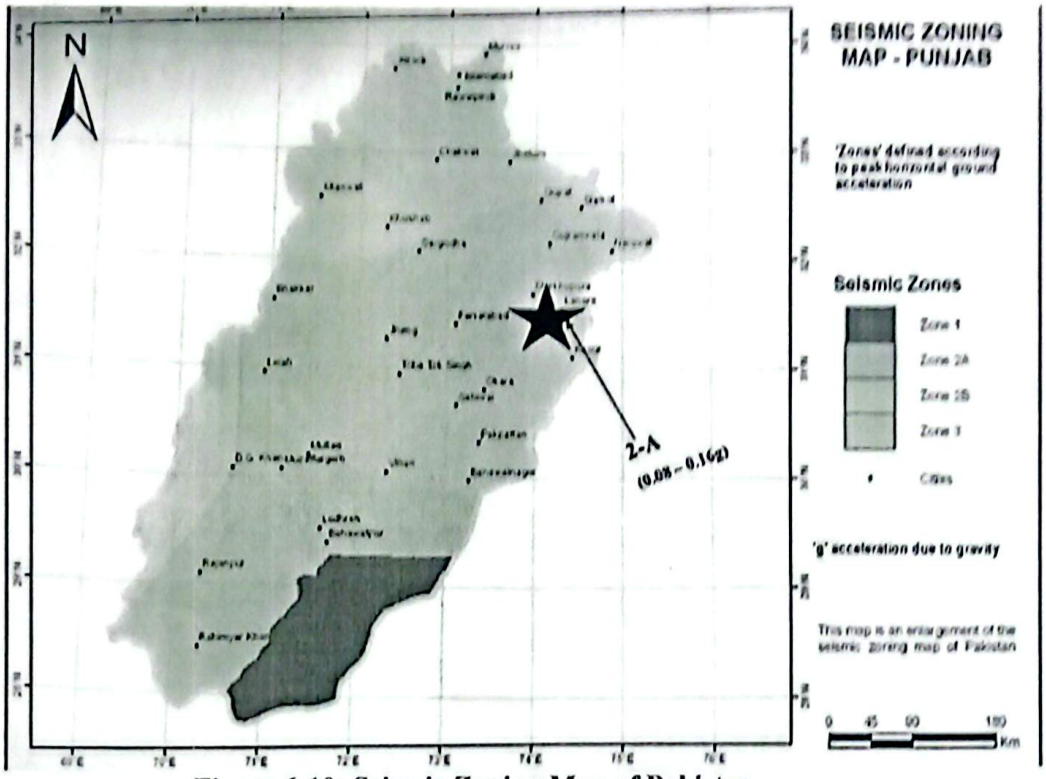


Figure 6-10: Seismic Zoning Map of Pakistan

6.2.7 Flooding

No surface drainage problems are foreseen as surface water can be disposed of in the existing primary and secondary drainage network including partly moving into the sewerage.

6.2.8 Water Logging and Salinity

There are no signs of waterlogging on the project site.

6.3 ECOLOGICAL RESOURCES

6.3.1 Flora

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

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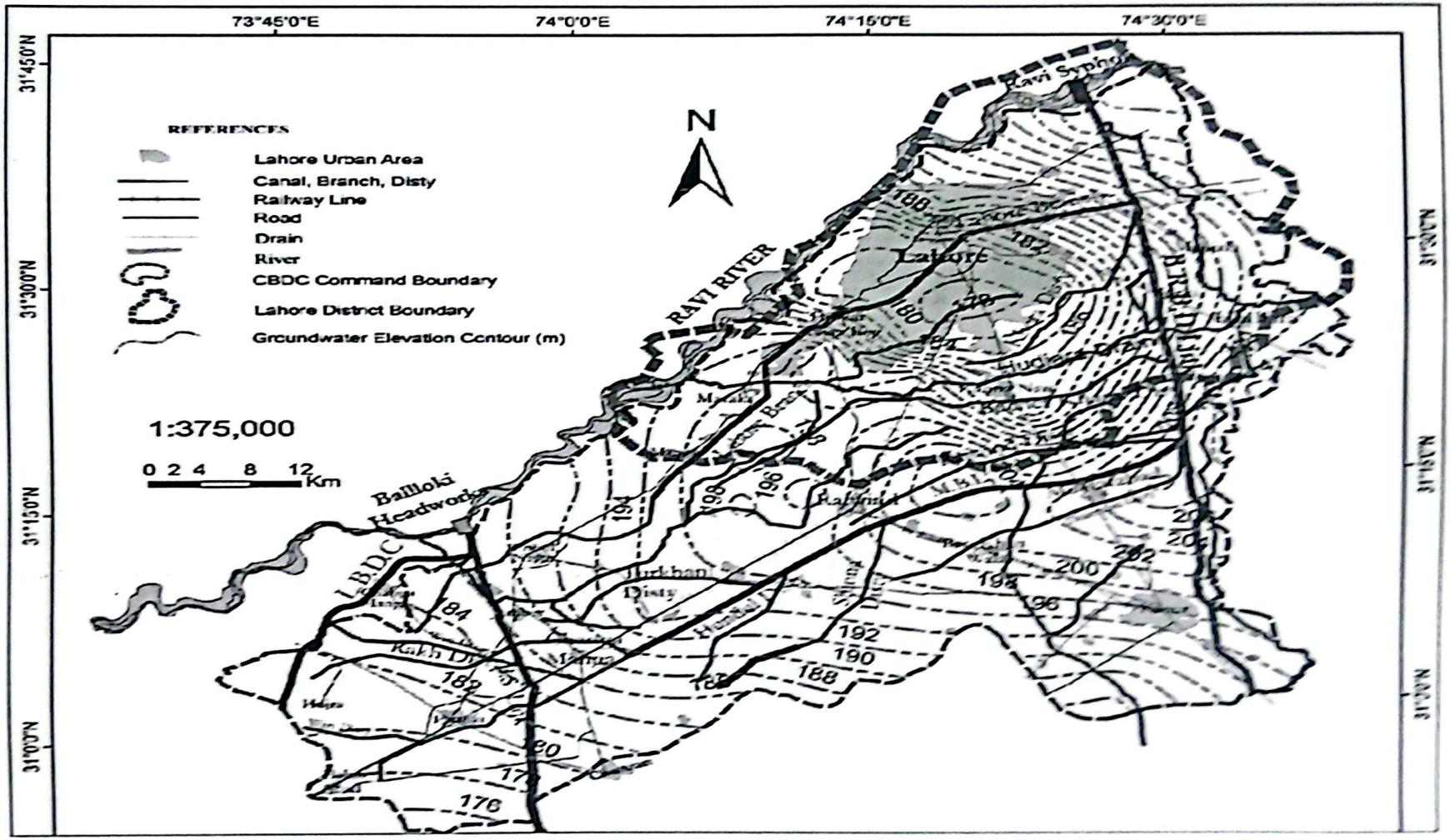


Figure 6-8 Groundwater Contours of Lahore

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

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

Table 6-1 Inventory of Trees Present in Lahore District

Serial No.	Common Names	Botanical Names
1.	Arjun	*Terminalia arjuna*
2.	Dhak	*Butea frondosa*
3.	Mahwa	*Bassia latifolia*
4.	Bahara	*Terminalia bellerica*
5.	Amaltas	*Cassia fistula*
6.	Gul-e-nishter	*Erytrina subrosa*
7.	Putajan	*Putranjiva roxburgi*
8.	Gab	*Diospyores embryopteris*
9.	Berna	*Crateva religiosa*
10.	Khark	*Celtus australis*
11.	Putajan	*Putranjiva roxburgi*
12.	Fiddle wood/Kashmir Lagotis	*Eithrxyllum ruberratum*
13.	Gul-e-mast	*Dalinia indica*
14.	Gul-e-mohr	*Poinciana regia*
15.	Alstonia	*Alstonia scholaris*

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16.	Ashoke	*Saraca indica*
17.	Sheesham	*Dalbergia sisso*
18.	Alata	*Stercolia colorata*
19.	Kenair	*Nerium grandiflora*
20.	Weeping Willow	*Salix babylonica*
21.	Keekar	*Parkinsonia aculeata*
22.	Nilem	*Jacaranda mimosfolia*
23.	Kachnar	*Bauhinia purpurea*
24.	Molsary	*Mimosop elengi*
25.	Bel	*Aegle marmelos*
26.	Siris	*Albizia lebbek*
27.	Tun	*Cedrela toona*
28.	Jamin	*Eugenia jambolana*
29.	Moor pankh	*Thuja orientalis*
30.	Silkoak	*Grevillea robusta*
31.	Sufeda	*Eucalyptus citriodora*
32.	Peepal	*Ficus relegiosa*
33.	Simbal	*Hyacinthus orientalis*
34.	Berri	*Diospyros melanoxylon*
35.	Suk chain	*Pongamia glabra*
36.	Poplar	*Populus alba*
37.	Aam	*Mangifera indica*
38.	Shehtoot	*Morus alba*

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39.	Peepal	*Ficus relegiosa*

Source: PHA, Lahore

6.3.2 Fauna

Common birds found in the area are crows and sparrows. Chirping birds are having their nests in the well-grown trees that are providing a natural habitat for the birds. Some squirrels, parrots, rats, weavers, and sparrows are also found in the area.

Different species of reptiles and amphibians such as lizards and frogs are also found. Various bird species known to occur in the area include myna, bulbul, crow, and sparrow.

6.3.3 Endangered Species

The endangered plant in Pakistan is the Elm i.e., *Ulmuswallichiana* which is not found here. No endangered species exist in the project area.

6.4 SOCIOECONOMIC ENVIRONMENT

Lying between 31°31′08°41′ N and 74°21′18°76′ E, Lahore is bounded on the north and west by the Sheikhupura District, on the east by Wagah, and on the south by Kasur District. The Ravi River flows on the northern side of Lahore. Lahore city covers a total land area of 404 square kilometers (156 sq mi) and is still growing. With a rich history dating back over a millennium, Lahore is the main cultural center of Punjab and one of the most densely populated cities in the world. The city of Lahore remains an economic, political, transportation, entertainment, and educational hub. It is referred to as the "Mughal City of Gardens" due to the historic presence of gardens in and around the city dating back to the Mughal period.

6.4.1 Political and Administrative Setup

The project area falls in Lahore City of the Lahore District. District Coordination Officer is the highest-ranked administrator of the district. For the collection of revenue and administration, the districts are subdivided into Tehsils. Local governments also administer the area through Union Councils and Tehsils. The total area of the district Lahore is 2,300 square kilometers.

6.4.2 Economy and Industrial Activities

As of 2008, the city's gross domestic product (GDP) by purchasing power parity (PPP) was estimated at $40 billion with a projected average growth rate of 5.6 percent. This is at par with Pakistan's economic hub, Karachi, with Lahore (having half the population) fostering an economy that is 51% of the size of Karachi's ($78 billion in 2008).

The contribution of Lahore to the national economy is supposed to be around 13.2%. As a whole, Punjab has a $115 billion economy making it the first and to date only Pakistani Subdivision of economy with more than $100 billion at rank 144.

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Lahore's GDP is projected to be 102 billion$ by the year 2025, with a slightly higher growth rate of 5.6% per annum, as compared to Karachi's 5.5%. Central to Lahore's economy is the Lahore Stock Exchange (LSE), Pakistan's second-largest stock exchange.

Lahore has offices of several Pakistani government corporations including the Water and Power Development Authority (WAPDA) and Water and Sewage Authority (WASA). Food and restaurant businesses remain open all night. Lahore is the second largest financial hub of Pakistan and has industrial areas including Kot Lakhpat and the new Sundar Industrial Estate (near Raiwand). Lahore's economic base is broad and varied.

Major industries include the manufacture of automobiles and motorcycles, Heavy machinery, railway coaches, home appliances, steel, telecommunications, information technology, chemicals, pharmaceuticals, computers, engineering, and construction material. A major industrial agglomeration with about 9,000 industrial units, Lahore has shifted in recent decades from manufacturing to service industries. Some 42% of its workforce is employed in finance, banking, real estate, community, cultural, and social services. The city is Pakistan's largest software-producing Centre and hosts a growing computer-assembly industry. Arfa Software Technology Park in Lahore is the biggest and most advanced IT park in the country.

6.5 QUALITY OF LIFE

6.5.1 Demographic Characteristics of the Project Area

- The current metro area population of Lahore in 2023 is 13,979,000, a 3.23% increase from 2022.
- The metro area population of Lahore in 2022 was 13,542,000, a 3.41% increase from 2021.
- The metro area population of Lahore in 2021 was 13,095,000, a 3.58% increase from 2020.
- The metro area population of Lahore in 2020 was 12,642,000, a 3.72% increase from 2019.[3]

[3] Lahore, Pakistan Metro Area Population 1950-2023 | MacroTrends

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Table 6-2 Area, Population by Sex, Sex Ration. Population Density, Urban Proportion, Household Size, and Annual Growth Rate[4]

ADMN-UNIT	POPULATION 2017									Population 1998	1998 - 2017 Average Annual Growth Rate
	Area (sq. Km)	All Sexes	Male	Female	Transgender	Sex Ratio	Population Density per sq. Km	Urban Proportion	Average Household Size		
Lahore District	1,772	11,119,985	5,813,987	5,303,982	2,016	109.626275.39	6275.39	100.00	6.23	6,340,114	3.00
Rural		-		-						1,131,026	-100.00
Urban		11,119,985	5,813,987	5,303,982	2,016	109.626275.39			6.23	5,209,088	4.06
Lahore Cant Tehsil Tehsil	466	1,632,702	857,133	775,333	236	110.55	3503.65	100.00	6.17	918,730	3.07
Rural	-	-		-						182,733	-100.00
Urban	-	1,632,702	857,133	775,333	236	110.55			6.17	735,997	4.27
Lahore City Tehsil	214	3,653,616	1,905,921	1,746,900	795	109.10	17072.97	100.00	6.25	2,219,399	2.65
Rural		-		-						143,532	-100.00
Urban		3,653,616	1,905,921	1,746,900	795	109.10			6.25	2,075,867	3.01

[4] https://www.pbs.gov.pk/census-2017-district-wise/results/053

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ADMN-UNIT	POPULATION 2017									Population 1998	1998 - 2017 Average Annual Growth Rate
	Area (sq. Km)	All Sexes	Male	Female	Transgender	Sex Ratio	Population Density per sq. Km	Urban Proportion	Average Household Size		
Model Town Tehsil	353	2,703,569	1,421,291	1,218,762	516	110.89	7658.84	100.00	6.11	1,409,228	3.48
Rural	-	-		-						273,036	-100.00
Urban	-	2,703,569	1,421,291	1,218,762	516	110.89			6.11	1,136,192	4.66
Raiwind Tehsil	467	848,541	448,403	400,031	107	112.09	181 7.00	100.00	6.34	357,934	4.64
Rural	-	-								330,620	-100.00
Urban	-	848,541	448,403	400,031	107	112.09			6.34	27,314	19.78
Shalimar Tehsil	272	2,281,557	1,181,239	1,099,956	362	107.39	8388.08	100.00	6.35	1,434,823	2.47
Rural										201,105	-100.00
Urban		2,281,557	1,181,239	1,099,956	362	107.39			6.35	1,233,718	3.28

6.5.2 Rural and Urban Distributions

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

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

6.5.3 Religion

The population of the district is predominantly Muslim i.e. 93.9 percent. The next higher percentage is of Christians with 5.8 points followed by Ahmadis with 0.2 percent. While other minorities like Hindus etc. are very small in number.

6.5.4 Ethnic Structure

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

6.5.5 Mother Tongue

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

6.5.6 Institutions

Lahore is a metropolitan city and a hub of various educational, academic, and flourishing government institutes. In the vicinity of the project, there are many educational institutions like Government College University, University of Veterinary and Animal Sciences, University of the Punjab, College for Women University, Forman Christian College, National College of Arts, King Edward Medical University, Kinnaird College for women, Shadbagh Girls College and many more renowned institutions.



Figure 6-11: Educational Institutes in Lahore

6.5.7 Transportation

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The city of Lahore is one of the most accessible cities in the Punjab Province. In addition to the historic Grand Trunk Road (G.T. Road), a motorway (M- 2) was completed in 1997 from Lahore to Islamabad. The government has built underpasses to ease congestion and prevent traffic jams, and according to official figures, Lahore transportation services have improved to accommodate the growing number of visitors to the city. It is well connected by air to other countries as well as all major cities of Pakistan. Buses, trains, taxis, and rickshaws are the other means of transport available in Lahore.

6.5.8 Health Facilities

Ample medical and health facilities are available in the Lahore Metropolitan Corporation area and its suburbs. Shaukat Khanam Hospital is the latest addition to the medical care facilities in Lahore for the most dangerous disease in the country. i.e. Cancer. There are also other hospitals of voluntary organizations which provide health coverage to the general public. Among the prominent hospitals are General Hospital, Lady Willington Hospital, Mayo Hospital, Fatima Jinnah Hospital, The Children Hospital, Services Hospital, Ganga Ram Hospital, etc. Besides, several private medical practitioners, Hakims, and homeopathic doctors are also practicing in the city. Services Hospital is the nearest healthcare facility that is present in the vicinity of the project.



Figure 6-12: Hospitals in Lahore

6.5.9 Architecture Style

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

a) Royal Fort Lahore

Royal Fort Lahore/Shahi Qila is located at an eminence in the northwest corner of the Walled City. The Citadel is spread over an area of 50 acres. Many visitors from foreign and local tours of different educational institutions come to see this historical place every year. The front gate of the Fort is called the Alamgiri Gate of the Royal Fort.

b) Minar-e-Pakistan

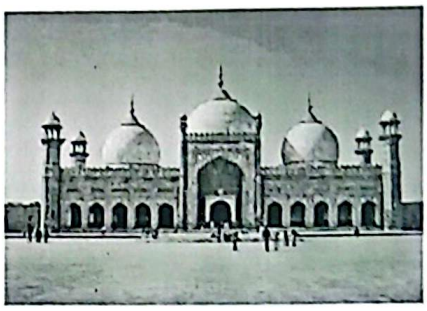
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About 59.5 meters tall monument, called Minar-e-Pakistan is situated near the Royal Fort in the spacious Iqbal Park (previously known as Minto Park), where the historical resolution for the creation of Pakistan was adopted on the 23rd March 1940. Around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



c) **Badshahi Mosque**

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



d) **Lahore Museum**

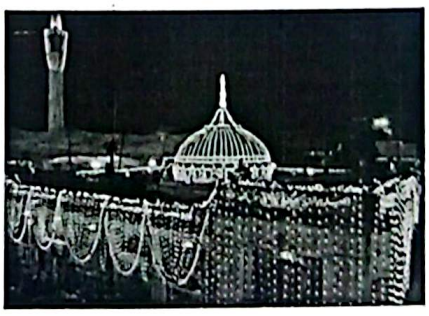
Opposite the old Punjab University Hall, a Mughal-style building on the Shahrah-e-Quaid-e-Azam houses the Lahore Museum. The Museum contains some fine specimens of Mughal and Sikh door-ways and woodwork and has a big collection of paintings dating back to Indo-Pakistan, Mughal, Sikh, and British times



It also has a collection of musical instruments, ancient jewelry, textile, pottery, and armory. There are also relics from some Tibetan and Nepalese exhibits.

e) **Shrine of Data Ganj Bakhsh**

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



i) **Shrine of Madhu Lal Hussain**

This is the famous tomb in Lahore, where Mela Chiraghan is held on the last weekend of March and draws enormous

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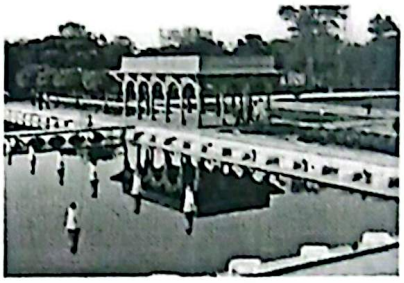
crowds of devotees and others. The shrine is famous because of its antiquity and is revered by Muslims and Hindus alike.



Recreational/Entertainment Places

f) Shalimar Garden

About 5 kilometers east of Lahore is the famous, Shalimar Garden laid out by the Mughal Emperor Shah-Jehan in 1642 A.D.



The Garden is spread out in typical Mughal Style and surrounded by high walls with watched towers at the four corners. It covers an area of about 42 acres. Many people from the entire city come to visit the park with their families at the weekend to spend their idle time.

j) Jallo Park

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

6.5.10 Approach to The Project Area

The proposed project area is already developed and with suggested improvements, the functioning of the traffic facilities will be improved

6.5.11 Cultural & Religious Resources

There is not any documented or known site of archeological, or historical in the project site. However, quite a number mosques, schools, academies and one church is present within the area of influence.

6.6 ENVIRONMENTAL MONITORING DATA

The main objective of environmental monitoring is to manage and minimize the impact a Project's activities have on an environment. Different parameters are monitored at the project site as mentioned;

- Air quality
- Noise
- Water quality

The results of monitored parameters are provided in the ***Annexure.***

6.6.1 Air Quality

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Ambient air quality was continuously monitored for one hour and the monitoring locations were selected nearest to the sensitive receptors in and around the project area to assess the air shed quality before commencement of works. The monitoring points were carefully selected keeping in view the environmental sensitivity receptors and their location in and around the project corridor. The monitoring was conducted using the air quality monitoring system (AQM series 09) which provides the hourly average monitored values.

The monitored data for ambient air including PM_{10} & $PM_{2.5}$, CO, NOx, and SO_2 indicates that the concentration of PM_{10} and $PM_{2.5}$ are exceeding at all monitored locations which shows that the air shed is degraded with regards to particulate matter since it is a highly urbanized area while all other pollutant parameters are within the WHO guidelines. Keeping this in view, considerable efforts will need to be put in to ensure that during the project works, all required measures are put in such as dust sprinkling etc to minimize particulate emissions as far as possible. Ambient Air Quality Monitoring reports are attached as Annexure

6.6.2 Noise Levels

Noise measurement was carried out around the project site to access current noise conditions. The noise measurement report is attached as Annexure.

6.6.3 Water Quality

Groundwater sampling was carried out at the project site. Detailed analysis reports are provided as Annexure

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7.0 ASSESSING IMPACTS

This chapter contains detailed environmental impact, and its identification based on timing, nature, duration, magnitude, and significance.

7.1 IMPACTS ASSESSMENT

Environmental Impact Assessment (EIA) is a systematic and integrative process for considering possible impacts before a decision is taken on whether or not a proposal should be approved to proceed.

Table 7.1 below shows the impact classification criteria based on its potential.

Table 7-1: Classifications of Impacts

IMPACT POTENTIAL	ABBREVIATION	IMPACT CRITERIA
Low Adverse	LA	Causing low environmental deterioration
Medium Adverse	MA	Causing ordinary environmental deterioration
High Adverse	HA	Causing extreme environmental deterioration
Not Applicable	NA	Not related to project activity
None or Insignificant	O	Causing no environmental deterioration
Low Beneficial	LB	Less positive environmental impacts
Medium Beneficial	MB	Ordinary positive environmental impacts
High Beneficial	HB	Extreme positive environmental impacts
Not Determinable	ND	Not present

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Table 7-2: Anticipated Impacts and Their Magnitude of the Project

Environmental Components / Components / Activities	Physical Environment											Biological Environment							Social Environment						
	Topography	Agricultural Lands	Soil (Erosion / Stability)	Cultural / Religious Properties	Infrastructure	Mineral Resources	Land pollution	Surface water quality	Groundwater quality	Air quality	Noise	Aquatic Ecosystem	Wetland Ecosystem	Terrestrial Ecosystem	Habitat change	Animal Movement	Wildlife	Disease Vectors	Public Health / Safety	Land Use	Communication System	Employment	Community Stability	Benefit to Community	Traffic Management
Construction camps, workshops, etc.	O	O	LA	NA	LA	NA	LA	LA	LA	MA	MA	NA	NA	O	O	NA	NA	O	O	LA	LA	LB	O	LB	LB
Transportation of construction materials	O	O	LA	NA	NA	NA	LA	NA	NA	LA	LA	NA	NA	O	O	O	NA	O	O	O	O	MB	LA	MB	LA
Use of construction materials etc.	O	NA	LA	NA	O	NA	LA	LA	LA	LA	LA	NA	NA	O	O	O	NA	NA	LA	LA	LA	LB	LA	LB	LA
Earthwork / concrete work operations	LA	NA	LA	NA	O	NA	LA	LA	LA	LA	LA	NA	NA	NA	O	NA	NA	NA	LA	LA	O	LB	LA	LB	LA
Operation of concrete batching plants.	O	NA	LA	NA	O	NA	LA	LA	O	MA	MA	NA	NA	NA	O	O	NA	NA	LA	LA	O	LB	LA	LB	LA

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Environmental Components / Components / Activities	Physical Environment											Biological Environment							Social Environment						
	Topography	Agricultural Lands	Soil (Erosion / Stability)	Cultural / Religious Properties	Infrastructure	Mineral Resources	Land pollution	Surface water quality	Groundwater quality	Air quality	Noise	Aquatic Ecosystem	Wetland Ecosystem	Terrestrial Ecosystem	Habitat change	Animal Movement	Wildlife	Disease Vectors	Public Health / Safety	Land Use	Communication System	Employment	Community Stability	Benefit to Community	Traffic Management
Machinery and Equipment work	O	NA	LA	NA	O	NA	LA	NA	NA	MA	MA	NA	NA	NA	NA	O	NA	LA	LA	LA	LA	LB	NA	LB	LA
Solid Waste	O	NA	LA	NA	O	NA	LA	LA	LA	LA	O	NA	NA	NA	NA	NA	NA	LA	LA	LA	O	LB	LB	O	O
Health and Safety		NA	NA	NA	LA	NA	NA	O	O	NA	MB	NA	NA	NA	NA	MB	NA	HB	MB	O	MB	HB	MB	NA	
Material Storage	O	NA	LA	NA	O	NA	LA	LA	O	LA	O	NA	NA	NA	NA	O	NA	O	O	LA	NA	LB	NA	O	O
Movement of Traffic	O	NA	O	NA	O	NA	LA	LA	O	LA	LA	NA	NA	NA	NA	O	NA	O	O	LB	LB	MB	MB	HB	HB
Road Maintenance Works	O	NA	LA	NA	O	NA	LA	LA	LA	LA		NA	NA	NA	NA	O	NA	O	LA	LA	LA	MB	LA	LA	LA
Air Quality	O	NA	NA	NA	O	NA	NA	O	O	LB	O	NA	NA	NA	NA	O	NA	O	LB	LB	O	O	LB	LB	O

LA: Low Adverse MA: Medium Adverse HA: High Adverse NA: Not Applicable O: None or Insignificant
LB: Low Beneficial MB: Medium Beneficial HB: High Beneficial ND: Not Determinable

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7.2 MITIGATION ASSESSMENT

Mitigation refers to minimizing or avoiding the described impacts. Overall, mitigation measures are a response to the findings of impact assessment; they need to cover all the areas identified. The key focus of mitigation actions should be on:

- Preventive measures that avoid the occurrence of impacts and thus avoid harm or even produce positive outcomes.
- Measures that focus on limiting the severity and the duration of the impacts.
- Compensation mechanisms for those impacts that are unavoidable and cannot be reduced further.

7.3 PURPOSE OF MITIGATION AND IMPACT ASSESSMENT

The purpose of conducting an EIA is to identify and understand (assess), and then prevent or minimize (mitigate) the adverse impacts of the planned project on the environment and people. Because the impacts of the project can change over time, the impacts need to be assessed and measured over the lifetime of the project – from its construction through to operations and after closing.

Impact assessment is indispensable to provide systematic and detailed descriptions of the probable impacts in comparison to the identified project alternatives. Mitigation measures are a critical part of the EIA process, as these actions aim to prevent adverse impacts from the planned project on the environment and people, ensuring that unavoidable impacts are maintained within acceptable levels

7.4 ENVIRONMENTAL MONITORING PLAN (EMP)

Environmental Monitoring is undertaken during project activities to ensure the effectiveness of the mitigation measures. To respond to the anticipated environmental concerns at an early stage and to determine the intensity of the impact, prediction is required. Specific monitoring programs are outlined below as well as responsibilities for the collection and analysis of data and the reporting requirements showing the environmental monitoring plan suggested for proposed project activity.

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Table 7-3: Environmental Monitoring Plan

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
CONSTRUCTION PHASE					
Vegetation Clearance	Construction site	Visual inspection of loss of vegetation, soil erosion & instability, surface water pollution, and occupational health of workers and community	Weekly	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air)	Contractor, LDA through Approved Monitoring Agency
Excavation of earth	Construction site and camp site	Visual inspection for soil erosion & stability	Weekly	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Dust Emissions	Construction site and camp site	Visual inspection during construction activities Transportation of materials	Weekly	To meet the **PEQSAA** (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Storage and handling of materials	Material storage facility and construction camp	Visual inspection of storage facilities	Monthly	To minimize any risk of accident	LDA through Approved Monitoring Agency

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ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
Traffic Safety	Construction site and camp site	Visual inspections	Monthly	To avoid the accidents	LDA through Approved Monitoring Agency
Ambient Air Monitoring	Construction site, campsite, batching plant Material storage & active sites	PM_{10},SO_x as SO_2, NO_x as NO_2, CO	Quarterly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Noise Level	Construction Site	Using a noise level meter (minimum dB and maximum dB)	Quarterly	To meet the **Noise Standards**	LDA through Approved Monitoring Agency
Ground & Drinking Water Quality	Construction Site	By analyzing pH, TDS, Chloride, Fluoride, Color, NO_{3-}, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.coli, Total count.	Quarterly	To meet the **PEQS** Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency

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ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
Solid Waste	Construction camps and construction sites	A visual inspection that solid waste will be disposed of at the designated site Waste generation rate, Waste composition, Recyclables and non-recyclables, Hazardous waste.	Weekly	Minimize impacts on the Environment	LDA through Approved Monitoring Agency
Occupational Health & Safety	Construction Site	Proper provision of PPEs to workers	Daily	To avoid any risk to human health	HSE Officer
OPERATIONAL PHASE					
Ambient Air Monitoring	Road	PM_{10} SO_x as SO_2, NO_x as NO_2, CO	Quarterly (During operation)	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air) &WHO (World Health Organization)	LDA through Approved Monitoring Agency
Noise Level	Road	Using a noise level meter (minimum dB and maximum dB)	Quarterly (During operation)	To meet the Noise Standards	LDA through Approved Monitoring Agency

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ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	**WHERE** (Is the parameter to be monitored)?	**HOW** (Is the parameter to be monitored)?	**WHEN** (Is the parameter to be observed)?	**WHY** (Is the parameter being monitored)?	**WHO** (Is responsible for monitoring)?
Water Quality	Road	By analyzing pH, TDS, Chloride, Fluoride, Colour, NO_3-, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	Quarterly (During operation) End of summer before the onset of Monsoon every year.	To meet the PEQS Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency

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8.0 SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

8.1 GENERAL

The potential impacts of the proposed project on the area's geomorphology, surface, and groundwater resources, air quality, biological resources, and socio-cultural environment have been discussed in the following sections. Where appropriate, mitigation measures have also been included to reduce the unacceptable impacts. Likely impacts that trigger the Environmental Management Plan (EMP), and accompanied mitigation measures have been identified in this EIA. The organizational structure and responsibilities of various functionaries towards EMP also have been highlighted, indicating generic environmental control measures that need to be applied during the possible implementation of EMP if and when required. The primary objectives are to:

Facilitate the implementation of the mitigation measures required by EPA.

- ❖ Identify monitoring parameters to ensure the effectiveness of the mitigation measures.
- ❖ Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
- ❖ Identify training requirements at various levels

Accordingly, mitigation measures have also been prepared to manage the environment and for sustainable development.

8.2 ENVIRONMENTAL PARAMETERS INCLUDING THE LOCATION OF THE PROJECT

Environmental problems related to the location of the project are mostly in the areas of the physical setting, socioeconomic setting, ecological setting, and special areas. The project involves the rehabilitation and widening of the existing roads for the smooth flow of traffic.

8.3 ENVIRONMENTAL PARAMETERS REGARDING DESIGN

The design of the project has sought to minimize any environmental potential impacts by ensuring that the project should be in according to the environmental standards. Local aesthetic value is another issue to be considered during project design.

8.4 IMPACT PHASES

This impact assessment and mitigating measures cover the entire cycle of the project activities, from pre-construction to construction, operation, and maintenance. The coverage of each of the project phases is defined as follows:

- ❖ Design Phase,
- ❖ Pre-construction Phase
- ❖ Construction Phase
- ❖ Operation Phase

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8.5 TYPES OF IMPACTS

The types of impacts that may arise during Project work can be classified as follows:

Direct Impacts– i.e., those directly due to the Project itself such as the impacts on air quality resulting from construction activities, equipment, and vehicles. Direct impacts also include the impact of construction expenditures on the local economy.

Indirect Impacts– i.e., those resulting from activities prompted by the Project, but not directly attributable to it. The use of rock and other construction materials, for example, has an indirect impact on increasing the demand for these materials.

Cumulative Impacts– i.e., impacts in conjunction with other activities. A single road improvement may not exert a significant environmental impact, but if some roads are developed in the same area developing a road network the cumulative or additive effect could be more significant.

Impacts in all three categories may be either:

Short–term– i.e., impacts that occur during construction and affect land use, air quality, and other factors. Many of these impacts, however, will be short–term and without long-lasting effects. Even the effects of some relatively significant impacts such as borrow pits, for example, maybe eventually be erased if appropriate mitigation actions are taken.

Many potential short–term negative impacts can be avoided or otherwise mitigated through proper engineering designs and by requiring Contractors to apply environmentally appropriate construction methods.

Long–term – i.e., construction impacts that could, for example, affect regional community health and safety if poor design practices are used.

Both short–term and long–term impacts may be either beneficial or adverse. Short-term positive impacts will include, for example, the generation of employment opportunities during the construction period. Long–term benefits will include enhanced development opportunities, improved transport services, easier access to commercial and service facilities; faster communications and commodity transport; improved access to markets and growth centers, and increased services and commercial facilities.

8.6 POTENTIAL IMPACT SOURCES

Environment impacts are attributable to the project implementation and can broadly be classified into those taking place during construction and those occurring during the operational phase. Some of these impacts can be anticipated and avoided through appropriate adjustments in the project design. Some can be mitigated by careful implementation of the project while others can be mitigated by appropriately following the operational manual and an effective collaboration with local communities.

Construction related Impacts are heavily dependent on:

- The contractor's work practices, especially those related to the storage of construction mater

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- Project management's enforcement of correct construction practices and standards;
- Effective collaboration with local communities in evolving a workable Social framework.
- The quality of Monitoring and Reporting of EMP implementation

Operational impacts of the proposed project are associated with the movement of vehicular traffic on it and allied activities. These include air and noise pollution, safety hazards, and other similar impacts.

For this Project, potential impacts are reviewed under construction and operational phases. The environment has been studied under the following subheads:

- Physical Environment
  - Land Resource
  - Water Resource
  - Air Quality
  - Noise Level
- Biological Environment
  - Flora
  - Fauna
  - Fish
  - Endangered Species
  - Cultural and Historical Sites
  - Socio-economic Environment

8.7 ENVIRONMENTAL IMPACTS AND THEIR MITIGATION MEASURES DURING THE CONSTRUCTION AND OPERATIONAL PHASE

Anticipated impacts during the construction and operational phase are given in Table 8-1 and Table – 8-2 similarly in detail with the discussion of suggested mitigation measures.

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Table 8-1: Anticipated Impacts and Their Mitigation Measures during the Construction Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
TOPOGRAPHY	The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.	❖ To minimize erosion and avoid creating hazards for people Ditches or borrow pits that cannot be fully rehabilitated will be landscaped ❖ Land for temporary facilities like construction camps, storage areas, etc. shall be brought back to its original land use. ❖ No waste dumping should take place in borrow areas ❖ Slope protection by providing frames, dry stone pitching, masonry retaining walls, and planting of grass and trees. ❖ Side slopes of all cut and fill areas will be graded and covered with stone pitching, grass, and shrub as per design specifications. ❖ Care should be taken that the slope gradient shall not be greater than 2:1. ❖ To avoid soil erosion the earth stockpiles will be provided with gentle slopes.
	This impact is temporary and Moderately adverse	
SOIL	Soil erosion due to Construction activities, earthwork, cut and fill, stockpiles, etc.	❖ Low embankments will be protected by planting vetiver grass that can flourish in relatively dry conditions. ❖ Soil contamination by asphalt will be minimized by placing all containers in caissons. ❖ All spoils will be disposed of as desired and the site will be restored to its original conditions before handing over. ❖ Store and reuse topsoil. This requires that topsoil will be separated from subsoil during the initial excavation. The more fertile topsoil can later be deposited on the slopes to form a superficial layer conducive to seedling establishment.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Replanting cleared areas and slopes is the most effective action to be taken in reducing erosion and stability problems, It will be undertaken as early as possible in the construction process before erosion becomes too advanced.
	Compaction of soil and impact on quarry haul roads due to the movement of vehicles and equipment.	❖ Construction vehicles, machinery, and equipment are to be stationed in the designated ROW to avoid compaction. ❖ Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce compaction. ❖ Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the roads.
	Contamination of soil due to leakage/spillage of oil, bituminous and non–bituminous debris generated from demolition and road construction	❖ Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil. ❖ Fuel storage and refueling sites are to be kept away from drainage channels. ❖ Unusable debris shall be dumped in ditches and low-lying areas. ❖ To avoid soil contamination Oil Interceptors shall be provided at wash-down and refueling areas. ❖ Waste oil and oil-soaked cotton/cloth shall be stored in containers labeled. ❖ Non–bituminous wastes are to be dumped in borrow pits with the concurrence of the landowner and covered with a layer of topsoil conserved from opening the pit. ❖ Bituminous wastes will be disposed of in an identified approved dumping site.
This impact is temporary and moderately adverse.		
AIR QUALITY	Dust Generation due to construction activities and	❖ Unloading of loose and fine materials through covered vehicles. ❖ Paved approach roads.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	transport, storage, and handling of construction materials	❖ Storage areas are to be located downwind of the habitation area. ❖ Water spraying on earthworks, unpaved haulage roads, and other dust-prone areas. ❖ Provision of PPEs to workers. ❖ Storage of construction materials is to be carried out in accordance with the construction material storage and handling plan. ❖ Storage areas shall be at least 500m from communities. ❖ Proper implementation of the dust management plan as given in Annexure C.
	Emission of air pollutants (PM10, PM2.5, HC, SO2, NO_x, CO, etc.) from vehicles due to traffic congestion and use of equipment and machinery	❖ Regular maintenance of machinery and equipment. ❖ Batching, asphalt mixing plants, and crushers at downwind (1km) direction from the nearest settlement. ❖ Regular Ambient air quality monitoring will be conducted. ❖ A construction traffic management plan (CTMP) will be followed. (as given in Annexure-B.)
	The overall impact on the quality of air during the construction phase will, however, be limited to the project's construction phase only	
NOISE	Noise from construction activities and operation of equipment and heavy machinery i.e. ❖ bulldozers, ❖ excavators, ❖ stabilizers, ❖ concrete mixing plant,	❖ All equipment is to be timely serviced and properly maintained ❖ Construction equipment and machinery are to be fitted with silencers and maintained properly. ❖ Confining noisy work to normal working hours in the day, wherever possible. ❖ Providing the construction workers with suitable hearing protection like ear caps, or earmuffs and training them in its use. ❖ Restricting construction vehicle movements during nighttime.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	❖ pneumatic drills, ❖ stone crushers asphalt plants and ❖ other equipment's	❖ Contractors shall comply with the submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ a strict implementation of operation procedures.
	This impact is temporary and minor adverse.	
Flora & Fauna	❖ Direct impact on Fauna and Flora as a result of vegetation clearance. ❖ During the Construction Phase, the removal of natural vegetation.	❖ The project includes a rehabilitation plan through landscaping a large area which will improve vegetative cover. ❖ The cleared proposed site must be surveyed and demarcated before construction commences ensuring no unnecessary loss of natural vegetation outside the approved footprint. ❖ The contractor's staff must not harvest any natural vegetation. ❖ Vehicles and machinery should not encroach into areas outside/surrounding the planned project footprint. ❖ The project area must be monitored for any new growth of invasive plants until completion of construction. ❖ Short-term monitoring for 12 months after construction has been completed must be conducted.
	This impact is temporary and minor adverse.	
CONSTRUCTION CAMP	Due to the proposed campsites, loss of vegetation and dissatisfaction with rehabilitation measures during and after the completion of the construction phase may occur.	❖ The campsite is to be selected after careful reconnaissance to minimize the social and physical disruption to local communities and road users. ❖ Setting up a complaint office for public complaints registration and advertisement of the grievance redress mechanism ❖ The contractor shall provide a plan for removal & rehabilitation of the site upon completion.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas. ❖ Implement a landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measure.
This impact is temporary and moderately adverse.		
WATER	Sourcing of water during Construction	❖ Arrangements shall be made by the contractor so that the water availability and supply to nearby communities remain unaffected. ❖ Water-intensive activities are not to be undertaken. ❖ Provision of water harvesting structure to augment groundwater condition in the area.
	Disposal of water during construction	❖ Provisions shall be made to connect roadside drains with existing nearby natural drains.
	Alteration in surface water hydrology	❖ The existing drainage system is to be maintained and further enhanced. ❖ Provision shall be made for adequate size and number of cross drainage structures particularly in the areas where land is sloping towards road alignment.
	Siltation in water bodies due to construction activities/earthwork	❖ Embankment slopes are to be modified suitably to restrict the soil debris entering water bodies. ❖ Provision of Silt fencing shall be made at water bodies. ❖ Silt/sediment will be collected and stockpiled for possible reuse as surfacing of slopes where they have to be vegetated. ❖ Earthworks and stonework to be prevented from impeding the natural flow of rivers, streams, and water canals or existing drainage systems.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	Deterioration in Surface water quality due to: ❖ leakage from vehicles ❖ leakage from equipment ❖ Waste from construction camps.	❖ No vehicles or equipment should be parked or refueled near water–bodies, to avoid contamination from fuel and lubricants. ❖ All chemicals and oil shall be stored away from water and concreted platform with a catchment pit for spill collection. ❖ All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean–up. Readily available, simple to understand, and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors. ❖ Construction camp to be sited away from water bodies. ❖ Wastes must be collected, stored, and taken to an approved disposal site only. ❖ Water quality shall be monitored.
This impact is temporary and moderately adverse.		
CONSTRUCTION WASTE & DEBRIS	Selection of Dumping Sites	❖ Dumping sites will be selected away from residential areas and water bodies ❖ Dumping sites must be having an adequate capacity equal to the amount of debris generated. ❖ Minimize the production of waste materials by the 3R (Reduce, Recycle, and Reuse) approach. ❖ Burning of solid waste will be prohibited. ❖ All personnel will Train and instruct in waste management practices and procedures as a component of the environmental induction process
	Reuse and disposal of construction and dismantled waste	❖ All excavated materials from roadway, shoulders, verges, drains, and cross drainage will be used for backfilling embankments, filling pits, and landscaping. ❖ Unusable and non–bituminous debris materials will be suitably disposed of at pre-designated disposal locations, with the approval of the concerned authority.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ The bituminous wastes shall be disposed of in secure landfill sites only in an environmentally accepted manner. ❖ Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed of off-site.
This impact is temporary and moderately adverse.		
HEALTH & SAFETY OF WORKERS	Safety of Workers and accident risk from construction activities	❖ Safe work practices will be followed and applied by the contractor. The health and Safety Management Plan will be strictly applied at the construction site which is given as Annexure-C ❖ At the construction site, fluorescent and retro-refectory signage will be used. ❖ Training workers on safety procedures and precautions. ❖ All regulations regarding safe scaffolding, ladders, working platforms, gangways, stairwells, excavations, trenches, and safe means of entry and egress shall be complied with. ❖ Provision of PPEs to workers. ❖ Provision of a readily available first aid unit including an adequate supply of dressing materials.
This impact is temporary and minor adverse		
SOCIAL ISSUES	Approach/hindrance problems for the residents/business owners and movement of the people will be disturbed during construction activities.	❖ Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities. ❖ Maintaining a grievance procedure to facilitate stakeholders in expressing concerns. ❖ Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out.
	This impact is temporary and minor adverse	

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
CONSERVATION OF RESOURCES AND ENVIRONMENTAL SUSTAINABILITY	Construction will pose a burden on the existing natural resources	❖ One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction; ❖ Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduces greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions; ❖ Use solar panels and LED lights in the construction camps instead of using diesel-operated generators and normal bulbs. ❖ Waste minimization strategies will be developed and followed. ❖ To reduce the level of energy consumption, warm–mix asphalt (WMA) will be used to replace hot–mix asphalt (HMA). Besides the fact that WMA is produced at a lower temperature, it also induces great benefits such as an improvement of working conditions (less exposure to heat and fumes) and asphalt compaction, reduction of paving cost, and longer hauling.
This will be a permanent negative impact.		
SITE RESTORATION AND REHABILITATION	Clean–up Operations, Restoration, and Rehabilitation	❖ The contractor will prepare site restoration plans, which will be approved by the "Engineer". ❖ The clean–up and restoration operations are to be implemented by the contractor before demobilization ❖ All construction zones including culverts, roadside areas, camps, hot mix plant sites, crushers, batching plant sites, and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer. ❖ All the opened borrow areas will be rehabilitated and the "Engineer" will certify.
	This will be a permanent negative impact.	

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Table – 8-2: Anticipated Impacts and Their Mitigation Measures during Operational Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
AIR QUALITY	The air quality will improve due to the smooth flow of traffic	During the operational stage, the overall air quality will improve due to the smooth flow of Traffic, however, the following mitigation measures are recommended to be adopted for minimum deterioration of air quality: ❖ Vehicles with excessive smoke emissions shall not be allowed to enter the project area ❖ Permissible limits of air pollution (as specified in the guidelines) will be monitored regularly and any deviation shall be taken care of; ❖ Signs for sensitive zones to disallow the use of pressure horns. ❖ To improve air quality roadside tree plantation will be done.
This impact is permanent and minor adverse.		
NOISE	The noise level will decrease because of smooth traffic flow	To avoid any noise pollution following mitigation measures should be taken into account: ❖ Ban on the use of pressure horns; ❖ Proper implementation of inspection and maintenance programs for vehicles. ❖ Strict check on the use of proper silencers especially for motorcycles.
This impact is permanent and minor adverse.		
LAND AND SOIL	Soil erosion at embankment during heavy rainfall	❖ Periodic checking is to be carried out to assess the effectiveness of the stabilization measure ❖ Necessary measures are to be followed wherever there are failures.
	This impact is temporary and minor adverse.	

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
WATER	No major adverse impact on surface and groundwater, however, Water logging may be caused due to blockage of drains	❖ Regular visual checks and cleaning of drains shall be done along the alignment to ensure that the flow of water is maintained through cross drains and other channels. ❖ To avoid the exception of some occasional oil spills due to any road accident emergency plan will be followed.
This impact is temporary and minor adverse.		
MAINTENANCE OF RIGHT OF WAY & SAFETY	Accident risks associated with traffic movement	❖ All safety features provided in the main approach roads such as guide rails, and speed bumps, will be maintained and kept in good condition. ❖ Traffic control measures, including speed limits, will be forced strictly. ❖ Further encroachment of squatters within the ROW will be prevented. ❖ Monitor/ensure that all safety provisions included in the design and construction phase are properly maintained.
This impact is temporary and minor adverse.		
ROAD MAINTENANCE WORK	Lack of maintenance during the operational phase can cause harm	❖ Implementation of HSE Plans during the maintenance period. ❖ Strict implementation of PPEs. ❖ Use of high-quality equipment and material by the contractor ❖ Continuous improvements in the emergency plans. ❖ Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans. ❖ Selection of suitable sites for contractor camps and implementation of all the related important protocols for the management of camp activities to avoid environmental and HSE issues.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Conservation practices that limit particulate matter emissions will be incorporated into long–term maintenance plans.
This impact is temporary and minor adverse.		

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8.8 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

As an additional measure, the following steps will further enhance roadways environments where its related dividends will be continued to be received for a very long time far beyond the project life. Following potential environmental enhancement measures will be taken to protect the environment of the project area, workers, and road users.

8.8.1 Construction Traffic Management Plan (CTMP)

An appropriate systematic traffic management Plan is essential for safety and smooth traffic flows on roads, making maximum usage of road facilities to enlarge the current road capacities.

(a) To achieve smooth traffic flow
(b) To reduce traffic accidents, and
(c) To create pedestrian-friendly facilities

This CTMP addresses the following Key Issues:

- Safety and amenities of road users and the public;
- Site security, site access, and signage;
- Project identification, including advertising and site signage;
- Traffic and road user delay and inconvenience management;
- Speed limit signage;
- Traffic transfer (switch) arrangements and procedures;
- Maintenance during Construction;
- Traffic and Safety Management Responsibilities;
- Construction staging including detailing the intersection layout and capacities for each construction stage;
- Emergency and Incident Response Plans

Table 8-3 below shows the risks to be dealt with during the design and construction stage of the Project that may affect safety. A comprehensive Traffic Management Plan is developed and attached with the report as Annexure B to avoid any inconvenience or traffic accident during the construction of the project.

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Table 8-3: Construction Traffic Management Plan

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Construction methods may disrupt traffic	Traffic delays cause frustration for drivers	❖ Consider methods of construction at an early stage during the design to reflect community needs and reduce delay times, therefore, minimizing the impact on traffic
Traffic management– inadequate anticipation and communication of issues	Potential community issues causing dissatisfaction and frustration	❖ Determine traffic routes and engage with the community to refine details. ❖ Confirm pre-existing conditions. ❖ Consider the need for a night assessment. ❖ Identify any short–term corrective actions.
Severe delays to traffic are perceived by the community as a direct result of the construction activities.	Community dissatisfaction, claims for time delays.	❖ Establish good public relations from the outset. ❖ Erect Early Warning information signs through Variable Message Signs (VMS). ❖ Early engagement in ascertaining needs and potential effects of changed access.
Major Traffic Incident.	Local traffic was disrupted upsetting locals	❖ Regular checking of Traffic Management Plan implementation. ❖ Have procedures in place for rapid recovery, Keep locals informed.
Access to the site for deliveries	Traffic disruption or interference	❖ Development of this Plan in conjunction with Community Communication Strategy – access points will be high-risk locations and will need detailed consideration. ❖ Simplification of traffic staging will simplify access arrangements or minimize impacts

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RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
		❖ Signage and pre-delivery notifications for delivery routes to be clear and simple as per the VMP
Traffic Speed	Works in multiple areas across the Project may result in intermittent speed changes that may frustrate road users	❖ Traffic is to generally be reduced to 80kph speeds within the construction zone. The construction zone to be the full length of the Project
Pedestrian access	Potential disruption to progress causing pedestrians to not comply with pedestrian provisions	❖ Liaise closely with the relevant bodies from an early stage to ensure pedestrian access provisions are adequately addressed, well established, and maintained
Lowering speeds, when it is perceived as unnecessary	Poor public opinion and safety for workers if motorists start ignoring limits	❖ Appropriate design of traffic protection measures, intersections, alignments, etc. to allow consistent speed limits, i.e., 80km / h where–ever possible.
Too many changed configurations	Unfamiliarity causes potential confusion among road users that may cause traffic incidents	❖ Keep motorists on the existing alignment for as long as possible. Effective use of TMP for advanced notification and clear direction during any traffic flow adjustments
Inadequate provisions for break–downs during construction	Traffic delay	❖ Design temporary break-down bays. Consider temporary verges where possible during the design of traffic staging

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RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Dangerous entry and exits to sites and properties	Traffic Incident	❖ Ensure that entries and exits are designed to cater to expected traffic volumes and for sight distances, acceleration, and deceleration provision, and clear advanced warning signage
Seasonal traffic variations are not allowed	High volumes during holidays and weekends	❖ Consider seasonal volumes in programming works. Keep TMP informed and up to date. Be aware of reporting and notification requirements
Reduced allowable movements	Traffic delays and confusion for commuters may lead to an incident	❖ Implement effective community engagement strategies that will consider businesses, property owner's requirements
Damage to local roads due to heavy vehicle movements	Vehicle damage and potential incidents.	❖ Allow for heavy vehicle movements in traffic staging and planning ensuring existing, temporary alignment and pavements are suitable during the construction period.

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9.0 ENVIRONMENT MANAGEMENT & MONITORING PLAN

9.1 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

This section provides a brief description of environmental issues, mitigation measures to eliminate and/or reduce environmental and social impacts to an acceptable level, institutional arrangement for the implementation of the mitigation measures and also carrying out environmental monitoring for air quality, water quality, and noise pollution-related parameters.

9.2 ENVIRONMENTAL MANAGEMENT PLAN

This EMP describes the mitigation and management measures to address the environmental issues during construction, and its regular operation.

9.3 OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN

9.3.1 General Objectives

The objectives of the EMP are as follow:

- ❖ Identify and assess the environmental status and trends continuously;
- ❖ Act as an early warning system, by identifying any sudden environmental deterioration that needs to be countered.
- ❖ Afford effective environmental surveillance and provide reliable information upon which continued environmental management of the project can be updated and refined.
- ❖ To outline functions and responsibilities of responsible persons.
- ❖ To state standards and guidelines, which are required to be achieved in terms of environmental legislation.
- ❖ To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the project to minimize the extent of environmental impacts and to manage the environmental impact associated with the proposed project.
- ❖ To prevent long-term or permanent environmental degradation
- ❖ To identify training requirements at various levels.

9.3.2 Objectives during Pre–Construction and Construction Stages

These are to:

- ❖ Monitor actual impacts on physical, biological, and socio-economic & human resources.
- ❖ Provide early warning to the project management whether the intensity of an impact is more severe than the one predicted.
- ❖ Suggest mitigation measures for the impacts which had not been anticipated in the EIA.
- ❖ Suggest mitigation measures for the impacts whose intensity is more severe than those predicted during the EIA.
- ❖ Furnish feedback for correction of any deficiencies / improper situations.

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- ❖ Ensure compliance with the administrative and legal framework.
- ❖ Ensure fulfillment of the obligations required under Punjab Environmental Quality Standards (PEQS).
- ❖ Restore/rehabilitate construction camps and workshop sites.
- ❖ Ensure proper disposal of excavated soil and excess construction materials.
- ❖ Monitor rehabilitation of the borrow areas/pits.
- ❖ Ensure specified construction of project infrastructure.
- ❖ Monitor a–forestation along roads.

9.3.3 Objectives during the Operation and Maintenance (O&M) Stage

These are to:

- ❖ Monitor the effectiveness of mitigation measures.
- ❖ Evaluate the effectiveness of the EIA in the backdrop of projected levels of impact.
- ❖ Suggest modifications/improvements in construction procedures.
- ❖ Determine the survival rate of tree plantation along the roads.

9.4 INSTITUTIONAL CAPACITY

Project Proponent, (LDA) will be responsible for Monitoring and Evaluation, but the Environment consultant (of the proponent) will be responsible to monitor EMP implementation in the field and reporting to the Project Proponent. The Project Proponent will integrate monitoring reports in the main monthly reports of the project. The District Office of the EPA (Lahore) in the project area will monitor the overall activity at the site.

9.5 ORGANIZATIONAL STRUCTURE: ROLES & RESPONSIBILITIES

9.5.1 Primary Responsibilities

The project Manager of the proposed project will be responsible on the LDA's behalf to carry the primary responsibilities and local legislations for the overall duration of the project.

9.5.2 Operation Management & Control

Conducting the development activities in an environmentally sound manner will be the responsibility of the Project Manager.

9.6 PERFORMANCE INDICATORS

The following are the performance indicators:

- ❖ Decreased Vehicle Operating Costs.
- ❖ Control of air and noise pollution.
- ❖ Improved flow of traffic.
- ❖ Alleviation of poverty.

9.7 COMMUNITY AND WORKER HEALTH & SAFETY

The objective of environmental health and safety is to provide workers with safe and healthy working conditions and prevent accidents, injuries, and diseases. It also covers the

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establishment of preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. It is therefore a combination of occupational health and safety of staff/workers at the subcomponent facilities and community health and safety of people living nearby or potentially affected by failures or poor operation of facilities.

Safety risks are mainly related to the construction phase. Residents, particularly children, are at risk during project construction. In linear construction activities such as road construction and pipe network construction which typically occur in areas frequented by the public, physical and educational measures to protect residents from risks are needed.

A comprehensive Occupational Health and Safety plan is developed and provided as Annexure-C. It is the responsibility of the contractor to implement the OHS Plan to avoid any fatal accident/injury.

Safety measures for construction staff and the public will include the following responsibilities of the Contractor:

(i) Providing safe and convenient passages for the public;
(ii) Providing construction workers with sufficient personal protection equipment such as hard hats, earpiece, safety shoes, and others;
(iii) providing seminars on safety issues to the local public, particularly school students;
(iv) Installing warning signs where potential dangers are present;

Ensuring construction staff are on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the villages to ensure safety; and Setting up traffic signs at and near construction sites. Health risks are primarily related to the increased transit population during construction (construction workers) and operation (visitors) in the regions. The increased mobile population could potentially bring and spread infectious diseases in the Project area. Workers could spread diseases such as hepatitis to residents as well as among themselves. Measures for protecting community health include:

(i) Providing disease prevention and control training to construction workers, particularly epidemic diseases such as hepatitis B before the start of construction. Leaflets and education seminars will be organized, in association with the local government and communities, to increase awareness and knowledge;
(ii) Providing posters in and around the construction sites for disease control, for not only construction workers but also villagers and others in the areas;
(iii) Providing periodical health checks to construction workers to ensure their health and well-being.

9.8 INSTITUTIONAL MONITORING ARRANGEMENTS

9.8.1 Establishment of Environmental Monitoring Cell

The monitoring and evaluation will be carried out during the construction and operation of the Project. There is thus a need of establishing a well–structured Environmental

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Monitoring Cell (EMC) for the Project. Keeping in mind the financial constraints, the EMC personnel will be taken from the existing establishment.

9.8.2 Training of Monitoring Team

For capacity building of LDA staff, there is a dire necessity for environmental training, where a general training vacuum has been felt at all levels. Without appropriate training, there are apprehensions that EMP cannot be implemented in letter and spirit. The following training activities have been proposed for wider dissemination of benefits to a larger number of stakeholders:

Following three different types of training workshops are proposed, each having its function, level of participants, and a particular segment of stakeholders, including their sensitization to environmental affairs of roads.

(a) Advanced Environmental Training Workshops
(b) Environmental Mitigation & Monitoring Workshops
(c) Community Consultative Workshops.
(d) One- day Training session on Health and Safety

9.9 ENVIRONMENTAL MANAGEMENT PLAN DURING THE CONSTRUCTION AND OPERATIONAL PHASE

Table 9-1 shows the planned Environmental Management Plan (EMP) for the project Construction of Link Connecting Ferozpur Road (Arfa Tower) With Pine Avenue along Satu Katla Drain Lahore during the construction and operational phase respectively. The project aims to rehabilitate and widen the road from Arfa Kareem Tower to Chatri Chowk (Pine Avenue) on both sides of the Satukatla drain

This EMP shows the goal of each effect that why we are moderating the undertaking and predicting impacts. The individual responsible to actualize and screen the EMP is also discussed in Table 9-1 and Table 9-2 below. Details of anticipated impact mitigation are discussed in Chapter No: 8 of this EIA Report titled Screening of Environmental Impacts & Mitigation Measures.

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Table 9-1: Environmental Management Plan during Construction Phase

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Topography	To ensure minimum changes in the topography of the project area.	❖ Project design should consider aesthetic concerns.	Construction Contractor	Project Manager Construction Contractor
Air Quality	Ensure that the pollution level does not exceed the limit	❖ Regular monitoring of vehicular emissions ❖ All vehicles, machinery, equipment, and generators used during construction activities shall be kept in good working condition and be properly tuned and maintained to minimize exhaust emissions; ❖ Open burning of solid waste from the Contractor's camps will be strictly banned. ❖ To avoid dust from construction activity Storage of construction materials is to be carried out in accordance with the construction material storage and handling plan and storage areas shall be no less than 500m from communities. ❖ Ensure implementation of the Dust management plan provided in Annexure- C	Construction Contractor	Project Manager Construction Contractor Approved Monitoring Authority
Noise	To minimize noise level	❖ Selection of up–to–date and well-maintained plant or equipment with reduced noise levels ensured by suitable inbuilt damping techniques or appropriate muffling devices.	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Confine excessively noisy work to normal working hours in the day, as far as possible. ❖ During construction, suitable hearing protection like ear caps or earmuffs will provide to workers. ❖ Preferably, restrict construction vehicles' movement during nighttime ❖ Contractors shall comply with the submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ a strict implementation of operational procedures;		Approved Monitoring Authority
Flora & Fauna	To minimize impacts on the flora	❖ The project includes a rehabilitation plan through landscaping a large area which will improve vegetative cover. ❖ The tree plantation plan is planned and will be implemented according to the plan (See Annexure) ❖ The cleared proposed site must be surveyed and demarcated before construction commences ensuring no unnecessary loss of natural vegetation outside the approved footprint.	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ The contractor's staff must not harvest any natural vegetation. ❖ Vehicles and machinery should not encroach into areas outside/surrounding the planned project footprint. ❖ The project area must be monitored for any new growth of invasive plants until completion of construction.		
Construction Camps	To minimize loss of assets and vegetation/tees due to construction of construction camps.	❖ The contractor shall provide a plan for removal & rehabilitation of the site upon completion; ❖ Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas; ❖ Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures; ❖ Operate equipment in a manner sympathetic to the ambient noise environment. ❖ Do not leave equipment idling unnecessarily;	Construction Contractor	Project Manager Construction Contractor
Ecology	To avoid/minimize tree cutting.	❖ Incorporate technical design measures to minimize the removal of trees, if possible such as a change in alignment.	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Disallow the introduction of exotic species with known environmental setbacks. ❖ The vegetation which can be translocated, should be moved. The task may be assigned to the relevant department i.e. PHA for safe translocation. ❖ The contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/shrubs/bushes for fuel will not be allowed.		
Social Disturbance	To minimize the entry/exit problems of the locals in the Project Area.	❖ Inform residents of the area about the detail of work, likely disturbances, and their duration and to whom they should address their complaints. ❖ Establishing good community relationships so that any disruption can be resolved with due consideration of the community.	Construction Contractor	Project Manager Construction Contractor
Public Utilities	To avoid disturbance to the public.	❖ Incorporate technical design features to minimize the effect on public utilities. ❖ All public utilities will need to be relocated well before the commencement of construction work.	Construction Contractor	Project Manager Construction Contractor
Water Resources	To avoid/minimize the contamination of surface and groundwater bodies.	❖ Protection of groundwater reserves will be ensured from any source of contamination such as construction waste and spillage.	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ The contractor will repair/replace/compensate for any damages caused by the Construction activities to the drinking water source/s. ❖ Use of spill prevention trays and impermeable sheets to avoid contamination of the groundwater/surface water ❖ Take immediate action by following the instruction mentioned (**Emergency response plan, *Annexure-***) ❖ Furthermore, septic tanks will need to be constructed which will be cemented to prevent the groundwater contamination		Approved monitoring agency
Construction Waste & Debris	To avoid any illegal dumping and minimal impact on the environment	❖ Dumping sites will be selected away from residential areas and water bodies ❖ Dumping sites must be having an adequate capacity equal to the amount of debris generated. ❖ Minimize the production of waste materials by the 3R (Reduce, Recycle, and Reuse) approach. ❖ Burning of solid waste will be prohibited. ❖ All personnel will Train and instruct in waste management practices and procedures as a	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		component of the environmental induction process ❖ All excavated materials from roadway, shoulders, verges, drains, and cross drainage will be used for backfilling embankments, filling pits, and landscaping. ❖ Unusable and non–bituminous debris materials will be suitably disposed of at pre-designated disposal locations, with the approval of the concerned authority. ❖ The bituminous wastes shall be disposed of in secure landfill sites only in an environmentally accepted manner. ❖ Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed of site.		
Health and safety of workers	To minimize health risks	❖ Implementation of Health and Safety Plan as given in ***Annexure*** ❖ Provide basic medical training to specified work staff and basic medical services and supplies to workers; ❖ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers;	Construction Contractor HSE Officer	Project Manager Construction Contractor HSE Officer

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Protection devices (ear muffs) shall be provided to the workers doing the job in high-noise areas. ❖ Provision of adequate sanitation, washing, cooking, and dormitory facilities; ❖ Proper maintenance of facilities for workers will be monitored; ❖ Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves, etc. for laborers handling hazardous materials; ❖ Ensure strict use of wearing this protective clothing during work activities. ❖ Instruct foremen to strictly enforce the keeping out of non–working persons, off work sites; ❖ Adequate signage, lightning devices, barriers, yellow tape, and persons with flags during construction to manage traffic on Road.		
Borrow Areas	To avoid land disputes and to minimize soil erosion	❖ No excavations are allowed within a distance of 500 m to RoW; ❖ In borrow pits, the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4;	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Soil erosion along the borrow pit shall be regularly checked to prevent/mitigate impacts on adjacent lands; and ❖ In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito–breeding sites.		
Impacts of Heavy Vehicles	The working of heavy vehicles on the existing road network may result in air pollution	❖ Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition. ❖ Noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the contractor	Construction Contractor	Project Manager Construction Contractor
Traffic Management	To minimize traffic problems in the Project Area.	❖ A proper traffic management plan as provided in Annexure B shall be implemented to avoid traffic jams / public inconvenience.	Construction Contractor	Project Manager Construction Contractor
Maintenance of Construction Equipment	Improper maintenance of construction equipment may lead to safety and environmental hazards	❖ Place substantial blocking under any chain–hoist suspended or jack-supported equipment under which people must work. ❖ All work areas shall be provided with proper ventilation. ❖ Secure unbolted heavy parts or engines if necessary to leave the work.	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Waste	To minimize odor, spreading of diseases, and clogging of canal and drain.	❖ A waste management plan shall be implemented including the provision of waste bins, defining collection frequencies, allocating personnel, and defining safe disposal options.	Construction Contractor	Project Manager Construction Contractor
Conservation of Resources and Environmental Sustainability	To minimize any burden on the natural resources	❖ One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction; ❖ Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduces greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions; ❖ Use solar panels and LED lights in the construction camps instead of using diesel-operated generators and normal bulbs. ❖ Waste minimization strategies will be developed and followed. ❖ To reduce the level of energy consumption, warm–mix asphalt (WMA) will be used to replace hot–mix asphalt (HMA). Besides the fact that WMA is produced at a lower temperature, it also induces great benefits such as an improvement of working	Construction Contractor	Project Manager Construction Contractor

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		conditions (less exposure to heat and fumes) and asphalt compaction, reduction of paving cost, and longer hauling.		
Site Restoration and Rehabilitation	Proper implementation of the plan	❖ A contractor will prepare site restoration plans, which will be approved by the 'Engineer'. ❖ The clean–up and restoration operations are to be implemented by the contractor before demobilization ❖ All construction zones including culverts, roadside areas, camps, hot mix plant sites, crushers, batching plant sites, and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer. ❖ All the opened borrow areas will be rehabilitated and the 'Engineer' will certify.	Construction Contractor	Project Manager Construction Contractor

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Table – 9-2: Environmental Management Plan during Operational Phase

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Air Quality	Ensure that the pollution level does not exceed the limit.	❖ Regular monitoring of vehicular emissions. ❖ Impose a fine on vehicles emitting gaseous emissions beyond the prescribed limit.	LDA Project Manager	Project Manager Approved Monitoring Authority
Noise	To minimize noise levels	❖ Ban the use of pressure horns ❖ Proper implementation of inspection and maintenance program for vehicle ❖ Strict check on the use of proper silencers especially for motorcycles	LDA Project Manager	Project Manager Approved Monitoring Authority
Land and Soil	To avoid soil erosion	❖ Periodic checking is to be carried out to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures, etc. ❖ Necessary measures to be followed wherever there are failures	LDA Project Manager	Project Manager Approved Monitoring Authority
Water Quality	To minimize the water contamination To avoid blockage of drains (waterlogging)	❖ Regular visual checks and cleaning of drains shall be done along the alignment to ensure that the flow of water is maintained through cross drains and other channels. ❖ To avoid the exception of some occasional oil spills due to any road accident emergency plan will be followed.	LDA Project Manager	Project Manager Approved Monitoring Authority

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Monitoring of water-borne diseases due to stagnant water bodies		
Maintenance of Right of Way & Safety	To avoid chances of accidents	❖ Safety measures shall provide in case of emergency ❖ Social awareness will be addressed among people on how to avoid any accidents with fast-moving vehicles. ❖ All safety features provided in the main approach roads such as guide rails, and speed bumps, will be maintained and kept in good condition. ❖ Traffic control measures, including speed limits, will be forced strictly. ❖ Further encroachment of squatters within the ROW will be prevented. ❖ Monitor/ensure that all safety provisions included in the design and construction phase are properly maintained.	LDA Project Manager	Project Manager Project HSE Officer
Road Maintenance work	To control HSE and environmental-related issues.	❖ Strict enforcement of speed limits, installation of speed guns, and channelization of traffic concerning categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators.	LDA Project Manager	Project Manager Project HSE Officer

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Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Implementation of HSE Plans during the maintenance period. ❖ Strict implementation of PPEs. ❖ Use of high-quality equipment and material by the contractor. ❖ Continuous improvements in the emergency plans.		

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9.10 EQUIPMENT MAINTENANCE DETAIL

Equipment shall be inspected, tested, and maintained by qualified trained personnel. If any equipment is not in good operating condition, it should be repaired immediately. Authorized dealers will be responsible for the maintenance of equipment. Equipment procedures and maintenance guidelines shall be kept in a central location for quick reference when needed

9.11 ENVIRONMENT MANAGEMENT COST

The total cost for environmental management is estimated at 12 Million. Details are given below in Table 9-3:

Table 9-3: Environment Management Cost

Environmental Component	Quantity	Amount PKR
Contractor Environmental Specialist	3	2.0
Air and Water Quality & Noise Monitoring	5	3.0
Health and Safety Measures and Provision of PPE's	Lumpsum	3.5
Roadside Tree Plantations of Endemic / Local Species	Lumpsum	3.5
TOTAL		**12 Million**

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10.0 INVOLVEMENT OF STAKEHOLDERS / PUBLIC CONSULTATION

10.1 GENERAL

Stakeholder consultation is a means of involving all primary and secondary stakeholders in the project's decision-making process to address their concerns, improve project design, and give the project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of enhancing project sustainability. Community input (both 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 Pakistan but also to improve and enhance the social and environmental design of the project.

The following chapter includes detailed information on the process and parties that depicts the involvement and consultation of the important stakeholders that is conducted by the Sustainable Environment Consultant. The consultation is carried out to resolve any kind of issues that are involved and can be potentially affected by the proposed project. The activity plays an important role in decision-making and keeps in view the concerns of stakeholders. The parties that are involved in the process are as follows:

- Local government
- Local community
- Affected community (directly and indirectly)
- General public
- Service providers
- Proponents

10.2 PROPONENT'S ENVIRONMENTAL MANAGEMENT TEAM

All possible impacts and mitigation measures related to the project were discussed with the proponent (LDA) and management. Proponent assured us to take all suggested mitigation measures to control any discrepancy that arose during the project construction and to make the protected environment friendly.

10.3 THE RESPONSIBILITY AUTHORITY

Lahore Development Authority shall be the responsible authority to take all measures before starting the project construction activity.

10.4 OTHER DEPARTMENTS AND AGENCIES

For the impact analysis detailed with the management, local community, educational institutes, and shopkeepers. All issues were discussed related to the implementation of the project. Scoping sessions, focused group discussions and wayside consultations were held with the relevant stakeholders in the area. The following Departments were also consulted;

- EPA

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- TEPA
- WASA
- Civil defense
- Rescue 1122
- PHA

10.5 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

During a visit to the project site, discussions with stakeholders and consulted with the local people of nearby areas to evaluate the project's socio-economic impacts. People of the area belong to different professions mostly belong to employment, own businesses, doctors, some abroad, teaching, etc. women were also consulted for their points of view regarding the betterment of the area through this project, some of them communicated but according to the social value of the area, they mostly hesitate to communicate comfortably and get pictured. People provide a massive information about the project and have positive remarks regarding the project development.

10.6 AFFECTED AND WIDER COMMUNITY

A large number of community and local businesses will be affected due to the construction of the proposed project. The team has consulted with the inhabitants of neighboring areas. The remarks of people are positive regarding the project and people foresee positive impacts like the smooth flow of traffic, business, development of the area, etc.

10.7 PUBLIC CONSULTATION:

During the fieldwork public consultations were carried out by the team members of the Integrated Environment Consultant (IEC) to brief the people of nearby areas about the Project. The participants included residents, workers, students, and others concerned. The majority of people are having positive comments/concerns regarding the Project.

Table 10-1 List of individuals Consulted along with their written feedback

Sr. No	Individuals Name	Designation	Address	Date	Feedback
1.	Iftikhar Ahmad	Business	Satu Katla	21-6-2023	This project will provide good job opportunities.
2.	Bilal Mumtaz	Worker	Satu Katla	21-6-2023	As a result of this project, the probability of accidents will be reduced.
3.	Yaseen	Student	Satu Katla	21-6-2023	The project will provide a smooth flow of traffic.

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4.	Asif Raza	Job	Township	21-6-2023	It's a good initiative. The project will provide a smooth flow of traffic.
5.	Waqar Hussain	Shopkeeper	Wapda Town	21-6-2023	Local labor should be hired on a priority basis.
6.	Naveed Malik	Shopkeeper	Township	21-6-2023	The proposed project is a step towards better facilities for residents.
7.	Ahmad Ali	Student	Township	21-6-2023	It will facilitate residents.
8.	M. Hassan	Student	Township	21-6-2023	This project will provide smooth flow and will reduce traffic congestion at the Roundabout.
9.	Faisal Raja	Medical Store	Wapda Town	21-6-2023	Clear working hours and notifications to the public regarding excessively noisy activities
10.	Iqrar Hussain	Food Stall	Township	21-6-2023	During the project implementation traffic should remain uninterrupted
11.	Alamgir Ahamad	Autoshop	Wapda Town	21-6-2023	It is a very good initiative taken by the authority but they should not destroy the environment and there should be a green belt around the project area
12.	Shameer	Fruit Stall	Wapda Town	21-6-2023	It will facilitate residents.
13.	Haroon Waseem	Security Guard	Wapda Town	21-6-2023	The project will provide a smooth flow of traffic
14.	Sajid Ali	Private Business	Green Town	21-6-2023	This project will create jobs opportunity for the locals and the value of the nearby land will also increase
15.	Hussain Ali	Fruit Stall	Green Town	21-6-2023	During the project implementation traffic should remain uninterrupted

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16.	Arshad Najeeb	Driver	Green Town	21-6-2023	As a result of this project, the probability of accidents will be reduced.
17.	Ahmad Shazad	Student	Green Town	21-6-2023	The project will provide a smooth flow of traffic
18.	Bashir Malik	Driver	Green Town	21-6-2023	This project will create jobs opportunity for the locals and the value of the nearby land will also increase

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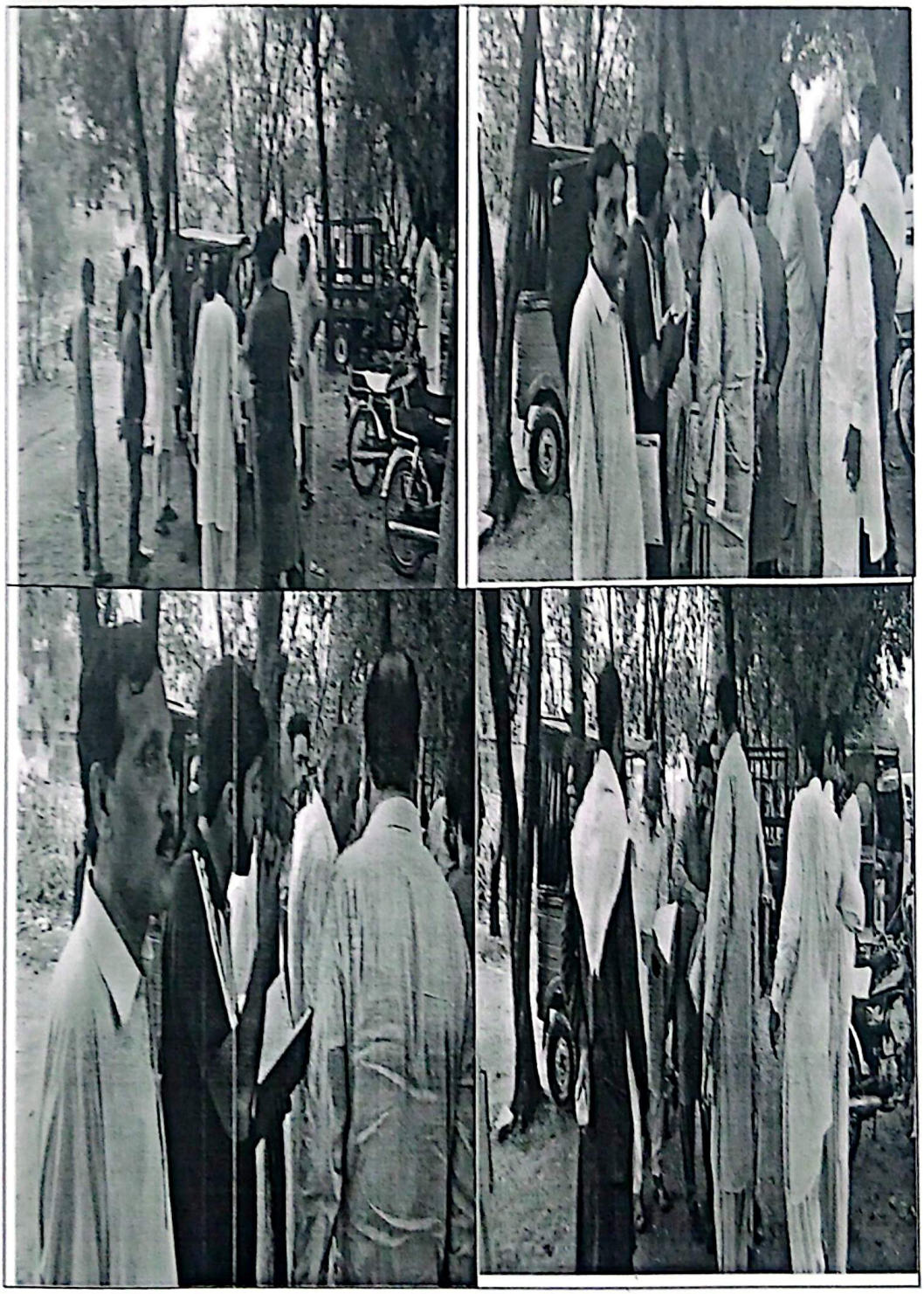


Figure 10-1: Consultation with General Public

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11.0 CONCLUSION AND RECOMMENDATIONS

Primary and secondary data were used to assess the environmental impacts of the project road, which were assessed comprehensively. This EIA Report provided a picture of all potential environmental impacts associated with the Project and makes suitable recommendations for mitigation measures.

The roadway mostly follows the existing alignments, being the best option from the environmental, legal, engineering, and socioeconomic points of view. Environmental impacts associated with the Project need to be properly mitigated through the existing institutional arrangements, which need to be augmented for optimum utilization of available resources.

The bulk of environmental impacts will take place during the construction phase. Implementation of mitigation measures during this period will be assigned to the contractors. However, traditionally contractors have little perception and understanding of environmental problems. Hence, the required environmental mitigation must be clearly described in the contract documents, and an environmental supervising consultant must monitor the implementation mechanism. This Report, including the EMP, should be used as a basis for an environmental compliance program.

The EIA Report has thoroughly assessed all the potential environmental impacts associated with the Project. The environmental impacts identified by the study are manageable and will be mitigated by LDA and contractors at various stages, as suggested in the Report. Based on the findings of the EIA, it is concluded that the project will pose some negative impacts that can be mitigated with the proper implementation of measures suggested in the Environmental Management Plan.

Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the operation of this project.

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REFERENCES

Listed below are some of the documents, reports, and other references consulted during the preparation of this Report:

- Information and data provided by project proponents;
- Project Pre–Feasibility Study Report;
- Technical Design Data related to the project.
- Information gathered through discussions with the project-related persons of the project proponent;
- Information collected from the Technical documents of various suppliers of machinery/equipment.
- The Punjab Environmental Protection Act 1997 (Amended 2012) covers aspects related to:
  - The protection, conservation, rehabilitation, and improvement of the environment and the prevention, control of pollution, and promotion of sustainable development;
  - Establishing complete regulatory and monitoring bodies, policies, rules, regulations, and Pakistan Environmental Quality Standards; and
  - To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC), and responsible bodies i.e. Punjab Environmental Protection Agency (PEPA) at Provincial Level.
- Environment-related Laws in Pakistan;
- Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review, and Approval of Environmental Assessment, 2000;
- Google earth, maps.
- Guidelines for Public Consultations – These guidelines cover:
  - Consultation, involvement, and participation of Stakeholders
  - Techniques for public consultation (principles, levels of involvement, tools, building trust)
  - Effective public consultation (planning, stages of EIA where consultation is appropriate)
  - Consensus building and dispute resolution.
- Work Place Safety and Health Act 2011
- Pakistan Penal Code, 1860

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GLOSSARY

Air Quality	Measurement of the pollutants in the air; a description of the healthiness and safety of the atmosphere.
Consultation	Consultation refers to two–way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Contractor	A person or firm undertakes a contract to provide materials or labor to perform a service or do a job.
Disclosure	The action of making new or secret information known
Environmental Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
Effluent	Wastewater – treated or untreated – that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters
Electrical conductivity	Electrical Conductivity is an indirect measure for finding the total dissolved solids in a water body
Evaluation	The making of a judgment about the amount, number, or value of something; assessment.
Geology	A science that studies rocks, layers of soil, etc., in order to learn about the history of the Earth and its life
Ground Water	Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solid content of 10,000 milligrams per liter or less, and are not "exempted aquifers."
Hazardous	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation
Impact	Effect on someone or something
Jurisdiction	The extent of the power to make legal decisions and judgments.
Mitigation	The action of reducing the severity, seriousness, or painfulness of something
Monitoring	Supervising activities in progress to ensure they are on–course and on–schedule in meeting the objectives and performance targets

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Occupational Health	Maintenance of the highest degree of physical, mental and social well–being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs
pH	pH is a measure of how acidic / basic water is.
Project Area	The area specified by the funding and / or implementing agency according to the Official Gazette Notification and includes the areas within the administrative limits of the Federal or a Provincial Government.
Project Manager	The person in overall charge of the planning and execution of a particular project.
Proponent	A person who advocates a theory, proposal, or course of action.
Rehabilitation	Include all compensatory measures to re–establish; at least lost incomes, livelihoods, living and social systems. It does not include the payment of compensation for required assets.
Resettlement	Means all measures taken to mitigate any and all adverse impacts, resulting due to execution of a project on the livelihood of the project affected persons, their property, and includes compensation, relocation and rehabilitation.
Road	A road is a thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by foot or some form of conveyance, including a motor vehicle etc.
ROW	A right–of–way (ROW) is a right to make a way over a piece of land, usually to and from another piece of land.
Scope	The extent of the area or subject matter that something deals with or to which it is relevant
Social Environment	It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.
Stakeholders	Include affected persons and communities, proponents, private and public businesses, NGOs, host communities and EPA.
Topography	Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.
Turbidity	Turbidity is the amount of particulate matter that is suspended in water.

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ANNEXURE-A

CAMP ESTABLISHMENT & MANAGEMENT PLAN

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Camp Establishment & Management Plan

Purpose of the Plan

The purpose of the camp establishment and management plan is to ensure the following:

- Provide safe and healthy accommodation to the staff and personnel;
- Prevent or minimize adverse impacts of camp operations on the surrounding environment;
- Prevent or minimize the social impacts and possible conflicts of workers within the host community and Poster a harmonious relationship between the Contractor and its staff and workers with the host community;
- The camp is properly permitted and compliant with the local regulations

The plan provides the criteria for site selection, the guidelines for permitting, the required environmental facilities, and environmental management i.e. liquid waste and solid waste management, sanitation and hygiene requirements for safety and security, and abandonment plan.

Roles and Responsibilities

The project manager has the overall responsibility for the establishment and management of the construction camp. The HSE officer carries the responsibility of overseeing the implementation of the health, safety, and environmental guidelines, rules, and regulations put in place by the Contractor. The camp occupants are bound to abide by the rules and observe the guidelines and report to management untoward incidents and prohibited activities.

Contractor Construction Camp Location

The construction camp is ideally situated distant from existing settlements to avoid possible conflicts and other social impacts. Additionally, the camp shouldn't occupy productive land nor affect productive land (e.g. agricultural land) and distance to water bodies to prevent pollution.

HSE Management of the Camp

The Health and Safety Plan prepared by the Contractor covers the worker's camp. The specific HSE requirement for the workers' camp includes the following:

a. Camp Rules and Regulations

The Contractor will impose camp rules and regulations as part of the security arrangement of the camp. The camp rules shall include, among others, the following

- Entry to camp is limited only to workers residing in the camp
- Curfew time shall be observed
- No consumption of alcoholic drinks and illegal drugs in camp and worksite
- No gambling in the camp and work site
- Workers are prohibited from keeping wildlife pets
- Weapons, guns, and bladed weapons are not allowed in camp and worksite
- Workers should keep the camp tidy and clean

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Camp Establishment & Management Plan

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- Curfew time shall be observed
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- No gambling in the camp and work site
- Workers are prohibited from keeping wildlife pets
- Weapons, guns, and bladed weapons are not allowed in camp and worksite
- Workers should keep the camp tidy and clean

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- No fighting

b. Fire Safety

Firefighting equipment (fire extinguishers) shall be installed in the following parts of the camp (labor camp, batching plant, asphalt plant, quarry, and crushing plant)

Safety designated will be posted Safety guidelines for storage of gas cylinders and combustible materials

c. First Aid Stations

The first aid station at the campsite is located at the Contractor site office.

The first aid station is supplied with a card of safety pins; and dressings consisting of:

(a) Adhesive dressings individually wrapped;
(b) Sterile gauze pads;
(c) Rolls of gauze bandage,
(d) Field dressings
(e) Triangular bandage.

In addition, the first aid station shall be supplied with a spinal board/stretcher, an eye wash station, and basic medicines for fever, pain, and stomach disorder.

A list of emergency contact numbers such as ambulance service, emergency hospital, the HSEO, and the Project Manager shall be posted at the first aid station and the different bulletin boards at the different facilities, i.e. Camp, and crushing plant.

d. Water Supply and Wastewater Management

Water supply for the camp will be sourced from deep well and private water suppliers. Water will be tested for portability and if needed, treatment, e.g. chlorination. Camp water will be pumped into an overhead steel tank and piped to the toilets, bathroom, kitchen/dining, and laundry area. Water from the toilet, bathrooms, kitchen/dining, and laundry area will be collected and treated in the septic tank. The septic tanks are the standard 3-chamber, with one chamber designed as the leaching chamber

Camp Run-off Management

The camp will be provided with concrete-lined ditches to catch and conduct run-off into a natural drainage channel

Solid Waste Management

Garbage receptacles will be distributed in different parts of the camp, in the offices, living quarters, dining, kitchen, and other common areas. Receptacles shall be provided for recyclable wastes and others for non-recyclables. The recyclable materials shall be recovered and temporarily stored in the camp.

Monitoring and Reporting

The monitoring of the implementation of the Camp Establishment and Management Plan shall be carried out by the HSE officer who is the designated Camp Manager, as part of the regular monitoring. Monitoring will be done monthly and the report will be compiled by the HSE officer together with the other monitoring reports to be included in the overall Monthly Environmental Monitoring Report.

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ANNEXURE-B

TRAFFIC MANAGEMENT PLAN

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TRAFFIC MANAGEMENT PLAN

Introduction

The purpose of the plan is to ensure that traffic management (and management of vehicles and equipment in respect of the Project) is undertaken in a safe and efficient manner. As such, the management of traffic in terms of this plan will be intended to avoid and minimize traffic risks to (and impacts on) the health and safety of the local community and any personnel on site during the Project, under both routine and non-routine circumstances. The requirements of this Plan shall apply to all construction personnel including any Subcontractor appointed to provide vehicles, machinery or drivers for the Project.

For the proper implementation of traffic management plan (TMP), Contractor will communicate the details of this plan to all personnel on site during the construction phase. The training will be provided to operators and staff personnel. All activities and project works excluding the arrival and departure of loaded vehicles from or site shall be carried between the hours of 6 a.m. to 6 p.m. except in emergency basis or other situation depending on site conditions.

This TMP addresses the following key issues:

- Safety and amenity of road users and the public.
- Site security, site access and signage.
- Project identification, including advertising and site signage.
- Traffic and road and streets user delay and inconvenience management.
- Speed limit signage.
- Procedures and Arrangement to divert traffic (if required).
- Maintenance during Construction.
- Traffic and Safety Management Responsibilities.
- Construction staging including detailing the intersection layout and cap areas for each and every construction stage.
- Impact of construction traffic on local roads.

Objectives and Targets

The objectives and targets include but not limited to the following:

- Keep traffic delays to a minimum.
- Minimize disruption to businesses.
- Maintain satisfactory property access.
- Minimize disturbance to the environment.
- Traffic impacts are within the permitted scope.
- Ensure the safety of Employees, contractors, the general public, pedestrians, cyclists and traffic;
- Design temporary roadways, crossings and detours where necessary.

Progress against the nominated objectives will be continually assessed during the course of the project.

KEY TRAFFIC MANAGEMENT AND SAFETY ISSUES

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Safety and Amenity for General Roads and Streets Users and Public

Throughout the project, safety will be considered based on the specific nature of the works. The measures to providing public safety include:

- Providing separation between the public and the construction workers. This is a key element to providing safety to road users and the construction team. This will be done through the use of barriers, barricading Tape, making of service roads for contractor's machinery, and availability of flagmen to provide sufficient separation and safety measures to minimize the impact of the works.
- Implementing specific traffic management measures only where absolutely necessary to reduce traffic speed, volumes and alignment to provide safety to both construction crews and the public and instruct the vehicle drivers to use service road and approaching streets.
- Limiting the working hours of works that could pose substantial impact on road users and the public.
- Minimizing disruption during peak traffic periods, public holiday weekends and school holidays by limiting the extent of traffic management undertaken during these times.
- Implementation of visual barriers to reduce potential distraction of road users.
- Community consultation and notification to keep roads and streets users and the public up to date regarding traffic management measures or restrictions.

Safety and Amenity for Pedestrians

While planning construction activities, safety control measures for pedestrians will be developed. For this purpose, number of pedestrians, type of their work activity like office, residential, recreational etc., origin and destination points of the pedestrians, number of vulnerable pedestrians like young persons, elderly, vision impaired, disabled persons and Proximity of pedestrian generation developments, such as schools, shopping centers, railway stations, bus terminals.

To provide a safe environment for pedestrians:

- The contractor will clearly define the boundaries of all work areas, and provide defined walking paths, where require.
- Hazardous areas will be barricaded to restrict physical access.
- Appropriate safety awareness sign boards will be installed.
- Pedestrian's pathways will be free of the trip hazards.

Safety and Amenity for Public Transport

Local roads and streets or property accesses used by public transport will be reviewed to ensure safe alternative or temporary stop locations during the execution of the project. The locations of any alternative or temporary stop locations, including school bus stops, will be confirmed in conjunction with affected transport services and regular users. Accordingly, safety control measures will be developed for the safe movement of the vehicles especially during peak hours.

Managing Construction Vehicular Movement

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The effective management of construction vehicle movements on site and throughout the road and streets network is critical to the success of all projects. Construction vehicle movements will be planned with the aim to minimize the risk to other road and streets users and keep the traffic generated by the project to minimum.

Driver's Responsibilities

It will be required to ensure that drivers Employed on the Project, whether direct Employees or subcontractors, understand a responsibility to drive safely. Moreover, the credibility of drivers will be assessed on the basis of past experience, reviews from previous Employees, license, knowledge and trainings etc.

Hazardous Movements

When planning construction vehicle movements, the following movements are considered hazardous:

- Entering and exiting work sites to and from adjacent travel lanes.
- U-turns movements across travel lanes.
- Reversing maneuvers within the work area and in the adjacent travel lane.
- Traveling through the work area.
- Transit of trucks through school zones when the school zone periods are in effect.
- Right-turn and Left-turn movements at high speed.
- All entry and egress to and from construction sites.
- Over-dimensioned vehicle movements.
- Hazardous goods vehicles using unapproved routes.

The safety control measures to mitigate the risk of these hazardous movements include, but not limited to:

- Installation of deceleration facilities like stud's humps etc.
- Installation of safety awareness and warning sign boards.
- Installation of warning devices on vehicles.
- Training of drivers.
- Restricting the movement of Contractor's vehicles on service roads where possible.
- Regular inspection of vehicles.
- Provision of flagmen to control traffic.

Traffic Control Devices

The devices used to control traffic include but not limited to:

Road Safety Barriers

Safety barrier will be used especially in areas where traffic is diverted from one route to another. To enhance the visibility of safety barriers, reflecting tapes are used.

Signage

Sign boards also play a very important role in traffic management as they provide road safety information to the road users. Different types of sign boards will be used during the



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execution of the project like Existing information signage, speed limit signage, safety information signage, directional signage for local roads and advance warning signage etc.

Safety Cones

Safety cones will also be placed on roads to temporarily redirect traffic in a safe manner. They shall be used for traffic redirection or advance warning of hazards or dangers, or the prevention of traffic.

Studs

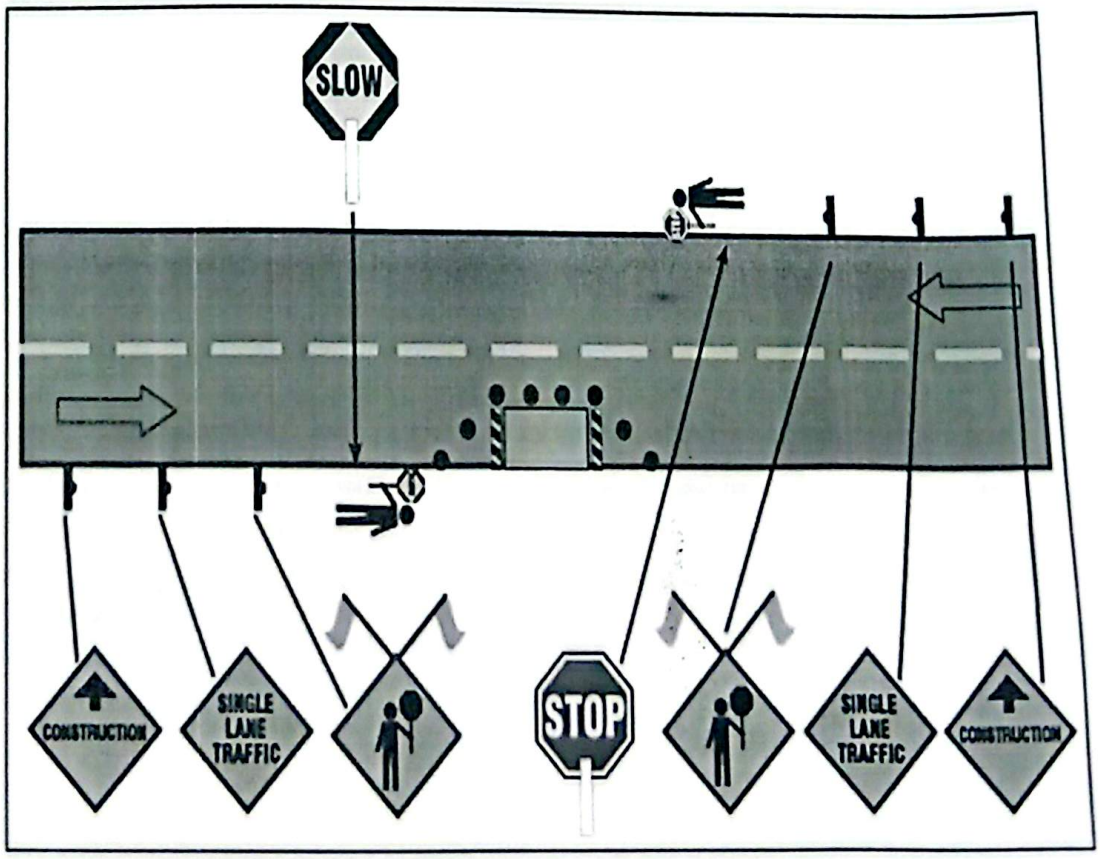
A large number of studs will be used throughout the project site to control vehicle speed. High profile and low-profile studs will be used at places according to their requirement. They shall be used to reduce vehicle speed, segregate lanes, at diversions, at access and egress routes, near schools and public places and near construction sites.

Traffic Triangles

Traffic triangles will be used to alert other drivers to issues ahead of them on the road. Commonly it is used when a vehicle is parked or is disabled near moving traffic; it alerts other drivers at a safe distance for them to slow down.

Revolving Lights

For night time use or low-light situations revolving lights will be used to convey the other road users about start of construction area and signaling the other drivers and road users to drive slowly and carefully.



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Proposed Schematic Diagram for Traffic Diversion

Review and Improvement

Continuous improvement of this plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement:

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of traffic management.
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non- conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Make comparisons with objectives and targets.

Maintenance

All vehicles and machinery used during the Project shall be regularly maintained and repaired where necessary. In this regard, all construction vehicles used during the Project shall be inspected by an appropriately qualified mechanic at regular intervals following the commencement of the Project. The Project Managers shall ensure that regular inspections are undertaken of construction vehicles to ensure that they are in good working order and are not overloaded. Gravel roads shall be sprayed with water to limit the generation of dust (where economically viable and environmentally acceptable).

Any potential road hazard or vehicle defect which may render a vehicle or road unsafe for use shall be immediately reported to the Project Managers who shall ensure that the vehicle/road is not used until the necessary repairs have been undertaken.

It will responsibility of contractor to maintain the road and any part of damaged road will be rehabilitated by the contractor.

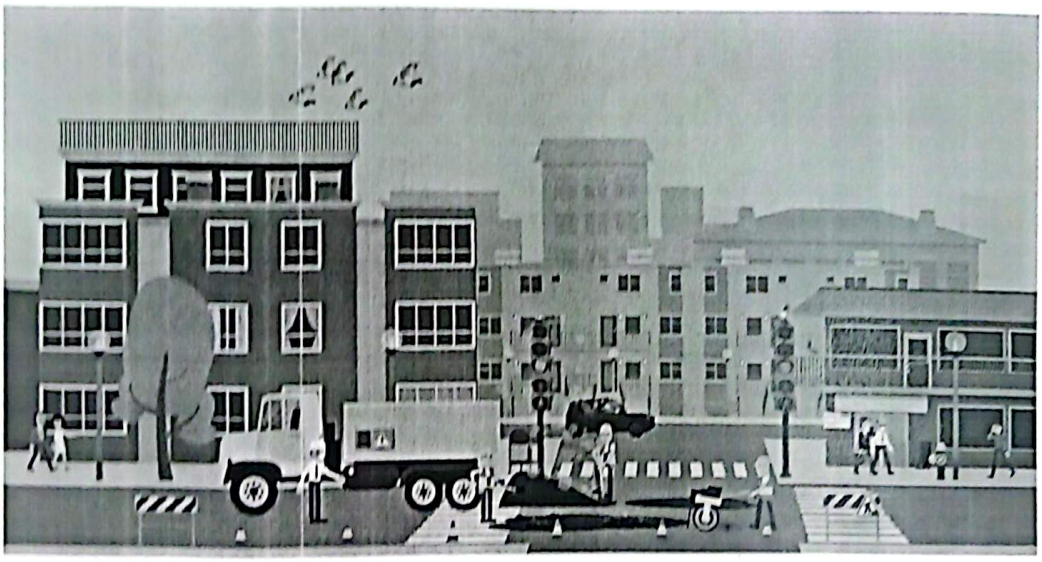
Transport of Equipment and Materials

It will the responsibility of the Contractor to ensure that all equipment and/or materials transported to or from Site shall be appropriately secured to, or contained in, vehicles. No construction vehicles shall be loaded in excess of its manufacturer-specified weight bearing capacity. All vehicles used during the Project shall have the appropriate load-bearing capacity for the materials and/or equipment intended to be transported. Drivers shall be appropriately trained in driving techniques applicable to specific loads where necessary.

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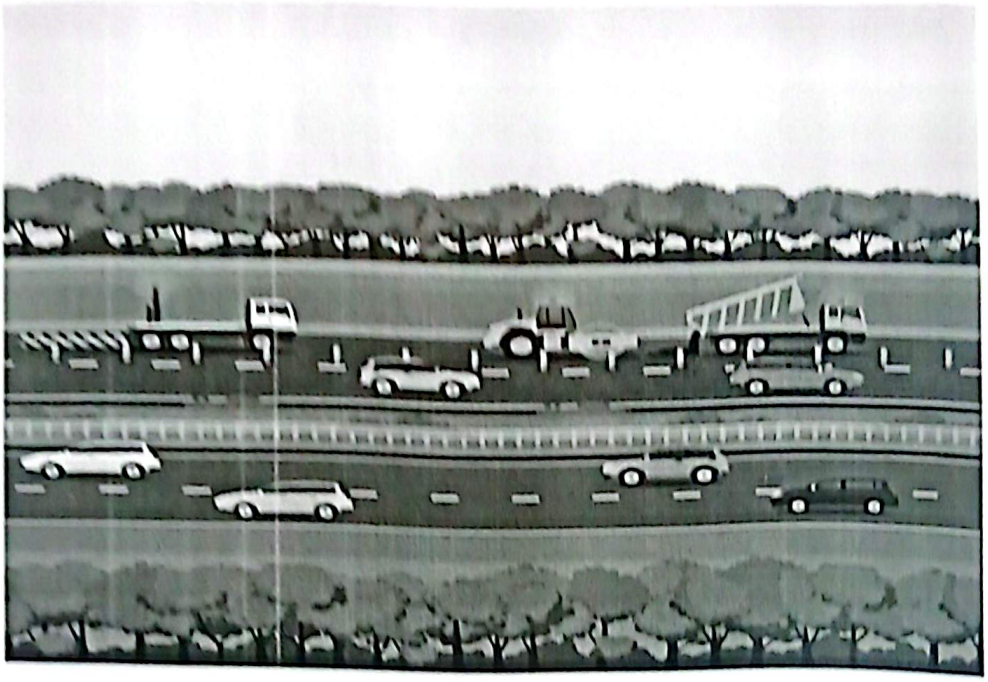
Proposed Signs or Traffic Diversion Equipment's



View of Traffic Management during Construction [5]

[5] https://trafficplanscompany.com.au/blog/what-do-I-need-to-know-when-working-on-a-vicroads-road/

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A View of Traffic Management during Construction (Two Lane roads)

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ANNEXURE-C

DUST MANAGEMENT PLAN

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DUST MANAGEMENT PLAN

General

The purpose of this plan is to describe the measures that the project shall take to ensure that the risk of emissions from dust generated by site operations during construction are minimized and that best practice measures are implemented.

Dust emissions from construction can cause ill health effects to Contractor staff along with nuisance and annoyance to members of the local community. Dust will be controlled through:

- Elimination
- Reduction/Minimization
- Control

Methodology

The following methodology will be undertaken for each project section:

Step 1 – IDENTIFY THE DUST GENERATING ACTIVITIES

Construction activities that are likely to produce dust will be identified. The activities that will be taken into account are:

- Haulage Routes, Vehicles and Concrete Batching Plant
- Roads, surfaces and public highways
- Static and mobile combustion plant emissions
- Tarmac laying, bitumen surfacing and coating
- Materials Handling, Storage, Spillage and Disposal
- Storage of material
- Stockpiles
- Spillages
- Storage of Waste
- Site Preparation and Restoration after Completion
- Earthworks, excavation and digging
- Storage of spoil and topsoil
- Demolition
- Construction and Fabrication Processes

Step 2 – Implement Best Practice Measures to Control

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Based on the nature of the activity producing the dust, the likelihood of dust being produced and the possible consequence of dust based on the sensitive receptors, the most effective control measure will be identified and implemented.

Step 3 – Monitor effectiveness of control

Supervision consultant will have the responsibility to ensure that dust control measures are being implemented and are effective.

Step 4 – Record and report result of monitoring

All inspections, audits and results of monitoring will be recorded and kept as part of the site filing system.

Optimum site layout

- Dust generating activities to be conducted away from sensitive receptors
- Supply of water for damping down.
- Good housekeeping and management
- All employees will be briefed on the Risk Assessment and Method Statement before starting work.

Training

All Contractor staff will be required to attend training seminars as already mentioned in the EMP document.

A site-specific induction will also be required before being allowed to work on site. These will include site-specific sensitive receptors and details regarding dust control measures to be taken.

Toolbox talks on air pollution and minimizing dust emissions will be provided on a regular basis to contractor staff.

Identification of Dust Generating Sources and Control Methods

Haulage Routes, Vehicles and Concrete Batching Plant	
Dust Source	**Dust Control Methods**
Major haul roads and traffic routes	Haul roads will be dampened down via a mobile bowser, as required.
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	Site traffic will be restricted to constructed access roads as far as possible. Site speed limit will be set at 10 mph as this will minimize the production of dust.

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Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	The number of times a material will have to be handled will be kept to a minimum to prevent double handling and ensure dusty materials are not handled unnecessarily.
Transport of fine dusty materials and aggregates.	Closed tankers will be used or sheeted vehicles.
Vehicle loading/unloading materials on to vehicles and conveyors.	Dusty materials will be dampened down Drop heights will be kept to a minimum and enclosed where possible.
Storage of Materials	
Bulk cement, bentonite etc.	Bentonite will be delivered in tankers and stored in dedicated enclosed areas. Bulk cement will be transported through tractor trollies or trailers.
Fine dry materials	These will be protected from the weather and by storing in appropriate containers and indoors, where necessary.
Storage location	Material will be stored in dedicated lay-down areas.
Storage of Stockpiles	
Stockpile location	Stockpiles will be placed so as to minimize double handling and facilitate the site restoration.
Building stockpiles	Stockpiles, tips and mounds will not be stored at an angle greater than an angle of repose of the material.
Small and temporary stockpiles	Where possible, stockpiles will be placed under sheeting. Dusty material will be damped down. Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Large and long term stockpiles	Long-term stockpiles will be vegetated and stabilized as soon as possible. Stock piles will be dampened down until stabilized, where necessary.

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	Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Waste Material from Construction	
Disposal method	A dedicated lay-down area will be available for waste. Waste will not be allowed to build up and will be disposed of at the designated locations as per EMP.
Site Preparation and Restoration	
Earthworks, excavation and digging	These activity areas will be kept damp where required and if possible, will be avoided during dry and windy periods.
Completed earthworks	Surfaces will be stabilized by re-vegetation as soon as possible, where applicable.
Construction and Fabrication Process	
Crushing of material for reuse, transportation and disposal	Authorization will be obtained from supervision consultant before using any mobile plant on site for activities such as crushing and screening. Any crushing or screening activities will be located away from sensitive receptors.
Cutting, grinding, drilling, sawing, trimming, planning, sanding	These activities will be avoided wherever possible. Equipment and techniques that minimize dust will be implemented. Water will be used to minimize dust.
Cutting roadways, pavements, blocks	Water sprinkling to be used.
Angle grinders and disk cutters	Best practice measures will be used such as dust extraction.

Monitoring Arrangements

Monitoring will be conducted at sensitive receptor locations in the project area as provided in the EMP. Furthermore, at locations where PM levels are exceeding applicable guidelines, additional stringent measures will be implemented at the respective location(s) in the project area to ensure dust levels are controlled as far as possible.

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ANNEXURE-D

OCCUPATIONAL HEALTH AND SAFETY PLAN

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OCCUPATIONAL HEALTH AND SAFETY PLAN

GENERAL

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the workplace or workplaces; and, specifying how consultation, training and information are to be provided to employees at various workplaces.

- Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.
- The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

Screening and regular unannounced checking of workers

- As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.
- In addition to this, the PMU will also undertake sudden, unannounced checks on workers to look for diseases such as HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

Minimizing hazards and risks at the workplace.

To ensure safety at all work sites, the following will be carried out:

- Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
- Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
- Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
- Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.
- Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.

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- Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;
- Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined at more than a slope of 1 vertical and 3 horizontals.
- Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.
- Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.
- Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

Provision of Personal Protective Equipment

- Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:
- High visibility clothing for all personnel during road works must be mandatory.
- Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.
- Safety belt shall be provided to workers working at heights (more than 20 ft.) such as roofing, painting, and plastering.
- Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
- Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.
- Eye and face protection equipment shall be provided to all welders to protect against sparks.
- Respiratory protection devices shall be provided to all workers during occurrence of release of particulate matter, or vehicular emissions.

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- Safety nets shall be provided when workplaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.

The specific PPE requirements for each type of work are summarized below.

PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft.), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and respirator.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.

Procedures to Deal with Emergencies such as Accidents, Sudden Illness and Death of Workers

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

Provision of dispensaries by the individual contractor.

- A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.
- A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.
- Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

Record Maintenance and Remedial action

The PMU will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed

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every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigate actions to change any unsafe or harmful conditions.

Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

Awareness Programs

- The PMU will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:
- Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.
- Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

Nomination of a Health and Safety Focal Person

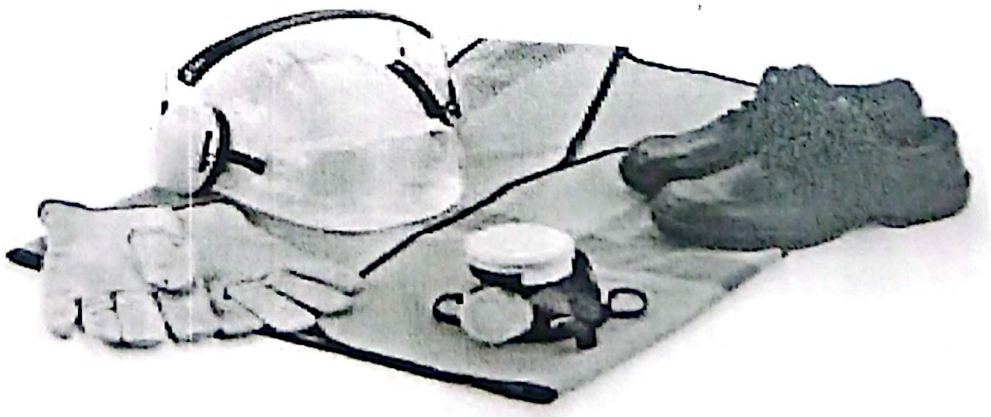
1. Within each site (especially if different sites are being implemented by different contractors), a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:
2. Function as the focal person/representative for all health and safety matters at the workplace;
3. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;
4. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;
5. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;

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6. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.



A View of PPEs



Proposed PPEs for the project

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ANNEXURE-E

SANITATION PLAN

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SANITATION PLAN

Introduction

This plan outlines the measures that can improve conditions of sanitation at construction sites during the construction and operation phase.

Purpose of the Plan

The plan intends to ensure sanitization including the control of water supplies, excretion and wastewater disposal, refuse disposal, vector of diseases, housing conditions, food supplies, and handling, atmospheric conditions, and the safety of the working environment.

Management of Sanitation during the Construction Phase

Responsibility

The Health and Safety Inspector designated by CC shall also inspect sanitation conditions and ensure the safe working environment for workers.

Location of camp Sites

The construction camps shall be located at least 300-500 meters (subject to availability) away from the residential community. The accommodation and ancillary facilities for labor shall be constructed and maintained to standards and scales approved by the Resident Engineer. The camps must be located such that the drainage from and through the camps shall not endanger any domestic or public water supply. All sites must be managed to avoid ditches and depressions to minimize nuisance due to stagnant water.

Water Supply

An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing, and laundry purposes. Potable water supply systems for labor camp occupants shall meet the drinking water quality standards. In addition, the design of water system facilities shall be based on the suppliers' Engineer's estimates of water demands. The drinking water must be monitored regularly for drinking water quality parameters. At all construction camping and other workplaces, good and sufficient water supply shall be provided and maintained to eliminate chances of waterborne diseases to ensure the health and hygiene of the workers

Toilet Facilities and Hygiene

According to health and safety guidelines, OR-OSHA number of toilets required at a construction site is one toilet for 20 workers. Within the premises of every workplace, toilets, and urinals shall be provided in an accessible place, and the accommodation, separately for each of them, as per standards prevailing in the province and country. Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located, to be accessible. A toilet room must be located within 200 feet of the camp. No toilet may be closer than 100 feet to the kitchen and sleeping area. These toilets must be distinctly marked by signs printed in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols. Urinal troughs in privies must drain into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit Proper facility for hand washing and other cleaning activities to be provided as follows:

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- Provide individual hand towels from a sanitary dispenser and receptacles for disposing of waste towels
- Providing hand soap and industrial hand cleaner for removing paints and other contaminants;
- Prohibited use of gasoline or solvent for hand washing;
- Keep the floor of facilities dry to prevent spills and falls.

Waste Disposal

The sewage system for the camp must be designed, built, and operated in compliance with the relevant legislation so that no health hazard occurs and no pollution to the air, ground, or adjacent watercourse takes place. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed of hygienically. Unless otherwise arranged for by the local sanitary authority, arrangements for the disposal of excreta should be done in the already existing sewerage system in the area. On completion of the work, all such temporary structures shall be cleared away, all rubbish but excreta tank and other disposal pits or trenches filled in and effectively sealed off, and the outline site left clean and tidy, at the Contractors' expense, to the entire satisfaction of the engineer

Maintenance of Sanitary Facilities

Proper maintenance of toilets and other sanitary facilities should assure by the health and safety inspector. Toilets and other sanitary facilities shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. The receptacles shall be tarred inside and outside at least once a year. All buildings, rooms, equipment, and the grounds surrounding them shall be maintained in a clean and operable condition, and be protected from rubbish accumulation. All necessary means shall be employed to eliminate and control any infestations of insects and rodents within all parts of any labor camp.

Management of Sanitation during Operational Phase:

A proper sanitation plan is to be adopted for maintaining hygienic conditions during the operational phase of the project. These include

- Site Clearance
- Sewage and Storm Water Drainage Clearing, and
- Solid Waste Management.

Site Clearance

The CC will assure the clearance of construction machinery, vehicle, and other equipment used during the construction period after the completion of the project.

Storm Water and Sewage Clearance

One of the main issues that may arise during the construction and operational phase is the clogging of drainage and sewer pipelines as a result of construction material, oil spillage from vehicles, and throwing of solid waste by the road users due to lack of bins into the nearby drainage and sewer pipes, as the blockage of these drainage pipes will cause overflow of water on the road, which will have negative impacts on the road in form of deterioration of road surface as well as a source of water-borne diseases in the area.

Responsible Authorities

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In case of storm water drains and sewer pipes clogging, the concerned department PMU-NHA is responsible for un-clogging these sewer and drainage pipelines.

Solid Waste Management

Municipal solid waste produced as a result of commercial activities, by road users, and from nearby residential communities should be collected and managed properly by the concerned department. Waste bins should be placed along the roads, regular cleaning of the road should be carried out twice a day and at least one sweeper should be deputed for the whole stretch of the project site to assure regular cleaning.

Awareness and Training

Training and awareness sessions shall be conducted for workers before the commencement of the project. The implementation of a sanitation plan would be more effective if the importance of hygiene; sanitation and safety are known to the workers.

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ANNEXURE-F

BATCHING AND ASPHALT PLANT MANAGEMENT PLAN

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Batching and Asphalt Plant Management Plan

The Contractor shall ensure the use of a relatively new, well-maintained hot mix plant (batch type) so that any emission conforms to the EQS norms and be fitted with a dust extraction unit to avoid prolonged engine-powered equipment illness. The hot mix plant, WMM plant, batching plant, generator set & crusher shall be located more than 500 m from any community or residence. The concessionaire has to obtain necessary consent/clearance from the state pollution control board to operate the hot mix plant, WMM plant, batching plant & crusher before the commencement of works. All vehicles, equipment, and machinery needed for construction will be regularly maintained to ensure that pollution emission levels conform to EQS norms. All vehicles will be fitted with silencers. Construction vehicles, machinery & equipment will move or be stationed in designated areas to avoid compaction of the soil to ensure the preservation of the topsoil for agriculture.



Tentative Design Of Batching Plant



Tentative Design of Asphalt Plant

Where it is necessary to use some such substance that can cause injury to the health of the workers, the contractor shall provide suitable protective clothing or appliances to his workers, viz. Earplugs, helmets, or dust masks. Additionally following management measures will be adopted

a. **Protection Of Adjoining Properties From Impacts Of The Asphalt Plant Operations**

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The asphalt plant area shall be visibly demarcated on the ground, while the asphalt plant shall be fenced with gate and security facilities. Materials spilled into the adjoining property shall be cleaned immediately and any damage to neighbors' crops or structures (e.g. fence) shall be compensated and/or repaired immediately by the Contractor.

b. Ecological Protection

- To minimize loss of vegetation cover in the plant site, clearing shall be kept within the minimum required area;
- The asphalt plant is prohibited from using wood fuel and workers shall not be allowed to collect wood from the wooded area around the area;
- The Contractor shall rehabilitate the asphalt plant site upon project completion, it shall undertake revegetation of the site using vegetation species found at the site. No exotic vegetation species shall be used for revegetation.

c. Noise Control

Noise generated within the asphalt plant poses health hazards primarily to workers. Noise in the asphalt plant site shall mainly be from operating heavy equipment. All equipment operators shall be provided ear plugs and will be rotated to prevent prolonged exposure to high noise levels.

The site office and accommodation facilities shall be located distant from the asphalt plant and the office and accommodation to control noise propagation.

d. Dust Control

Dust in the asphalt plant will be generated during producing asphalt concrete material and transporting. The most significant concern with dust is within the asphalt plant site where workers will be exposed to health hazards associated with dust. To control dust within the plant site the following measures shall be implemented:

- Workers assigned at the asphalt plant will be provided dust masks as part of the PPE;
- Aggregate materials small than 7 mm being transported shall be covered;
- Roads within the plant and access road to the highway shall be watered during the hauling of materials;
- A dedicated water truck shall be stationed at the asphalt plant site for dust control and firefighting

e. Prevention And Control Of Erosion And Siltation

To control erosion and siltation at the asphalt plant site, the Contractor shall implement the following in addition to measures cited in CEMP Section on Erosion and Sedimentation Control.:

- Vegetation clearing and removal of overburden shall be kept to the minimum required;
- Interceptor and drainage channels shall be installed around the asphalt plant

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- Water shall be pumped out as needed; water can be used for dust control and other uses suitable to the quality of the impounded water;

f. Pollution Prevention

- The asphalt plant shall be provided with a septic tank for sewage collection and treatment
- Above ground single wall fuel tanks shall be on hard standing and with containment wall and sump for oil-water separation;
- Refueling of equipment shall be supervised and on hard standing;
- Equipment servicing shall be on hard standing and drip pans used to collect leaking fuel and lubricant;
- Storage areas for hazardous materials including waste hazardous materials shall be secured, with roofing, on hard standing and containment wall;
- Hazardous materials shall be stored in secure containers and labeled;
- Hazardous and non-hazardous wastes shall be disposed of in authorized disposal sites:

g. Occupational Health, Safety, and Security

The asphalt plant site shall be fenced with gates and security facilities.;

- Workers shall undergo orientation and knowledge before commencing work at the site;
- Only workers, staff, and authorized visitors shall be allowed entry into the site;
- Curfew shall be imposed for workers residing within the site;
- The site shall be provided with sanitation facilities and sufficient water supply;
- The site shall be provided with a first aid kit;
- Use of PPEs while on duty shall be strictly imposed;
- Access to hazardous areas is limited to authorized workers and staff;
- Fire-fighting equipment shall be provided in strategic locations ions around the facility;
- Muster points and emergency evacuation routes shall be provided;
- Emergency procedures shall be established and workers trained in emergency response;
- The contractor should comply with the safety and security requirements for the operation
- Only authorized and certified operators shall be allowed to operate heavy equipment and vehicles;
- Equipment and vehicles shall undergo regular servicing and maintenance;
- Mobile equipment shall be provided with audible backing signals;

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Safety and Environmental Management

- The Contractor will be expected to adhere to the environmental and safety requirements described in the Environmental Management Plan (EMP). Management measures to be implemented. During the plant operation will include:
- Gate access will be maintained to control access
- Portable toilet facilities will be used within the plant site offices.
- These facilities will be maintained as required. The grey water created will be disposed of into a suitable tank and then pumped out and trucked to the municipal treatment location
- Provide for environmental management in accordance with the EMP for erosion, sediment control, oil/ water separation, control of noxious weeds, control of air emissions, drainage and future reclamation

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ANNEXURE-G

SPILL PREVENTION AND CONTINGENCY PLAN

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Spill Prevention and Contingency Plan

Purpose of the Plan

The purpose of the plan is to respond to spills to minimize:
Hazards to workers and the public;
Pollution of land and water;
The extent of the affected area;
- Adverse impacts on the environment, vegetation, and wildlife; and
- Disturbance during cleanup.

The Plan is intended to initiate an immediate response with trained personnel and equipment to clean up any accidental spill and ensure minimal impact on the land or aquatic environment in the immediate and surrounding area. The Plan includes procedures for cleanup, notification of appropriate authorities when necessary, containment, disposal, and monitoring, including details regarding equipment and personnel allocations.

1. Pre-Spill Preparation

Considering that this is a road construction project which involves limited quantities of hazardous materials on site, the possibility of large spills is generally low, and a corresponding spill contingency plan is put together.

a. Hazard Identification

The hazardous materials that will be used and will require storage are diesel fuel, lubricating materials (petroleum-based), prime coat, bitumen, and concrete additives. Diesel fuel will be stocked in above-ground fuel tanks at the crushing plant site, the batching plant site, and the asphalt plant sites. Lubricating oil will be stored in steel drums at the equipment maintenance yard. Bitumen and the prime coat shall be stockpiled at the asphalt plant. The bitumen shall be delivered in bulk and shall be contained in reusable tanks.

Hazardous waste materials that are expected to be generated during road construction are used oil, oil-tainted wastes (fabrics, oil filters, etc), and bitumen solvents. These shall be stored in a covered and secured storage facility at the plant sites. A Workplace Hazardous Materials Information System sheet will identify all hazardous compounds coming on site and this information will be available to all personnel. Workplace Hazardous Materials Information System training will be provided to all employees.

b. Risk Analysis

The threat of spill during the construction activities will be from petroleum products, mainly diesel fuel and the prime coat/tack coat. Spillage of these materials will be contained quickly using the spill equipment kept on site. In the unlikely event of a major spill, emergency response procedures will be activated. This Spill Prevention and Contingency Plan is primarily aimed at hydrocarbon spills due to the large amount of fuel in storage.

c. Initial Alerting

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Timely and accurate reporting of an accidental spill can help to ensure a quick and efficient response. This Plan includes detailed information regarding both general and specific notification procedures.

2. Spill Prevention

The Contractor will maintain diesel fuel tanks in Campsite, quarry site, and asphalt plant. Bitumen and additives will be stored in an asphalt plant. The equipment maintenance shop will be located within the campsite. For spill prevention, the Contractor shall implement in these sites the following measures:

a. Single wall above ground fuel tanks shall be provided with hard standing and containment wall; for refueling of vehicles, a fuel pump and refueling station with hard standing will be provided

b. The equipment workshop/repair shop shall be provided with hard standing and oil drip pans shall be used during vehicle and equipment repair and maintenance work. Used oil and oil-tainted materials shall be collected and contained in appropriate containers and stored in the hazardous waste storage facility.

c. Bitumen heater, the pump shall be installed on hard standing; spilled bitumen shall be cleared immediately;

d. Empty bitumen drums be stored properly, the drums shall be stored upright to prevent residual bitumen material from spilling onto the ground. Spilled bitumen should be scraped and stored in drums for disposal.

e. Hazardous wastes expected to be generated at the asphalt plant site shall include used oil, oil-tainted materials, and solvents (used for maintaining bitumen distributor); waste bitumen, i.e. bitumen spills. The hazardous wastes shall be temporarily stored in a covered and secure facility. It will have a containment wall and be on hard standing. The hazardous waste shall be disposed of through authorized waste disposal companies.

Roles and Responsibilities

- Project Manager Organize the relevant management personnel to establish a regular meeting system for learning Spill Prevention and contingency plan
- Site Manager Develop an inventory of all oil/hazardous material stored or used during construction; Prepare a basic facility diagram or sketch for any storage areas, including pipe yards and temporary storage areas. The diagram should include locations of oil-filled containers, the direction of run-off, emergency evacuation routes, and assembly areas. Provide spill prevention, containment, and clean-up equipment, and keep it available on-site; Perform daily inspections of all equipment, storage tanks, and/or container storage areas; Repair all leaking equipment, machinery, or tools immediately. If items cannot be repaired, remove them immediately from the project site; Maintain a minimal spill kit (absorbent diapers, plastic bags, gloves, etc.) for each piece of hydraulically operated equipment and personnel vehicles within the project area;
- Environment, Health, and Safety Officer establish a regular meeting system for Spill Prevention and a contingency plan Teach awareness-level training at the initial project

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environmental training session; Ensure further training is available for other new project personnel; Audit training records kept by the Contractor as necessary to prepare a secondary containment plan for any hazardous material storage within the project area. Perform daily inspections of all equipment, storage tanks, and/or container storage areas; Other Staffs Cooperate & assist the site Engineer and HSE officer to do the daily inspections, make records, and immediately inform if anything happened

Standard Procedure for Oil Spill

Consider the safety of all persons first. If any person has been affected or injured by the spill, first aid should be applied and medical attention rendered as soon as possible.

Identification of Spill

a. All employees must inform the Site Engineer at once, of a spill.

b. If the employee can safely stop the spill at the source, this should be done.

c. The Shift Supervisor will investigate and confirm the spill. He will:

- Determine the source, if possible
- Assess the size and nature of the spilled material
- Mobilize a response team to take immediate action to stop or reduce the spill and contain it, without endangering the health and safety of the workers or local population
- Take action to reduce hazards to persons working near the spill
- Contact the Ministry of Environment where necessary.

Response

Take any actions necessary to prevent the spill from contaminating groundwater or offsite surface water (e.g. clean-up using an absorbent material mixed with sand).

When responding, consider the safety of all persons first.

a) The oil should be prevented from escaping to storm water drains;
b) Collect the oil or soak up material using absorbent material.
c) Once the spill cleanup is completed, place the used absorbent pads or contaminated materials into drums for appropriate disposal.
d) Contaminated soils should be excavated and replaced with clean fill.
e) Oil-soaked sand or soil will be removed where necessary. The oil-tainted soil will be held in a treatment site where it will be laid out in windrows to allow oxidation of the oil.

The monitoring of the implementation of the Spill Prevention and Contingency Plan shall be carried out by the HSE officer as part of regular self-monitoring.

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ANNEXURE-H
EMERGENCY RESPONSE PLAN

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Emergency Response Procedure

Purpose

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the project. The aim of the Emergency Response Procedure is to:

i. Ensure all personnel and visitors to the subject sites are given the maximum protection from unforeseen events.
ii. Ensure all personnel are aware of the importance of this procedure in the protection of life and property.

Emergency Preparation and Response Measure Scope

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

- Construction Accident
- Road & Traffic Accident
- Hazardous material spills
- Structure collapse or failure
- Trauma or serious illness
- Sabotage
- Fire
- Environmental Pollution
- Loss of person
- Community Accident

Responsibilities

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in Tabl below.

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Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	↓ Overall control of personnel and resources. ↓ The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. ↓ Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	↓ Overall responsibility for activating emergency plan and for terminating emergency actions. ↓ Be alternative to emergency response chairpersons. ↓ Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. ↓ Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. ↓ Notify outside authorities if assistance is required. ↓ Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. ↓ Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. ↓ Establish and appoint all emergency organization structure and team. ↓ Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. ↓ Ensure resources available to purchase needed emergency response equipment and supplies. ↓ Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. ↓ Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. ↓ The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.
Security Team	↓ Ensure that the exit route is regularly tested and maintained in good working order.

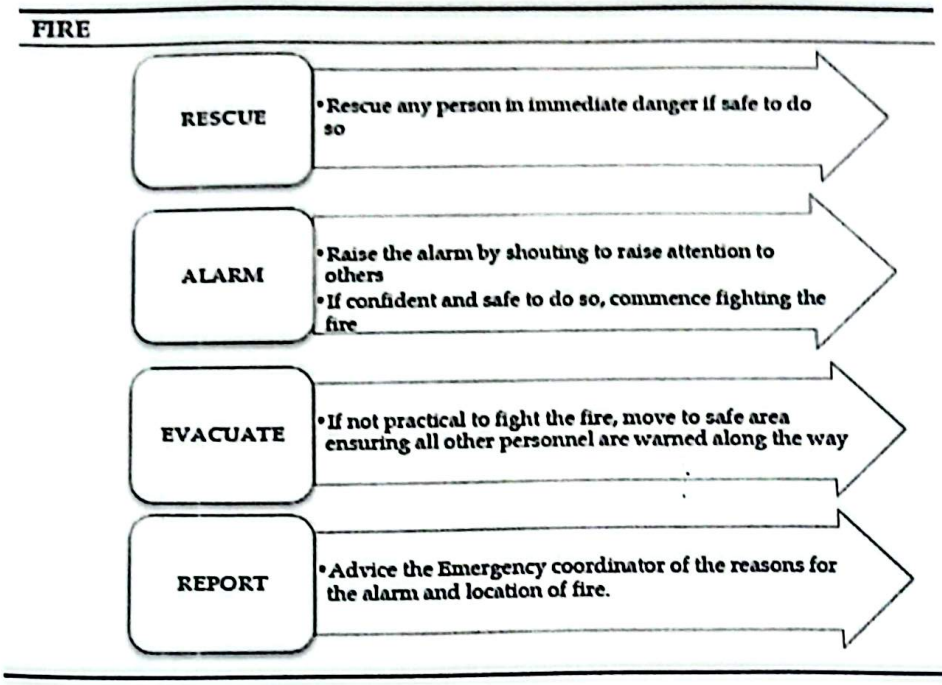
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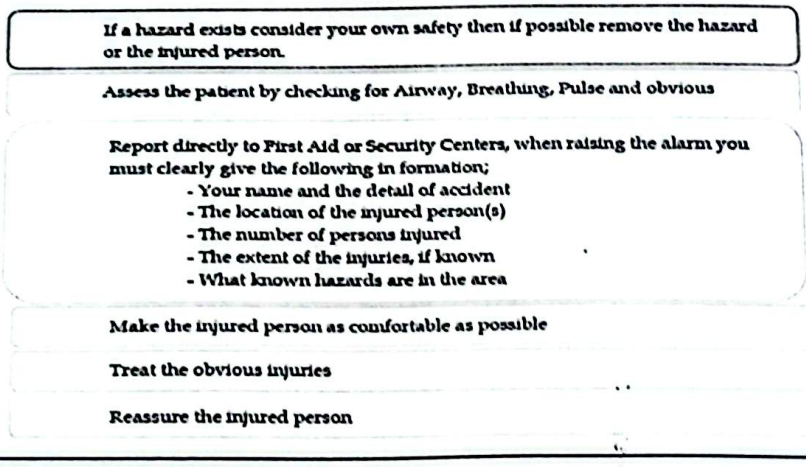
Action Group	Responsibility
	♣ Maintain station at the security gate in most suitable location to secure the area during an emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel ♣ Assist with timely activation of services during an emergency ♣ Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene. If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.
Rescue & Medical Team	♣ Protect the injured from further danger and weather ♣ Provide treatment to the victim(s) to the best of their ability to first aid and then transfer to hospital ♣ Remain familiar with the rescue activities and rescue apparatus ♣ Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	♣ Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. ♣ Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	♣ Call up of personnel into the safe location for protective life and property. ♣ Take immediate and appropriate action while Emergency Response Team is being mobilized. ♣ Keep in touch with the Emergency Commander ♣ Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. ♣ Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	♣ All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. ♣ Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

Procedure

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Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.





Emergency Procedure for Serious Accident

Communication with Authorities / Press at Site

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoiding politely, at all costs, with the terse comment that "the matter is under investigation and relevant information when available will be provided by our Head Office" Do not ever give your opinion or story.

First Aid Persons

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- Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,
- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

General Administration Team

Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

Security Team

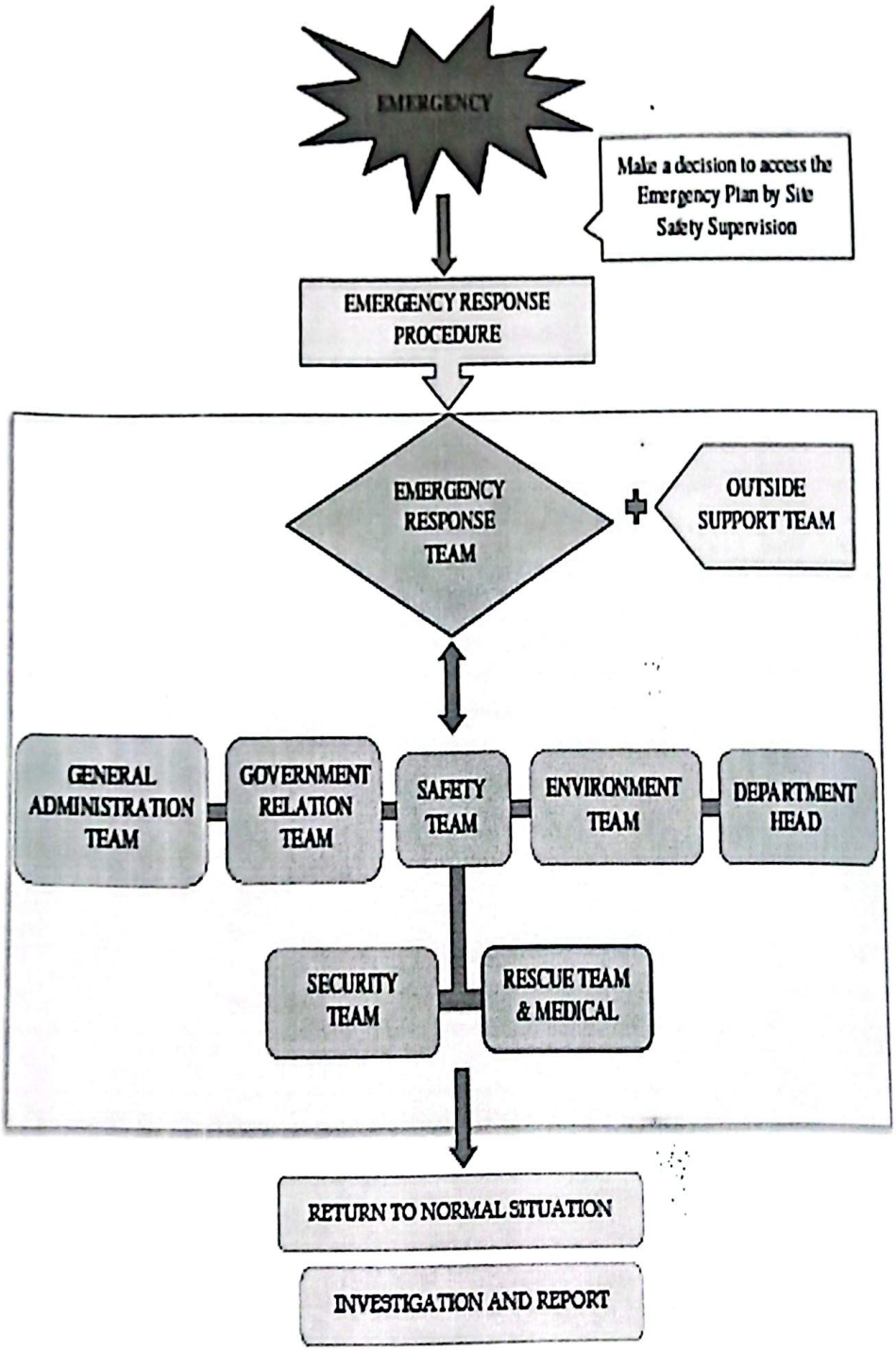
If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.

Prevent access to the site of unauthorized personnel (press, etc.).

Emergency Coordinator

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.

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Note: Name of contact person and call number from Owner/Contractor to be determined.

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INCIDENT AND ACCIDENT REPORT

Section A: Identification Data

Report No:	Date of Reported:	Reporter:	Sign:
Job Title:		Company Name:	

Section B: Violence Rate

Accident Violence: ☐ 01 Death ☐ 02 Serious Injury ☐ 03 Lost Time Injury ☐ 04 First Aid ☐ 05 Not Injury ☐ 06 Near Miss

Property Damage Cost: ☐ 1-2,000 USD ☐ 2,001-10,000 USD ☐ 10,001-50,000 ☐ > 50,001

Section C: Environmental Impact

Affected area	☐ Construction area	☐ Public area	
Receptor	☐ None	☐ Workers	☐ Community
Type of pollution	☐ Physical	☐ Chemical	☐ Biological
Toxicity	☐ Non toxic	☐ Low - toxic	☐ High - toxic
Return to Normal	☐ 1 day	☐ 1 day to 1 week	☐ ≥ 1 week
Cumulative impact	☐ Non cumulative	☐ Cumulative	

Section D: Injured/Illness Employee

1 Name:	Sex: ☐ Male ☐ Female	Date of Birth: Month	Day	Year	Age:	Regular Job Title:	Experience: In this job title: Years Weeks	In this Project: Years Weeks

Site:	Company:	Reference:	Phone No:	Social Security Number:

Part of Body Injured or Affected:

☐ Head ☐ Hands ☐ Face ☐ Nose
☐ Eyes ☐ Legs ☐ Teeth ☐ Neck
☐ Trunk ☐ Toes ☐ Elbow ☐ Shoulder
☐ Back ☐ Ankle ☐ Wrist ☐ Foot
☐ Arms ☐ Thump ☐ Fingers ☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration ☐ Amputation ☐ Puncture ☐ Fracture
☐ Strain & Sprain ☐ Burns ☐ Contusion ☐ Dry Heat Friction
☐ Hernia ☐ Foreign Body ☐ Chemical ☐ Contamination
☐ Skin (Occupational) ☐ Rash ☐ Irritation

Remark: .....

2 Name:	Sex: ☐ Male ☐ Female	Date of Birth: Month	Day	Year	Age:	Regular Job Title:	Experience: In this job title: Years Weeks	In this Project: Years Weeks

Site:	Company:	Reference:	Phone No:	Social Security Number:

Part of Body Injured or Affected:

☐ Head ☐ Hands ☐ Face ☐ Nose
☐ Eyes ☐ Legs ☐ Teeth ☐ Neck
☐ Trunk ☐ Toes ☐ Elbow ☐ Shoulder
☐ Back ☐ Ankle ☐ Wrist ☐ Foot
☐ Arms ☐ Thump ☐ Fingers ☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration ☐ Amputation ☐ Puncture ☐ Fracture
☐ Strain & Sprain ☐ Burns ☐ Contusion ☐ Dry Heat Friction
☐ Hernia ☐ Foreign Body ☐ Contamination ☐ Chemical
☐ Skin (Occupational) ☐ Rash ☐ Irritation

Remark: .....

Section E: Accidents/incident Details

Date Accident/Incident Occurred:	Time Accident/Incident Occurred:	Exact Location of the Accident / Incident:

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Details of the actual Job Being done at the time:

Details of Accident / Incident / What actually happened?

Section F: Accident Cause (Basic cause mark X / Contributing cause, if any mark O)

UNSAFE CONDITIONS		UNSAFE ACTS	
1	☐ Inadequately Guarded	1	☐ Operating Without Authority / Training
2	☐ Unguarded	2	☐ Operating at Unsafe Speed
3	☐ Defective Tools, Equipment, or Substance	3	☐ Making SHE Device Inoperative
4	☐ Unsafe Design or Construction	4	☐ Using Unsafe Equipment or Equipment Unsafely
5	☐ Hazardous Arrangement	5	☐ Unsafe Loading, Placing, Mixing
6	☐ Unsafe Illumination	6	☐ Taking Unsafe Position
7	☐ Unsafe Ventilation	7	☐ Working on Moving or Dangerous Equipment
8	☐ Unsafe Clothing	8	☐ Distraction, Teasing, Horse Play
9	☐ Insufficient Instruction	9	☐ Failure to use Personal Protective Devices
10	☐ Lack of system of work	10	☐ Lack of effective instruction or supervision

Why was the unsafe act committed? _____ Why did the unsafe condition exist? _____

Section G: Guide to Corrective Action (Base on the cause checked above, I am taking the following corrective action)

UNSAFE ACT	UNSAFE CONDITION	If Supervisor can't handle, then recommend to
☐ Stop the Behaviour	☐ Remove	☐ Site Engineer, or
☐ Study the job	☐ Guard	☐ Site Manager, or
☐ Instruct (tell-show-try-check)	☐ Warn	☐ Project Manager, or
☐ Follow Up	☐ Supervisory Training	☐ Safety Committee
☐ Enforce		

Detail below any immediate remedial actions that have been taken:

Detail below any corrective and preventative actions that could be taken to prevent future re-occurrence	Responsible	Completion Date

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Section [illegible]: Witness Statement	
Witness Name	Interviewer Name

Section [illegible]: Reviewed & Recommended By			
Recommendation:			
Reviewed By:	Position:	Signature	Date

Remarks: [illegible] Accident or Incident happened with [illegible] injury [illegible] to the [illegible] must further report to Safety Department;

[illegible] First Aid Case will not applicable to this form;

[illegible] The accident report shall submit to Safety Department within [illegible] days;

[illegible] Attached the photograph or sketch the location of accident / incident.

ANNEXURE-I

RESOURCE CONSERVATION PLAN

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RESOURCE CONSERVATION PLAN

Most of the resources in this world are finite and nonrenewable. We are completely dependent on these resources to fulfill all our daily requirements. Therefore, sustainable development calls for the need to conserve resources in a way that meets the needs of the present generation as well as the future generation, especially non-renewable resources.

Objective of the Plan

The Resource Conservation Plan is intended to make an effort toward achieving sustainable development. The objective of the resource conservation plan is to: '

Minimize the use of natural resources; and,

Mitigate and prevent pollution from contaminating natural resources

Planning

Careful estimations of quantities of materials, fuel, water, and energy required directly or indirectly shall be done to avoid excessive or unnecessary wastage of these materials. In addition to this, pollution prevention strategies shall also be devised to prevent the contamination of resources. The estimations include the following: Estimation of construction material required for the project Estimation of fuel consumption for construction machinery, construction vehicles, and generators; Estimation of the energy requirements during all the stages of the project and Estimations of water consumption for construction activities and construction campsites. Strategies shall be planned to reduce loads on the identified resources to be consumed; Best management practices shall be devised to control or reduce pollution resulting from the activities during different stages of the project; and an inspector shall be assigned responsibility to oversee the ongoing activities to check the compliance of the planned strategies.

Execution of the Plan

The planned strategies shall be implemented to conserve natural resources including but not limited to the following:

Material.

Material supplied shall be in conformance with the estimated quantities and excess material shall be returned to the supplier

Material wastage shall be avoided by using best management practices

Waste produced during the project operation shall be disposed of safely to the designated disposal sites through approved contractors, and Reuse of the materials shall be appreciated.

Energy

Reduce trips and optimize routes to and from the construction site for all kinds of activities Regular maintenance of equipment and vehicles to avoid leaks and sustain efficient fuel consumption; Switch off idle equipment and vehicles to avoid wastage of fuel; Minimize warm-up time, and unnecessary acceleration and deceleration of the construction

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equipment and vehicles; Avoid unnecessary bumping of fuel for cooking in construction camps; Avoid unnecessary use of heating and cooling systems during extreme weathers events: Construction shall start in early hours of the day to avoid heat in summers and utilization of daylight and Alternate energy sources shall be considered for electricity generations during construction and operation to conserve fossil fuel as it is a non-renewable resource.

Water

Avoid using portable water or sprinkling, curing, and washing equipment and vehicles. Surface water or treated effluent can be used instead: Wastage of water should be controlled by providing proper valves and controlling the pressure of the water. Unnecessary equipment washings should be avoided; Awareness amongst workers shall be raised to conserve water and immediately report for any leaks detected; and Ensure protection of canal water from contamination resulting from construction activities.

Pollution

Emissions shall be reduced and controlled as far as possible and direct discharges to air shall be avoided by strictly adhering to the mitigation measures outlined in EIA reports Wastewater shall not be discharged directly into the canal and must be managed as per the recommendations presented in EIA; and Construction and demolition waste and municipal solid waste shall not be dumped and burnt openly, and shall be handled according to the preventative measures given in the report

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ANNEXURE-J

SOLID AND HAZARDEOUS WASTE MANGEMENT PLAN

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Solid and Hazardous Waste Management Plan

Management of solid and hazardous waste is one of the most important issues during the construction phase of the project. The major components of the workers' camp waste are garbage, putrescible waste, rubbish and a small portion of ashes and residues, wastewater from camps toilets and washing yards, etc. The construction waste will include wastewater, oil spillage from machinery, and solid waste (damaged or spoiled materials, temporary and expendable construction materials, etc.). Insecure and unhygienic disposal of wastes may cause the degradation of soil, land, and water resources. However, a criterion has been developed for solid and hazardous waste management at the site. The criterion for a plan is as follows:

- All the anticipated solid wastes should be collected through a properly designed solid waste management system. Enough containers should be placed inside the camps and within the construction area for the collection of various types of waste.
- These containers will help the component separation of various types of waste at the source. Classification will be based on organic waste, recyclable waste, reusable waste (for resource and recovery), and waste for disposal sites. Based on the conditions of the region, organic waste should be frequently collected to avoid odor problems.
- Recyclable, reusable, and waste for disposal sites should be collected twice a week and on alternate days and should be transferred to a properly designed disposal site.
- A special strategy for safe handling, storage, and use of hazardous substances/materials should be developed and ensured at the site;
- The sewage system for camps shall be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewater;
- Lined wash areas shall be constructed within the campsite or at the site, for the receipt of wash waters from construction machinery;
- Medical waste and construction waste should be handled with care;
- Pesticide use shall not be allowed at the site and for clearance of row;
- Construction waste i.e. Waste concrete, bricks, cement, etc. Should be disposed of at the designated areas; and.
- Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse, and recycling to reduce quantity of the waste for disposal.

Based on the above guidelines, the Contractor(s) will be responsible for the preparation of the Waste Management Plan before the commencement of construction activities and its implementation at the site after the prior review and approval from SC and the proponent

During the rehabilitation and widening of the construction and demolition waste is likely to generate. The contractor shall be responsible to manage all kinds of waste during the implementation of the project.

Storage/ Collection and Reuse of Construction and Demolition Waste

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This waste is best stored at the source; i.e., at the point of generation. If they are scattered around or thrown on the road, they may not only obstruct traffic but also add to the workload of the local body. The following methods shall be adopted such as:

Clearing and Grubbing (C &G):

- The material collected after C &G at the site is stored within an approved disposal site so that waste does not get scattered and does not become an eyesore.

The waste material is carted to a disposal site in tippers properly covered and disposed of at the disposal site.

Scarified / Dismantled Bituminous Material:

The material collected for the scarification of the bituminous road or from the dismantling of the existing road is stored at the site and preserved.

These materials may be mixed in the required percentage with GSB material to achieve the desired gradation and may be utilized in the medial filling. The material is carted by tippers to the stockyard and preserved for reuse.

Dismantled Concrete/Bricks Waste:

The materials are collected from different locations of the dismantling of bridges and other structures during road construction.

They are generally heavy and bulky and require a huge effort to handle such type of waste.

The material is generally stacked at or near the site and later disposed of in suitable locations.

The suitable and reusable materials are stacked separately for reuse.

Oil/ Battery/ Tyre Waste:

The oil waste is collected in the oil intereeptor constructed at each workshop location. Further, the oil is collected in the drums. Similarly, the batteries/ Tyres that are out of service and become un-usable are stored in a safe place

Those wastes when collected in sufficient amounts are generally sold in the market for re-use.

Hazards to the surroundings due to such waste are prevented and income to the pocket is added by just good practices

The proper record of such waste must be maintained at the site.

Waste from hot Mix Plant (Aggregate Dust):

The aggregate waste is collected near the plant and a considerable amount of waste shall be re-used as filled in the bituminous works. Dust at the plant site is to be reduced to a considerable extent.

Settling Tank Waste (Concrete Batching Plant):

The waste generated at the batching plant is allowed to settle in the settling tank. Further, this will be collected and reused for the haul road to the plant site.

This helps in the reduction of dust during the movement of heavy vehicles. Further, the haul road shall be regularly watered and kept moist.

Organic Waste from Kitchen/Workers' Mess:

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The waste generated in the kitchen at the campsite is to be collected in a properly covered container (20 kg /day)

The waste is further carried away and disposed to the municipal committee waste disposal areas and after that shall be sent for composting.

Disaster Management Plan

A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its resources. Disasters are of two types i.e., natural and man-made.

Flooding, earthquake, and wind storms are the major disastrous phenomena in the region. The mountainous terrain makes the community as well as workers more vulnerable to disasters. The development of poor infrastructural measures poses a greater vulnerability risk concerning the onset of potential disasters. In such cases, even a moderate disaster could bring devastating effects on communities. The Provincial Disaster Management Authorities (PDMAS) of the Government of Punjab are mandated for planning, implementing, and coordinating all activities in case of the onset of a disaster. Therefore, there is a specific requirement for developing a plan that effectively responds to any Monsoon induced emergency. PDMA specializes in mitigation, preparedness, and an organized response to a disaster. The most important role of PDMA lies in providing a platform to come together and strategize management and response to disasters and calamities.

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ANNEXURE-K

TREE PLANTATION PLAN

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TREE PLANTATION PLAN

The basic purpose of afforestation/plantation of suitable species in the project area is to reduce the risk being made due to different construction activities for the proposed Project. The expected risk made will be compensated by the planting of saplings to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk being made but will also increase the Green cover, carrying capacity, and aesthetics of the area along with many positive aspects and impacts. Plantation will be done after the construction, work immediately. The plantation of indigenous trees species is highly important to maintain biodiversity and ecological balance. it is also important to prevent global warming, soil erosion, and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. Along with the importance of construction, the afforestation activity will further help in enhancing the socio-economic condition of the area and project sustainability. The number of plants to be grown along the boundary line of the area will be estimated after physical survey during construction and thirty trees need to be cut down due to project activity therefore it is estimated as approximately 300 with a tree to tree distance of 5ft/l.5m planted along the project site . The plan has been prepared with a balanced approach for aesthetic enhancement of the project corridors and places of importance by planting selective shed trees, landscaping and turfing with grasses.

Importance Of Tree Plantation

- Trees contribute to their environment by providing oxygen, improving air quality, climate amelioration, conserving water, preserving soil, and supporting wildlife.
- Trees control climate by moderating the effects of the sun, rain, and wind.
- Leaves absorb and fill the sun's radiant energy, keeping things cool in summer.
- Trees also preserve warmth by providing a screen from harsh wind.
- Trees also lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide.
- Both above and below ground, trees are essential to the ecosystems in which they reside.
- Trees absorb and store rainwater which reduces runoff and sediment deposits after storms. This helps the groundwater supply recharge, prevents the transport of chemicals into streams, and prevents flooding.
- Trees, shrubs, and turf also filler the air by removing dust and absorbing other pollutants like carbon monoxide, sulfur dioxide, and nitrogen dioxide

Objectives

- To Restore native species
- To improve the quality of air and reduce its pollution
- To add color to the landscape and enhances the beauty of the environment
- To uplift the quality of our lMng environment through active planting, proper maintenance, and preservation of trees together with other vegetation.
- To Protect and conserve the flora and fauna of the project area.
- To attract rain which is a positive impact on the project area.

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- To reduce sedimentation by plantation in the project area which will act as protection all against wind-born dust particles

Site selection

Plantation area mainly includes the following

- Green Belts

Choosing Species

Table: Species for Tree Plantation

Tree Plantation		
Name		Tentative Quantity
Shade Giving Trees		
1	Neem	100
2	Ficus	50
3	Kikkar	100
4	Other local species	50
Total		300

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ANNEXURE-L

TERM OF REFERENCES OF THIRD-PARTY MONITOR

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TERM OF REFERENCES OF THIRD-PARTY MONITOR

- Develop specific monitoring indicators for undertaking monitoring and evaluation of EMP implementation including the Community Participation, consultation and disclosure during the implementation of project.
- Review results of internal monitoring and verify claims through random checking at the field level to assess whether EMP and social objectives have been met.
- Involve the people and community groups in assessing the impacts of EMP implementation and measures for monitoring and evaluation purposes.
- Review monitoring reports and conduct field inspections and verify the progress in EMP implementation of the project and prepare reports for the LDA.
- Evaluate and assess the adequacy and effectiveness of the consultative process, including the adequacy and effectiveness of grievance procedures and legal redress available to the affected parties, and dissemination of information about these.
- Grievance procedures; its recording, reporting and processing time and its redressal;
- Institutional arrangements and effectiveness and efficiency of contractor and Supervision Consultants in EMP Implementation;
- Assessment of the EMP efficiency, effectiveness, impact and sustainability for drawing lessons for future resettlement policy formulation and planning.

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