CONSTRUCTION OF SIGNAL FREE CORRIDOR FROM KARIM MARKET TO MOTORWAY (M-2) (PHASE-I), LAHORE.

ENVIRONMENTAL IMPACT ASSESSMENT
(EIA) REPORT

Executing Agency

LAHORE DEVELOPMENT AUTHORITY

(LDA)

Khyaban-E-Firdousi Road, 467-D-II M.A

Johar Town, Lahore

CONSTRUCTION OF SIGNAL FREE CORRIDOR FROM KARIM MARKET TO MOTORWAY (M-2) (PHASE-I), LAHORE.

ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)SSS

Project Proponent
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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 and Climate Change 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 AND LOCATION OF THE PROJECT

Construction of Signal Free Corridor from Karim Market to Motorway (M-2), Lahore.

A BRIEF OUTLINE OF THE PROJECT

Allama Iqbal Town, situated in the southwest of Lahore, serves as both a commercial and residential locality, comprising 22 residential blocks. Karim Market, located in the Karim Block at the intersection of Wahdat Road and Maulana Shaukat Ali Road, features a variety of grocery stores, retail shops, garment stores, eateries, restaurants, and banks.

Maulana Shaukat Ali Road, running through the southern neighborhoods of Lahore, connects Faisal Town, Johar Town, Punjab University, and Allama Iqbal Town before terminating at Wahdat Road. This road plays a crucial role in facilitating significant traffic flow. A recent addition is the signal-free corridor established from Ferozepur Road to Canal Road (Jinnah Hospital), including Protected U-Turns on Maulana Shaukat Ali Road and a Flyover at Akbar Chowk.

Recognizing the potential to enhance transportation infrastructure, there is a proposal for a new signal-free corridor from Karim Market to the Motorway (M2). The plan envisions phased development, with Phase-I involving the construction of an underpass at Karim Market Intersection and the remodeling of the Roundabout at Fazal-e-Haq Road. In Phase-II, considerations include a Flyover under the Orange Line, link development along Kharak Nullah up to M2, and the establishment of a Trumpet Interchange at M-2.

The intersection at Karim Block Market, where Maulana Shaukat Ali Road intersects with Wahdat Road, stands as one of Lahore city's busiest junctions. Its significance is heightened by the bustling commercial activities in the surrounding area, particularly Karim Market. This junction serves as a vital link between the southern part of Lahore and the Motorway, traversing through heavily populated regions like Johar Town and Allama Iqbal Town. The recent construction of a new link via Punjab University has further underscored the importance of this junction. However, during peak hours, traffic at this intersection experiences significant congestion. The project's objective is to address this issue by implementing a Four-Lane Dual Carriageway Underpass along Maulana Shaukat Ali Road to Noor-ul-Amin Road. Additionally, the project encompasses at-grade

improvements at the confluence of Wahdat Road and Maulana Shaukat Ali Road, along with the remodeling of the roundabout at Fazal-e-Haq Road.

The main objectives of the project are

1. Address severe congestion issues experienced by traffic at the Karim Block Market intersection, particularly during peak hours.
2. Improve connectivity between the southern part of Lahore and the Motorway, facilitating smoother traffic flow through densely populated areas like Johar Town and Allama Iqbal Town.
3. Implement a Four-Lane Dual Carriageway Underpass along Maulana Shaukat Ali Road to Noor-ul-Amin Road to accommodate increased traffic volume.
4. Undertake at-grade improvements at the confluence of Wahdat Road and Maulana Shaukat Ali Road to enhance traffic flow and safety.
5. Remodel the roundabout at Fazal-e-Haq Road to optimize its functionality within the broader traffic network.
6. To reduce travel time.
7. Job opportunities of local people would be created.
8. 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.

ENVIRONMENTAL BASELINE

The proposed project has comprehensively assessed the existing environmental conditions, covering physical, biological, and socio-economic aspects. The methodology employed for Environmental Impact Assessment (EIA) preparation involved a thorough review of relevant documents, acquisition of firsthand data through onsite environmental investigations, ecological studies, and social assessments. Utilization of satellite imagery and Google Earth, consultation with the public and stakeholders, as well as social impact assessments were integral to the process.

The topography of the project area is characterized by a flat landscape, with a general height of approximately 220 meters above Mean Sea Level (MSL). The district of Lahore exhibits a division into low-lying alluvial soil along the Ravi River and an upland in the east, featuring a plain slope from northeast to southwest.

Seasonal climatic conditions, encompassing air quality, temperature, precipitation, humidity, and evaporation, are critical considerations for the project's design and execution. The extreme climate in the project area entails hot summers starting in April and lasting till September, with May, June, and July being the hottest months, experiencing mean maximum and minimum temperatures ranging from 40.4 ºC to 27.3 ºC.

The Lahore division, part of the Punjab Province, belongs to the lower Indus Basin geologically. The name "Punjab," derived from 'Punj-aab,' meaning five rivers, signifies the historical importance of rivers like Sutlej, Ravi, Jhelum, and Chenab in this region. Groundwater quality is generally fresh and acceptable in terms of salinity. Raw water extracted from deep tube wells is believed to be bacteria-free. Groundwater is accessed for drinking purposes by about 83% of the city's population, available at depths ranging between 15 to 23 meters below the natural surface level.

Various institutions, including schools, academies, mosques located along the project routes might be affected by project activities. However, mitigation measures are proposed to minimize impacts. Baseline assessments indicate that air quality, water quality (both surface and groundwater), and noise levels fall within acceptable limits.

The project area boasts diverse vegetation, with common trees and shrubs, along with the presence of local bird species. Socio-economic survey results reveal that the majority of the community follows a joint family system (63%) and resides in cemented houses (98.5%). Additionally, about 98% of the community members identify as Muslims.

The consultant utilized a participatory, transparent, and consultative approach from the bottom-up in crafting the EIA report. A combination of qualitative and quantitative data collection tools was employed to establish an environmental baseline for the proposed area.

Different parameters are monitored at the project site as mentioned;

- Air quality
- Noise
- Water quality

THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING THE

CONSTRUCTION PHASE

Impacts

The construction phase will have several impacts on soil, water, and air. These impacts can vary based on factors such as construction methods, materials used, and the surrounding environment.

- The excavation process for building the underpass will lead to soil disturbance and compaction. This will affect the natural composition and structure of the soil.
- Construction will increase surface water runoff, carrying sediment and pollutants into nearby water bodies, potentially affecting water quality.
- Excavation and construction activities will generate dust and particulate matter, contributing to air pollution. This will have implications for respiratory health and air quality in the vicinity.
- Construction machinery and equipment will emit pollutants into the air, including nitrogen oxides, sulfur dioxide, and volatile organic compounds.
- The operation of heavy machinery, excavation equipment, and construction activities will generate high levels of noise, impacting the surrounding environment and potentially will cause disturbance to nearby residents.
- Construction activities will alter traffic patterns and increase vehicular movements, contributing to elevated noise levels in the vicinity.
- Workers will face various hazards on construction sites, including falls, exposure to hazardous materials, and machinery-related risks.

Mitigation Measures

- Implementation of erosion control measures to minimize soil erosion and sedimentation.
- Dust suppression measures such as water spraying to control airborne dust will be ensured thrice a day.
- Environmentally friendly construction materials and equipment to reduce air and water pollution will be ensured.
- Implementation of noise barriers or sound walls around construction sites.
- Scheduling of construction activities during specific hours to minimize noise disturbance to nearby communities.
- Monitoring and managing construction activities to minimize disruption to soil and water systems.

- Providing proper personal protective equipment (PPE) such as hard hats, safety goggles, masks, and hearing protection.
- Conducting regular safety training and briefings for construction workers.
- Implementing measures to control exposure to hazardous materials and dust.

THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING THE OPERATIONAL PHASE

The operation of an underpass will have various impacts on soil, water, and air, primarily influenced by factors such as vehicular traffic, maintenance activities, and the overall functionality of the underpass infrastructure.

- Ongoing traffic movement on the underpass and roundabout will lead to soil compaction, affecting the soil structure and reducing its ability to absorb water.
- The continuous operation of vehicles will contribute to air pollution through emissions of nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs).
- 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 Environmental Monitoring Plan (EMP) plays a pivotal role in the EIA process, serving as a proactive and systematic framework for evaluating, managing, and mitigating potential environmental impacts throughout a project's lifecycle. By systematically monitoring various environmental components such as air quality, water quality, noise levels, and ecological systems, the EMP ensures that any adverse effects arising from the project are promptly identified and addressed. This not only contributes to regulatory compliance but also fosters sustainable development by promoting responsible environmental stewardship. The EMP provides a dynamic tool for ongoing assessment, allowing for adaptive management strategies and timely interventions to minimize negative impacts and enhance the overall environmental performance of the project.

It underscores a commitment to transparency, accountability, and the long-term well-being of both the project and the surrounding environment.

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
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
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,	Weekly	Minimize impacts on the Environment	LDA through Approved Monitoring Agency

		Recyclables and non-recyclables, Hazardous waste.			
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
Water Quality	Road	By analyzing pH, TDS, Chloride, Fluoride, Color, NO_{3-}, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum,	Quarterly (During operation) &End of summer before the	To meet the **PEQS** Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency

		Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	onset of Monsoon every year.		

CONSULTATION OUTCOMES

Collectively, there was a resounding endorsement from the community in favor of the project for the construction of underpass at Karim Market Intersection and remodeling of Fazal-e-Haq Roundabout, with widespread support evident among the local population. The proposed project has been warmly received, as it promises to alleviate traffic congestion and mitigate various road-related hazards along the designated road section. The expressed desire for the project's construction underscores the community's recognition of its potential benefits. Importantly, local residents advocate for ongoing and inclusive consultation processes throughout various project stages, encompassing design, construction, and operation. This collective stance emphasizes the importance of community engagement and stakeholder involvement, highlighting a collaborative approach to ensure the project's success while addressing the concerns and preferences of those directly impacted by the infrastructure development.

CONCLUSION

The EIA Report has undergone a comprehensive evaluation, diligently addressing all potential environmental impacts associated with the Project. Through meticulous analysis, the study has identified manageable environmental impacts, and appropriate mitigation measures have been proposed by both the LDA and the contracted entities. The findings of the EIA emphasize that the negative impacts anticipated from the project are controllable, and their effects can be effectively mitigated through the strategic implementation of measures outlined in the Environmental Management Plan. This proactive approach underscores a commitment to environmental responsibility, ensuring that the project proceeds with due consideration for sustainable practices and minimizing adverse impacts on the surrounding environment.

1 INTRODUCTION

1.1 PURPOSE OF THE 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 Signal Free Corridor from Karim Market to Motorway (M-2), 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 Signal Free Corridor from Karim Market to Motorway (M-2) (Phase-I), Lahore.

Sponsoring Agency: Government of Punjab

Project Proponent

Chief Engineer -I

Lahore Development Authority – LDA

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

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

The envisioned project entails the comprehensive construction of an underpass at the Karim Market intersection, coupled with the remodeling of the Fazl-e-Haq Roundabout. This ambitious initiative is poised to significantly transform the existing traffic infrastructure, enhancing both efficiency and safety at these critical junctions. The construction of the underpass at the Karim Market intersection represents a strategic measure to alleviate traffic congestion, providing a seamless flow for vehicles passing through this vital point. Simultaneously, the remodeling of the Fazl-e-Haq Roundabout aims to optimize its design and functionality, ensuring a more synchronized traffic movement and improved overall urban mobility. The combined impact of these interventions is expected to contribute positively to the transportation landscape, fostering enhanced connectivity, reduced travel times, and an overall improvement in the urban commuting experience.

Table 1-1 Sub-Components of the Project

Major Component	Four-Lane Dual Carriageway Underpass
Approved Project Cost	PKR Million. 2,975.034
Approved Gestation	4 Months Till March 2024
Approval Forum	PDWP (PDWP)
Scope of work details	**Four-Lane Dual Carriageway Underpass** **(Along Maulana Shaukat Ali Road)** Underpass Width = 16.2 m No of Lanes = 2 (either side)

	Main Carriageway width = 7.8 m Central Median = 0.6m Edge Barrier = 0.4 m (either side) **At Grade Widening/Improvement** **(Along Wahdat Road)** No of Lanes = 2 Lanes (either sides) Carriageway width = 7.3m Walkway = 1.5 m **(Along Maulana Shaukat Ali Road)** **Slips** No of Lanes = 2 Lanes (either sides) Carriageway width = 7.3m Walkway = 1.5 m **Pavement Structure** Asphaltic Wearing Course = 5 cm Asphaltic Base Course = 12 cm Water Bound Macadam = 25 cm Sub base = 20 cm
Environmental Impact	• Significant reduction in Carbon Emissions • Less Travel Time • Less Traffic Congestion • Extensive tree plantation

2 SCREENING

Based on the Punjab Environmental Protection Act 2012 and the Review of IEE & EIA Regulations, 2022 for filing, reviewing, and approving environmental assessments, the present project is classified under Schedule II Section D "**Transport"**, Sub-Section 5 "**Flyover, Underpass, and Bridges having total length of more than 500 meters"**. Following list shows the projects included in Class D.

D. **Transport**

1. Airports
2. Highways, Motorways, Express Road, and Major Roads
3. Ports and Harbor Development for ships of 500 gross tons and above.
4. Railway Works
5. **Flyover, Underpass, and Bridges having total length of more than 500 meters.**

The construction of major infrastructure projects such as flyovers, underpasses, and bridges with a combined length exceeding 500 meters necessitates the implementation of an Environmental Impact Assessment (EIA). The extensive scale and scope of these structures inherently entail significant alterations to the natural environment, including potential impacts on air quality, soil composition, water resources, and overall ecosystem integrity. An EIA becomes imperative to thoroughly assess and understand these potential environmental effects. It provides a comprehensive evaluation of the project's ecological footprint, allowing for the identification of potential risks and the formulation of effective mitigation strategies to safeguard the environment and minimize any adverse impacts on surrounding ecosystems. The EIA process ensures that sustainable and environmentally responsible practices are integrated into the construction, helping to strike a balance between infrastructure development and environmental conservation.

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).

3 SCOPING OF PROJECT

3.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

The establishment of spatial boundaries for projects addressing environmental and cumulative effects on Valued Environmental Components is intricately tied to the specific characteristics of the Project Development Area and the broader scope encapsulated by the Local and Regional Assessment Area.

In this project, Phase-I will involve pivotal initiatives, including the construction of an underpass at Karim Market Intersection and the meticulous remodeling of the Roundabout at Fazal-e-Haq Road. The subsequent Phase-II will amplify the scope, contemplating the construction of a Flyover beneath the Orange Line, comprehensive link development along the course of Kharak Nullah extending up to M2, and the establishment of a strategically positioned Trumpet Interchange at M-2.

Temporal boundaries are distinctly delineated by the projected timelines and duration of project activities, with the ambitious completion slated within a six-month timeframe. The construction phase is poised to embrace environmentally friendly practices, meticulously designed to preserve the existing boundaries and the holistic well-being of the surrounding project area. It is during this phase that the synergy between developmental aspirations and environmental preservation is paramount. As the project transitions into its operational phase, a steadfast commitment to meeting Punjab Environmental Quality Standards (PEQS) takes center stage. Every operational activity is executed with precision to align with these stringent standards, ensuring sustained environmental compliance and fostering a harmonious coexistence between infrastructural development and ecological integrity. This comprehensive approach underscores the project's commitment not only to achieving its developmental objectives but also to doing so in a manner that is environmentally responsible and sustainable.

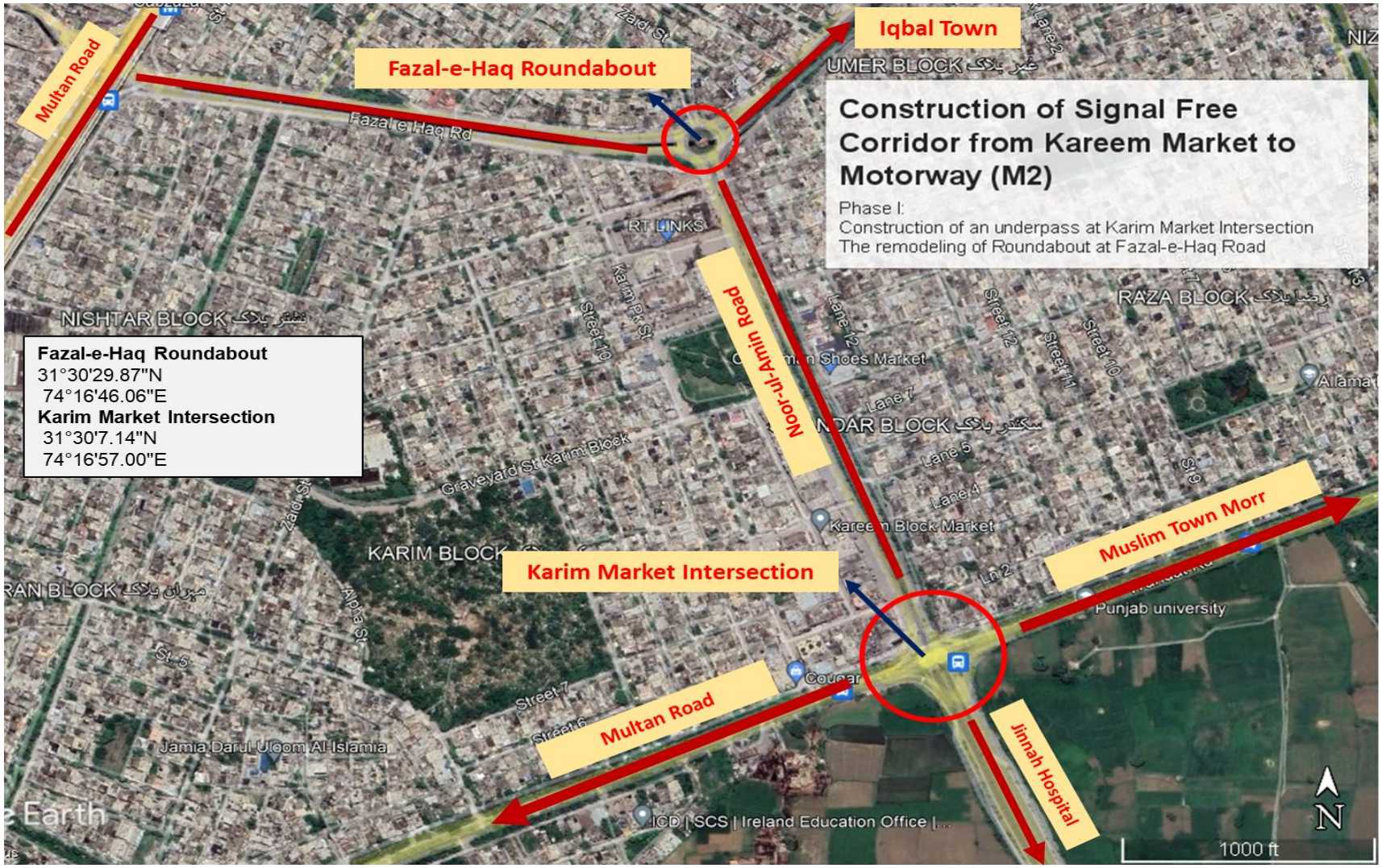

Figure 3-1 Location of the proposed project (Phase I)

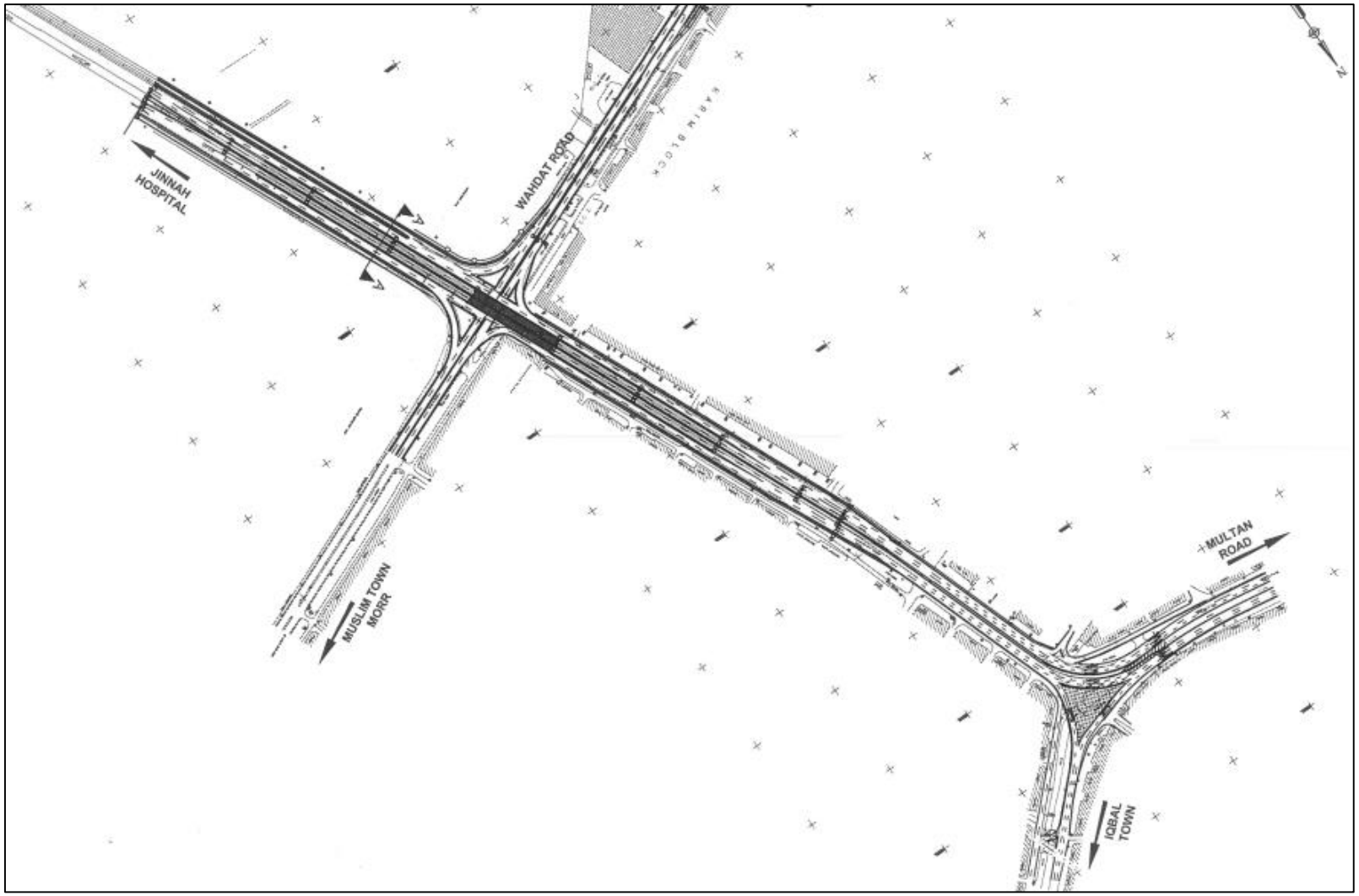

Figure 3-2 Proposed Location (Phase-I)

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

Frequent on-site visits were conducted to gain a comprehensive understanding of the various stakeholders associated with the project. These visits served as a crucial initiative to familiarize with the local community, businesses, and residents living in close proximity to the project site. Subsequently, an informative outreach program was undertaken to engage with the people residing around the project site. This involved providing concise yet comprehensive explanations of the project's scope, objectives, and anticipated impacts. To ensure inclusivity and address any potential concerns or questions, a strategic public consultation process was meticulously executed. This involved open dialogues, meetings, and feedback sessions, allowing stakeholders to voice their opinions and express any apprehensions they might have. Through this proactive approach, we aimed to foster transparency, build trust, and incorporate valuable insights from the community into the project's planning and execution phases.

Table 3-1 Issues Raised during Consultation

Sr. No.	Issues/Concerns	
1	**Traffic**	1. Traffic congestion has reached to an alarming levels. 2. Commuters experience increased traveling times, especially during peak hours. 3. Long queues of vehicles are a common sight during peak hours. 4. The public faces challenges in reaching their destinations within the required time. 5. The use of heavy machinery and construction activities will generate elevated noise levels.
2	**Public Safety**	1. Clearly mark entry and exit points with signage to guide traffic flow and prevent confusion. 2. Install secure fencing around the construction site to prevent unauthorized access and enhance safety.

		3. Provide secure alternative routes for nearby residents, ensuring accessibility during construction. 4. Establish transparent working hours and notify the public about noisy activities to manage expectations and minimize disruptions. 5. Implement traffic control measures, such as signals, to optimize traffic flow and enhance road safety.
3	**Site Logistics**	1. Develop a comprehensive traffic management plan to regulate the movement of construction vehicles and minimize disruptions to surrounding traffic. 2. Efficiently plan for the storage and handling of construction materials on-site to minimize congestion and ensure a streamlined workflow. 3. Implement a waste management strategy to handle construction debris responsibly, promoting recycling and minimizing environmental impact. 4. Implement robust security measures to safeguard construction equipment, materials, and the site perimeter against theft or unauthorized access.
4	**Neighboring Properties**	1. Implement measures to control construction-related vibrations, ensuring neighboring properties are not adversely affected by potential ground vibrations. 2. Employ visual screening measures, such as construction barriers or landscaping, to

		minimize the visual impact of the construction site on neighboring properties. 3. Communicate the construction schedule in advance to neighboring properties, allowing residents to anticipate and plan for periods of increased noise or dust.

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

The following impacts are anticipated to be significant and proper mitigation and maintenance plans for these will be made;

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

4 CONSIDERATION OF ALTERNATIVES

4.1 NO PROJECT OPTION

The No-build alternative proves inadequate in addressing the purpose and need due to the severity of structural deficiencies that cannot be effectively resolved through repair or maintenance efforts. Urban development endeavors to offer sustainable solutions, aiming at the socio-economic improvement of city commuters, thereby contributing significantly to both the economic advancement and overall liveability of the city. Opting for the No Project alternative is deemed least favorable from both a socio-economic and, to some extent, environmental standpoint, as the absence of the proposed project could potentially hinder socio-economic progress and overlook certain environmental considerations.

4.2 SITE ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

The envisaged project entails the establishment of a signal-free corridor spanning from Karim Market to the Motorway (M-2). The selected site is deemed well-suited, considering both environmental and physical constraints. Given that the land use within the project site is currently designated for existing roads, the construction aligns seamlessly with the existing urban layout. The overarching goal of the project is to address and mitigate traffic-related challenges prevalent in the identified segments.

Anticipated outcomes include a notable reduction in Vehicle Operating Costs (VOC), a substantial decrease in accident rates, transforming the segment into a controlled access facility. Simultaneously, the project is expected to contribute to the amelioration of noise and air pollution, enhancing the overall environmental quality to a significant extent. The holistic approach of the proposed construction underscores its potential to not only enhance traffic flow but also positively impact various facets of environmental sustainability and public safety.

4.3 ENVIRONMENTAL ALTERNATIVES AND THEIR SELECTION AND REJECTION CRITERIA

Without Project Scenarios

If the underpass at Karim Market Interchange is not constructed, several scenarios may unfold, each carrying potential challenges for the local community and transportation system. Without the

underpass, the existing traffic congestion at Karim Market Interchange is likely to persist, leading to extended travel times, increased fuel consumption, and heightened levels of frustration for commuters. The absence of an underpass could exacerbate safety concerns, with the continued risk of accidents and difficulties in managing traffic flow efficiently.

Furthermore, the lack of a dedicated underpass may limit accessibility for pedestrians and cyclists, impacting overall urban mobility. The local businesses in the vicinity might experience disruptions due to prolonged traffic queues, potentially affecting economic activities. Overall, the non-construction of the underpass could result in a less efficient and less safe transportation environment, with implications for both the daily lives of residents and the economic vitality of the area.

The envisioned project encompasses the construction of an underpass at the Karim Market Intersection and the remodeling of the Fazal-e-Haq Roundabout. This comprehensive initiative is designed to address existing traffic challenges and enhance transportation efficiency in the area. The construction of the underpass at Karim Market Intersection aims to alleviate traffic congestion, reduce travel times, and enhance the overall safety of the commuting experience.

Simultaneously, the remodeling of the Fazal-e-Haq Roundabout is intended to optimize traffic flow and modernize the existing infrastructure. Together, these strategic interventions seek to create a more accessible and seamlessly connected urban environment, promoting both safety and efficiency for pedestrians and motorists alike. The project's dual focus on underpass construction and roundabout remodeling underscores a holistic approach to urban planning and transportation management in the specified area.

The ongoing unsafe conditions and the negative environmental impacts on environmental quality would persist and potentially worsen without the implementation of the proposed improvements. Therefore, opting for the no-action alternative is deemed neither reasonable nor prudent for the proposed project. Such a choice would signify a reluctance to undertake essential enhancements, resulting in a failure to address existing issues and a hindrance to economic development in the affected area.

With Project Scenarios

The construction of an underpass at the Karim Market Intersection and the remodeling of the Fazal-e-Haq Roundabout promise substantial benefits for the community and the urban infrastructure. The underpass is poised to alleviate traffic congestion, reducing travel times, and enhancing overall safety for commuters. Simultaneously, the remodeled Fazal-e-Haq Roundabout aims to optimize traffic flow, modernize the existing infrastructure, and contribute to a smoother urban mobility experience.

These improvements collectively create a more efficient and safe transportation network, fostering a conducive environment for economic activities in the area. The enhanced traffic management and reduced congestion are anticipated to lead to a notable decrease in vehicle operating costs and a significant reduction in the likelihood of accidents. Additionally, the project is expected to contribute positively to environmental quality by minimizing noise and air pollution. Overall, the construction of the underpass and the remodeling of the roundabout represent a holistic approach to urban development, emphasizing safety, efficiency, and the well-being of the local community.

While the project is expected to bring about significant developmental advantages, typical of road development initiatives, it is essential to acknowledge the potential impacts on natural, social, and environmental aspects. Addressing these concerns may necessitate the provision of alternative access and utilities during construction or staged construction to ensure continuous access and utility maintenance. The adoption of top-down construction methods can mitigate disruptions and reduce their duration. Rigorous excavation support systems and ground improvement techniques may be essential to minimize settlements and lateral ground deformations, particularly in proximity to adjacent structures.

Special measures may be required to prevent the migration of groundwater-contaminated plumes during excavation near contaminated ground or adjacent basements. Dust suppression and wheel washing facilities are commonly employed, particularly in urban settings, to mitigate environmental impacts. Excavation methods that limit suspended solids in water are available to adhere to acceptable levels. Thorough investigation of existing fauna, flora, and ecological factors is crucial to anticipate and address potential adverse consequences. In cases where excavation encounters contaminated soils or groundwater, processing and disposal in a contained facility, compliant with environmental regulations, may be necessary.

Provisions must be in place to ensure public health and safety while meeting regulatory requirements. Minimizing potential impacts on environmental components through robust environmental practices is a priority. When avoidance is not feasible, comprehensive mitigation and enhancement strategies will be devised to effectively counteract any environmental damage resulting from the project.

Based on a comprehensive analysis of alternative options, the construction of an underpass at Karim Market Intersection and the remodeling of Fazal-e-Haq Roundabout, incorporating the proposed design features, emerges as the most favorable choice. This option is deemed optimal due to its potential to effectively address traffic challenges, enhance safety, and modernize urban infrastructure, aligning seamlessly with the broader goals of the project. The proposed design features demonstrate a strategic and holistic approach, making this option the preferred solution to optimize traffic flow, reduce congestion, and contribute to the overall improvement of the transportation network in the specified area.

5 DESCRIPTION OF THE PROJECT

This comprehensive chapter provides an in-depth exploration of the project's nature, classification, and key attributes. It delineates the project's objectives, detailing its specific type and category. The geographic location and layout of the project are thoroughly examined, offering insights into the spatial arrangement. Special attention is given to site features, particularly those related to vegetation, shedding light on the ecological context of the project.

A meticulous project schedule of implementation is outlined, providing a detailed timeline for the various phases and milestones. The chapter delves into a thorough description of the project's processes and steps, elucidating the intricacies of its execution and emphasizing the systematic approach undertaken. Furthermore, the restoration plan and rehabilitation strategies integral to the project are explicitly addressed, highlighting the commitment to environmental stewardship and the long-term sustainability of the project's impact. The comprehensive narrative serves as a guide to understanding the multifaceted dimensions of the project, from its conceptualization to its practical execution and the ensuing measures for restoration and rehabilitation.

5.1 OBJECTIVES OF THE PROJECT

The main objectives of the project are;

- Address severe congestion issues experienced by traffic at the Karim Block Market intersection, particularly during peak hours.
- Improve connectivity between the southern part of Lahore and the Motorway, facilitating smoother traffic flow through densely populated areas like Johar Town and Allama Iqbal Town.
- Implement a Four-Lane Dual Carriageway Underpass along Maulana Shaukat Ali Road to Noor-ul-Amin Road to accommodate increased traffic volume.
- Undertake at-grade improvements at the confluence of Wahdat Road and Maulana Shaukat Ali Road to enhance traffic flow and safety.
- Remodel the roundabout at Fazal-e-Haq Road to optimize its functionality within the broader traffic network.
- To reduce travel time.
- Job opportunities of local people would be created.

- 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.

5.2 LOCATION AND SITE LAYOUT OF THE PROJECT

The envisioned project encompasses the construction of an underpass at the Karim Market Intersection and the remodeling of the Fazal-e-Haq Roundabout. This comprehensive initiative is designed to address existing traffic challenges and enhance transportation efficiency in the area. The construction of the underpass at Karim Market Intersection aims to alleviate traffic congestion, reduce travel times, and enhance the overall safety of the commuting experience

Figure 5-1 Map of Pakistan Locating Project Area

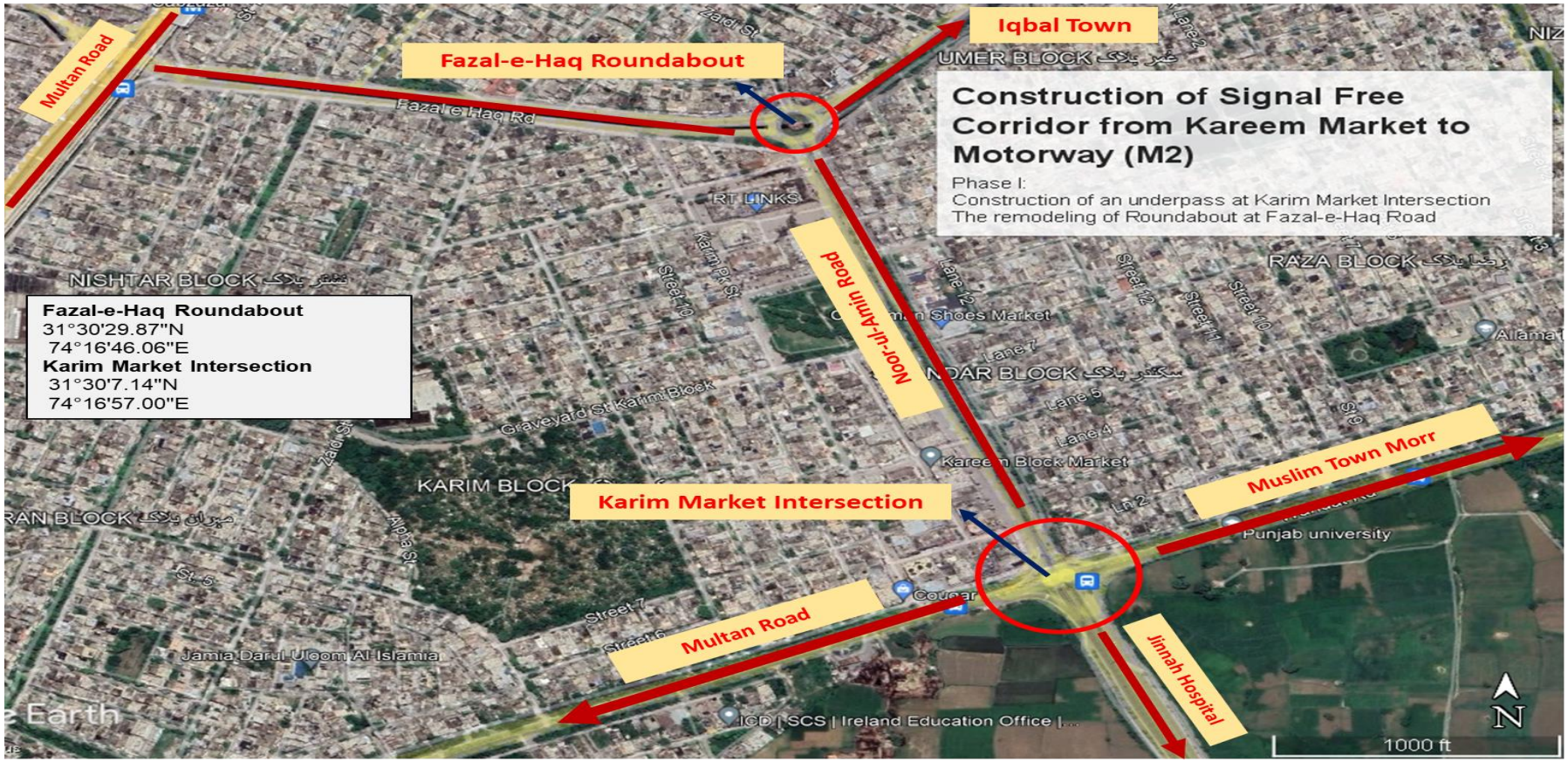

Figure 5-2 Proposed Locations for the Construction of Underpass and Remodeling of Roundabout

5.3 LAND USE ON THE SITE

Our expert consultant team conducted a thorough site visit and identified a pressing issue affecting the community – prolonged delays in reaching destinations due to traffic signals and congestion. Recognizing the urgency of this challenge, our proposed project is strategically designed to tackle these issues head-on. By addressing traffic signals and mitigating excessive traffic, our initiative aims to streamline urban mobility, ensuring a smoother and more efficient commute for residents. This strategic intervention aligns with our commitment to enhancing the overall quality of life in the community, reducing travel times, and fostering a more seamlessly connected urban environment.

Figure 5-3 Current Land Use

5.4 LAND ACCQUISITION

The implementation of both the underpass and roundabout construction projects will be executed within the confines of existing land, eliminating the need for additional land acquisition. This approach minimizes disruption to local communities and mitigates potential complications

associated with land procurement. By utilizing the available space efficiently, the projects aim to enhance transportation infrastructure while maintaining a sustainable and considerate footprint within the existing urban landscape.

5.5 ROAD ACCESS

The project site is strategically surrounded by several key roads, enhancing its accessibility and connectivity. Prominent thoroughfares include Wahdat Road, Maulana Shaukat Ali Road, Noor-ul-Amin Road, Fazal-e-Haq Road, and Multan Road.

5.6 VEGETATIVE FEATURES OF THE SITE

Green belts are flanking the road, offering a refreshing and aesthetically pleasing landscape. These verdant strips will contribute to the visual appeal of the surroundings while providing environmental benefits such as improved air quality. As part of the construction process for the underpass, it is anticipated that 30 trees from the green belt will need to be uprooted or cut. However, to mitigate the environmental impact, a conscientious approach is being adopted. A detailed tree plantation plan has been proposed, ensuring the relocation and replanting of the affected trees. This strategy not only aims to offset the immediate loss of greenery but also prioritizes environmental sustainability.

5.7 COST AND MAGNITUDE OF THE PROJECT

The comprehensive cost estimate for the project stands at **PKR Million 2,975.034** covering the construction expenses associated with both the underpass and roundabout components.

5.8 SCHEDULE OF IMPLEMENTATION

The project is scheduled for implementation within a concise timeframe of four months. This targeted timeline underscores the commitment to efficient and timely project delivery.

The outlined project implementation schedule is intended to be followed, contingent upon smooth execution as per the plan and the absence of significant obstacles. The implementation stages of the project activity include:

Stage One: Inspection:

- Initiate the project with a comprehensive inspection.
- Conduct feasibility assessments.

Stage Two: Digging and Excavation:

- Mobilize construction teams and equipment for excavation.
- Implement site preparation and clearing activities.
- Begin digging and excavation work as per the project design.

Stage Three: Construction:

- Execute earthwork and grading activities to establish a solid foundation.
- Progress to sub-base and base course construction phases.
- Pave the road surface using asphalt or concrete materials.
- Implement drainage systems and install necessary road features.
- Focus on landscaping and beautification aspects.

Stage Four: Monitoring:

- Conduct final inspections and quality control assessments.
- Address any outstanding items or issues.
- Officially hand over the completed project to relevant authorities.
- Initiate post-construction monitoring and maintenance programs.

5.9 PROJECT DESCRIPTION

The envisioned project encompasses the construction of an underpass at the Karim Market Intersection and the remodeling of the Fazal-e-Haq Roundabout. This comprehensive initiative is designed to address existing traffic challenges and enhance transportation efficiency in the area. The construction of the underpass at Karim Market Intersection aims to alleviate traffic congestion, reduce travel times, and enhance the overall safety of the commuting experience.

5.9.1 ECONOMIC JUSTIFICATION

Anticipated economic benefits due to the project implementation are primarily attributed to significant savings in Vehicle Operating Costs (VOC). The envisaged reduction in traffic jams and congestion is poised to yield tangible advantages, resulting in decreased Vehicle Operating Costs (VOC) and Vehicle Travel Time (VTT). Concurrently, these improvements are expected to mitigate noise and air pollution to a considerable extent. A comprehensive assessment of annual vehicle operating costs has been conducted, comparing scenarios both without and with project conditions. In summary, the project is poised to deliver substantial VOC savings to facility users, exemplifying its potential to enhance economic efficiency and environmental well-being.

Table 5-1Length of the Project

Description	Length (m)
Karim Market Intersection (Underpass)	580

Table 5-2 Vehicle Operating Speed

Description	Motor Cycle	Rikshaw	Car	Hiace Wagon	Mini-Bus	Bus	Truck Tractors
Without Project (Existing conditions)	25	25	40	30	25	25	25
With Project (After widening and Improvement)	50	50	60	55	50	50	50

Table 5-3 Total VOC savings

Years	Total VOC Savings (Millions)
From Jinnah Hospital to Karim Market	
2024*	118.48
2034	201.66
2044	361.95

The overall Annual Value of Travel Time (AVTT) is computed as a function of various factors, including Vehicle Travel Time (VTT) per kilometer, Average Daily Traffic (ADT), and the total distance covered annually. Building upon the earlier calculations involving these parameters, an

estimate for the annual AVTT has been derived. This metric serves as a comprehensive indicator of the total time expended on travel activities over the course of a year.

To assess the impact of the project, a comparison has been made between the AVTT under existing conditions and the AVTT anticipated with the implementation of the project. The disparity between these two values signifies the benefits realized through the project in terms of time savings for travelers. This evaluation takes into account the potential improvements in travel efficiency and reduced congestion resulting from the project's enhancements, emphasizing the tangible benefits accruing to the community in terms of saved travel time under the envisaged project conditions.

Table 5-4Total VTT Savings

Years	Total VTT Savings (Millions)
From Jinnah Hospital to Karim Market	
2024*	49.27
2034	95.48
2044	214.82

Table 5-5Total Project Benefits

Years	Total Project Benefits (Millions)
From Jinnah Hospital to Karim Market	
2024*	499.41
2034	712.20
2044	1075.16

Table 5-6Economic Parameters

Economic Parameters	At a 12% Discount Rate
Present Worth of Benefit (Million Rs.)	4314.24
Present Worth of Cost (Million Rs.)	2506.08

Net Present Value (Million Rs.)	1808.16
BC Ratio	1.72
EIRR (Percent)	21.33

The obtained results affirm the economic viability of the proposed road project, as the calculated rate of return surpasses the benchmark of 12 percent. This signifies that the anticipated financial gains and returns from the project exceed the established threshold, indicating a positive and financially sound investment. Given this favorable economic assessment, it is strongly recommended that the project be implemented as per the original plan. The robust rate of return not only suggests the feasibility of the project but also underscores its potential to generate substantial economic benefits. Implementing the project as planned is poised to contribute significantly to the overall economic development and infrastructure enhancement, aligning with the projected positive returns and affirming its viability within the established economic parameters.

5.9.2 CARBON EMISSIONS

The construction of the proposed underpass and flyover is poised to bring about significant environmental benefits by facilitating smoother traffic flow and concurrently reducing fuel consumption. The burning of 1 liter of diesel releases approximately 2.67 kg of CO_2 equivalent (CO_2e), while petrol emits 2.33 kg CO_2e. By alleviating traffic congestion through the implementation of the underpass and flyover, vehicles will experience improved traffic efficiency, resulting in reduced idling and smoother traffic transitions. This, in turn, is expected to lead to a notable decrease in fuel consumption, consequently mitigating carbon emissions associated with transportation. The project aligns with sustainable development goals by not only enhancing transportation infrastructure but also actively contributing to environmental conservation through reduced carbon emissions and improved air quality.

Based on the PC-1 data obtained from a one-day traffic study and the fuel consumption during the idling of traffic at signals, the calculation of carbon emissions was calculated.

Table 5-7 Carbon Emissions

Sr. No.	Mode of Transport	Carbon Emissions (kg of CO_2 equivalent (CO_2e)
1	Motorcycle	7891.3
2	Rikshaw	4283.5
3	Car	17857.2
4	Bus	122.82
5	Truck	245.64

5.9.3 SECTORAL SPECIFIC INFORMATION

The Geometric Design of the project is governed by prevalent standard codes for highway design.

The Geometric design parameters are given below:

Table 5-8Sectoral Specific Information

Four-Lane Dual Carriageway Underpass (Along Maulana Shaukat Ali Road)	
Underpass Width	16.2 m
No of Lanes	2 (either side)
Main Carriageway width	7.8 m
Central Median	0.6m
Edge Barrier	0.4 m (either side)
At Grade Widening/Improvement (Along Wahdat Road)	
No of Lanes	2 Lanes (either sides)
Carriageway width	7.3m
Walkway	1.5 m
(Along Maulana Shaukat Ali Road) Slips	
No of Lanes	2 Lanes (either sides)
Carriageway width	7.3m
Walkway	1.5 m

Pavement Structure	
Asphaltic Wearing Course	5 cm
Asphaltic Base Course	12 cm
Water Bound Macadam	25 cm
Sub base	20 cm

5.9.4 TYPICAL CROSS-SECTIONS OF UNDERPASS

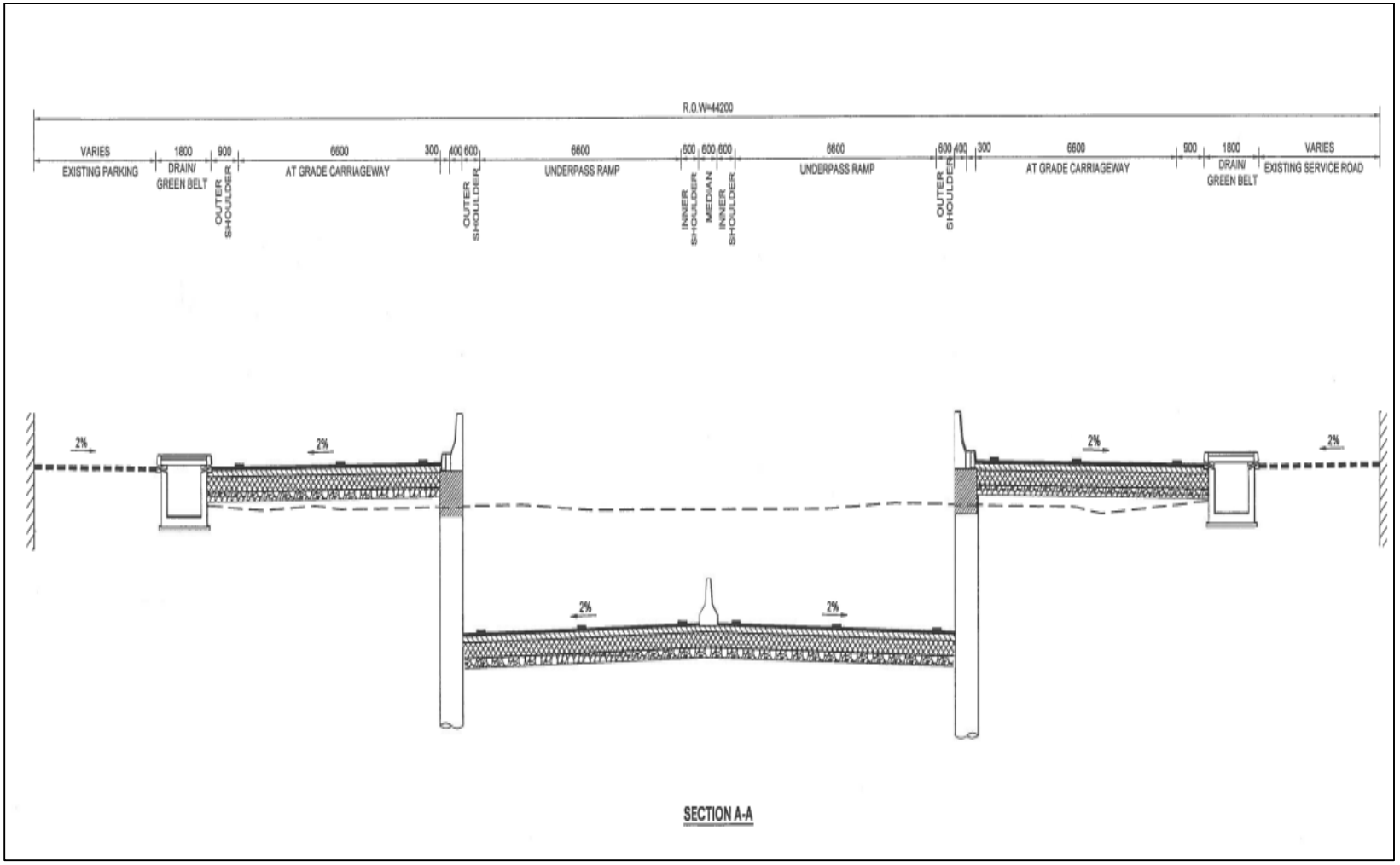

Figure 5-4 Typical Cross Sections

5.9.5 CONSTRUCTION CAMP

Construction campsite selection will prioritize factors such as the availability of ample space for establishing campsites, asphalt and batching plant sites, inclusive of designated parking areas for machinery, storage facilities, and workshops. Additionally, considerations will include proximity to local markets and maintaining a suitable distance from environmentally sensitive areas nearby. The determination of the area required for construction camps will be contingent upon factors such as the deployed workforce and the type and quantity of machinery utilized in the construction process. Due to the substantial space needs, contractors are anticipated to secure land on a lease basis from private landowners, unless it proves impractical to identify suitable campsites within the Right of Way (ROW). The Contractor is tasked with identifying construction camp sites adhering to the specified criteria and guidelines prior to the commencement of construction activities.

- The selection of campsites should prioritize the absence of resettlement issues, ensuring that the chosen locations do not disrupt or displace local communities.
- The campsites must be situated at a considerable distance from residential areas and other sensitive receptors to minimize any potential impact on the local population.
- Optimal sites for construction camps should be strategically located near the project area, providing convenient access to the nearby main link road for efficient transportation of materials and personnel.
- Camps must be positioned in areas where drainage from and through the camps poses no threat to domestic or public water supplies, emphasizing environmental safety.
- The chosen campsite must be of sufficient size to prevent overcrowding and ensure the proper layout of necessary structures, fostering a conducive and organized working environment.
- Consideration should be given to avoiding any adverse effects on property, vegetation, irrigation systems, and drinking water supply infrastructure.
- Campsites should be located in areas not prone to periodic flooding, mitigating risks and ensuring a stable and secure working environment for construction activities.
- There should be a prudent distance from ecologically sensitive areas such as wildlife sanctuaries, game reserves, national parks, and forested regions, safeguarding the natural ecosystem from potential disturbances caused by the construction camp.

A comprehensive annexure detailing the establishment and management of the construction camp is provided for reference and guidance.

5.9.6 EQUIPMENTS FOR CONSTRUCTION

The List of Machinery and Equipment required for the proposed project is provided in table below.

Table 5-9 Machinery and Equipment

Sr. No.	Machinery & Equipment
•	Dump Truck
•	Front End Loader
•	Dozer
•	Grader
•	Vibratory Roller
•	Water Tanker
•	Aggregate Spreader
•	Three Wheel Rollers
•	Asphalt Plant
•	Paver
•	Asphalt Distributor
•	Batching Plant
•	Concrete Transit Truck
•	Concrete Pump
•	Excavator
•	Water Pump
•	Cranes

Sr. No.	Machinery & Equipment
•	Vibrator
•	Generator
•	Concrete Mixer

5.9.7 MANAGEMENT STRUCTURE AND MANPOWER REQUIREMENT

Management structure indicative, likely to be deployed by the contractor on the project.

Table 5-10Job Descriptions

Job Description	No. of
Manager Admin	1
Office engineer	1
Soil Engineers	4
Design Engineer	2
Civil Engineers	4
Electrical Engineer	1
Mechanical Engineer	1
Drainage Engineer	1
Horticulture Specialist	1
Contract Specialist	1
Surveyors	10
Skilled	70
Unskilled	100

5.9.8 MACHINERY MAINTENANCE AND EQUIPMENT YARD

Machinery and equipment yards will be strategically planned to be located in close proximity to the work camps, ensuring operational efficiency and logistical convenience. These yards are

designed to encompass expansive storage and haulage space, providing ample room for the movement and operation of machinery and equipment. The yard will be enclosed by walls and equipped with a secure gate, fortified by an ample complement of security personnel to safeguard the valuable machinery and equipment housed within. The careful consideration of sufficient storage and haulage capacity, coupled with spacious areas for movement and operations, underscores the commitment to an organized and secure facility. This comprehensive approach aims to facilitate seamless coordination between work camps and machinery and equipment yards while prioritizing the protection and efficient utilization of construction assets.

5.9.9 MATERIAL DEPOT

In close proximity to the work bases, material depots are essential for the organized storage of construction materials. These depots will incorporate temporary sheds dedicated to housing cement, steel, and asphalt, along with open spaces designated for the storage of stones, shingles, and bricks. Ensuring security and protection, the material depots will be enclosed by walls, and the entrance gate will be equipped with ample security measures. A designated storekeeper will be responsible for meticulous record-keeping, meticulously documenting the incoming and outgoing materials, contributing to the efficient management and accountability of construction resources.

5.9.10 MACHINERY REPAIR WORKSHOP

Given the substantial fleet of vehicles and similar machinery associated with the project, the establishment of a repair workshop will be deemed essential. The contractor will have the flexibility to establish their workshop, equipped to address maintenance and repair needs efficiently. This workshop will play a pivotal role in ensuring the optimal functioning and longevity of the diverse array of vehicles and machinery deployed for project activities. By having an on-site repair facility, the contractor will promptly address any mechanical issues, conduct regular maintenance, and minimize downtime, thereby contributing to the overall efficiency and smooth execution of the project.

5.9.11 APPROACH TO WORK BASES

Work bases will be strategically established to ensure convenient accessibility. Recognizing the significance of easy access to these work bases, the project considers the utilization of both public and private lands, subject to the explicit consent of the landowner and/or local community. Supplementary access roads and paths may be created, facilitating seamless entry and egress to the

work bases. This approach will not only optimize logistical efficiency but will also underscore a commitment to collaborative and respectful engagement with the local community, ensuring that the use of private lands aligns with the preferences and needs of the landowners and residents.

5.9.12 CAMP OFFICES

In close proximity to both labor camps and work bases, the contractor will be granted with the permission to establish a camp office, serving as a central hub for the day-to-day field operations. The flexibility extends to the utilization of public or private land, subject to the agreement and consent of the landowner or local authorities. This camp office will function as a critical operational center, facilitating efficient communication, coordination, and management of various project activities. The flexibility in choosing the location, whether on public or private land, reflects a collaborative approach, ensuring that the establishment of the camp office aligns with the preferences and regulations of the local community and landowners.

5.9.13 SECURITY ARRANGEMENTS

Considering the prevailing field conditions, the imperative for adequate security measures is paramount. To ensure the safeguarding of key project elements, sufficient security personnel will be deployed at critical locations, including the Work Base, Labor Camp, Material Store, Equipment Yards, and areas where construction work is actively in progress on the work site. This comprehensive security approach is essential to mitigate potential risks, theft, or unauthorized access, thereby safeguarding both assets and personnel.

Effective coordination with nearby law enforcement agencies is deemed necessary to enhance the overall security framework. This collaborative effort aims to foster a seamless working relationship between project security personnel and local law enforcement, ensuring a prompt and coordinated response to any security-related challenges that may arise during the project's execution. By aligning with law enforcement agencies, the project emphasizes a proactive and collaborative approach to security management, promoting a safe and secure working environment for all stakeholders involved.

5.9.14 HEALTH CARE

Given the substantial workforce involved in the underpass construction project, the likelihood of minor accidents occurring at various construction sites is acknowledged. In response to this, the contractor will be committed to establishing a dispensary on-site. This medical facility will be

equipped to address and manage minor accidents promptly, ensuring the immediate well-being of laborers and employees. Additionally, for more severe cases, a pre-coordinated arrangement has been established wherein patients requiring advanced medical attention will be promptly shifted to the nearby Hospital. This comprehensive medical setup reflects the contractor's commitment to the health and safety of the workforce, ensuring that appropriate medical care is readily available and seamlessly integrated into the overall project management framework.

5.9.15 LABOR REPORTING OFFICE

Designated areas along the road and within work bases will be specially marked to serve as gathering points for labor during pick-up and drop-off times, emergencies, or briefings. These demarcated spaces will be maintained in an open and clean condition, emphasizing a conducive environment for gatherings. In accordance with the specific needs, these areas will be equipped with public address systems to facilitate effective communication during various operational scenarios. This comprehensive approach will ensure not only organized logistics during transportation activities but will also prioritize safety, emergency preparedness, and efficient communication, contributing to a well-coordinated and secure working environment for all personnel involved in the project.

5.9.16 LABOR TRANSPORT

LDA places a strong emphasis on sourcing unskilled labor locally, demonstrating a commitment to community engagement and economic collaboration. To facilitate this, the contractor will be tasked with providing vehicle(s) for the daily pick-up and drop-off of local labor. This approach not only supports the integration of local workforce into the project but also contributes to alleviating pressure on the camps by ensuring a consistent and organized transportation system. By implementing this comprehensive strategy, the project aims to foster a mutually beneficial relationship with the local community, enhance accessibility for the workforce, and maintain a more manageable and efficient work environment within the camps.

5.9.17 WORK UNIFORM AND EALTH SAFETY EQUIPMENT

Recognizing the specialized nature of road construction, the safety and well-being of the labor force are paramount. Workers engaged in tasks such as breaking stones, handling bricks, and working with concrete or asphalt will be provided with specialized protective uniforms and adhere to stringent Health, Safety, and Environment (HSE) measures. To ensure their safety, laborers

involved in these activities will be equipped with essential personal protective equipment (PPE), including long boots, overall dresses, goggles, gloves, ear mufflers, safety jackets, and safety hats.

As part of a comprehensive HSE strategy, it is mandatory for all construction workers and anyone entering the construction area to utilize the necessary PPEs. This proactive approach will underscore the project's commitment to maintaining a secure and health-conscious working environment, prioritizing the safety of every individual involved in the construction process and adhering to industry-best practices for occupational safety.

5.9.18 SIGNAGE

Throughout the construction phase, LDA will be committed to enhancing safety through the strategic placement of suitable signboards and traffic signs. These informative and cautionary signs will be prominently displayed on the construction site itself and along the entire length of the road. This comprehensive signage approach will serve as a proactive measure to anticipate and prevent potential accidents by providing clear guidance to both construction personnel and the general public. The signboards will convey essential information about construction activities, potential hazards, speed limits, and other pertinent instructions, contributing to heightened awareness and accident prevention. By prioritizing effective communication through signage, the project aims to create a secure environment for all stakeholders and foster a culture of safety throughout the construction process.

Figure 5-5Signage

5.9.19 LIGHTING AND ILLUMINATION

The contractor will be dedicated in ensuring optimal visibility and security across key project areas, including work bases, work sites, camp sites, machinery yards, and material depots, through the implementation of suitable lighting arrangements. This proactive measure not only facilitates extended working hours, enhancing productivity, but also contributes significantly to overall security measures. In instances where a local electric supply is unavailable, the contractor will make provisions for electricity generators at all locations requiring lighting. This strategic approach ensures a consistent and reliable source of illumination, addressing both operational and safety considerations. By prioritizing adequate lighting, the project aims to create a conducive and secure working environment, promoting efficient project execution and safeguarding the well-being of personnel and assets during the entire construction process.

5.9.20 ENVIRONMENTAL TRAINING

Capacity building is a multifaceted endeavor that will be effectively achieved through a diverse range of methods, including on-the-job training, short courses, training workshops, lectures, educational visits, and seminars. The implementation of these interactive learning platforms extends to engaging key stakeholders such as team members from the Lahore Development Authority (LDA), Environmental Protection and Climate Change Agency (EPA), consultants, construction managers, supervisors, and other relevant agencies. Specifically tailored to road-related environmental issues, these interactions aim to enhance the expertise and knowledge base of the participants.

By involving various stakeholders in these capacity-building initiatives, the project emphasizes collaboration, knowledge sharing, and skill development. This comprehensive strategy will ensure that key individuals involved in the project will well-equipped to address and manage road-related environmental issues effectively, ultimately contributing to the sustainable and responsible execution of the construction endeavor.

5.9.21 AWARENESS RAISING

Elevating awareness about current and potential environmental threats related to roads will be of paramount importance, especially for the general public and roadside dwellers. Recognizing the historical oversight in this aspect, LDA will be committed to implementing an effective strategy

for enhanced education in road-related environmental issues through targeted awareness campaigns.

Utilizing a multi-faceted approach, these campaigns will employ visual graphics, harnessing the power of compelling imagery to convey key environmental messages. Print media, including informative brochures and pamphlets, will serve as tangible resources for disseminating detailed information. Seminars and workshops will provide interactive platforms for in-depth discussions and knowledge sharing, engaging participants in a meaningful way.

The comprehensive awareness strategy aims not only to inform but also to empower communities and individuals with the knowledge needed to understand and address environmental threats associated with roads. By embracing visual, print, and interactive methods, the project endeavors to bridge the gap in past neglect and foster a heightened sense of environmental consciousness among the public and those residing along roadways.

5.10 TRAFFIC ANALYSIS

The primary goal of Traffic Studies is to comprehensively evaluate both the volumes and composition of traffic load anticipated to utilize the proposed controlled access facility. Additionally, the assessment extends to gauging the benefits and travel time savings that would be realized as a direct outcome of the proposed improvements at the Karim Market intersection. It is anticipated that these enhancements will lead to a substantial reduction in accidents along Wahdat Road, Noor ul Amin Road, and Maulana Shaukat Ali Road. This comprehensive approach seeks not only to analyze the current and future traffic dynamics but also to quantify the positive impact of the proposed improvements on travel efficiency and safety, ultimately contributing to a safer and more streamlined transportation network in the specified areas.

5.10.1 SCOPE OF THE PROJECT

The overarching aim of the project is the substantial remodeling of the existing Fazal-e-Haq Roundabout and construction of underpass at Karim market intersection. This ambitious undertaking is poised to elevate the overall quality and functionality of the road significantly. By implementing controlled access features, the project aims to streamline traffic flow and effectively address prevalent traffic issues along this critical stretch.

The envisioned enhancements encompass a holistic approach, incorporating design modifications and infrastructure improvements to create a controlled and efficient traffic corridor. Through this comprehensive remodeling initiative, the project seeks not only to upgrade the physical attributes of the road but also to mitigate congestion, enhance safety, and optimize the overall transportation experience for commuters. The end goal is to establish a Controlled Access Facility that not only meets contemporary traffic standards but also contributes positively to the surrounding urban infrastructure, fostering sustainable and efficient mobility within the specified corridor.

5.10.2 TRAFFIC VOLUME ON PROJECT ROAD

Conducting a comprehensive traffic study before the construction of an underpass is of paramount importance for several reasons. Such a study serves as a foundational step in understanding the intricate dynamics of vehicular movement and traffic patterns in the designated area. By analyzing current traffic conditions, including volume, congestion points, and peak hours, planners can make informed decisions about the design and capacity of the underpass. This proactive approach helps anticipate potential traffic bottlenecks and ensures that the underpass is tailored to address the specific needs and demands of the existing road network. Additionally, a thorough traffic study aids in predicting the impact of the underpass construction on surrounding areas, enabling the implementation of effective mitigation measures to minimize disruptions during the construction phase. Ultimately, the insights derived from a traffic study contribute to the creation of a more efficient and seamlessly integrated transportation infrastructure, enhancing overall traffic management and promoting the project's long-term success.

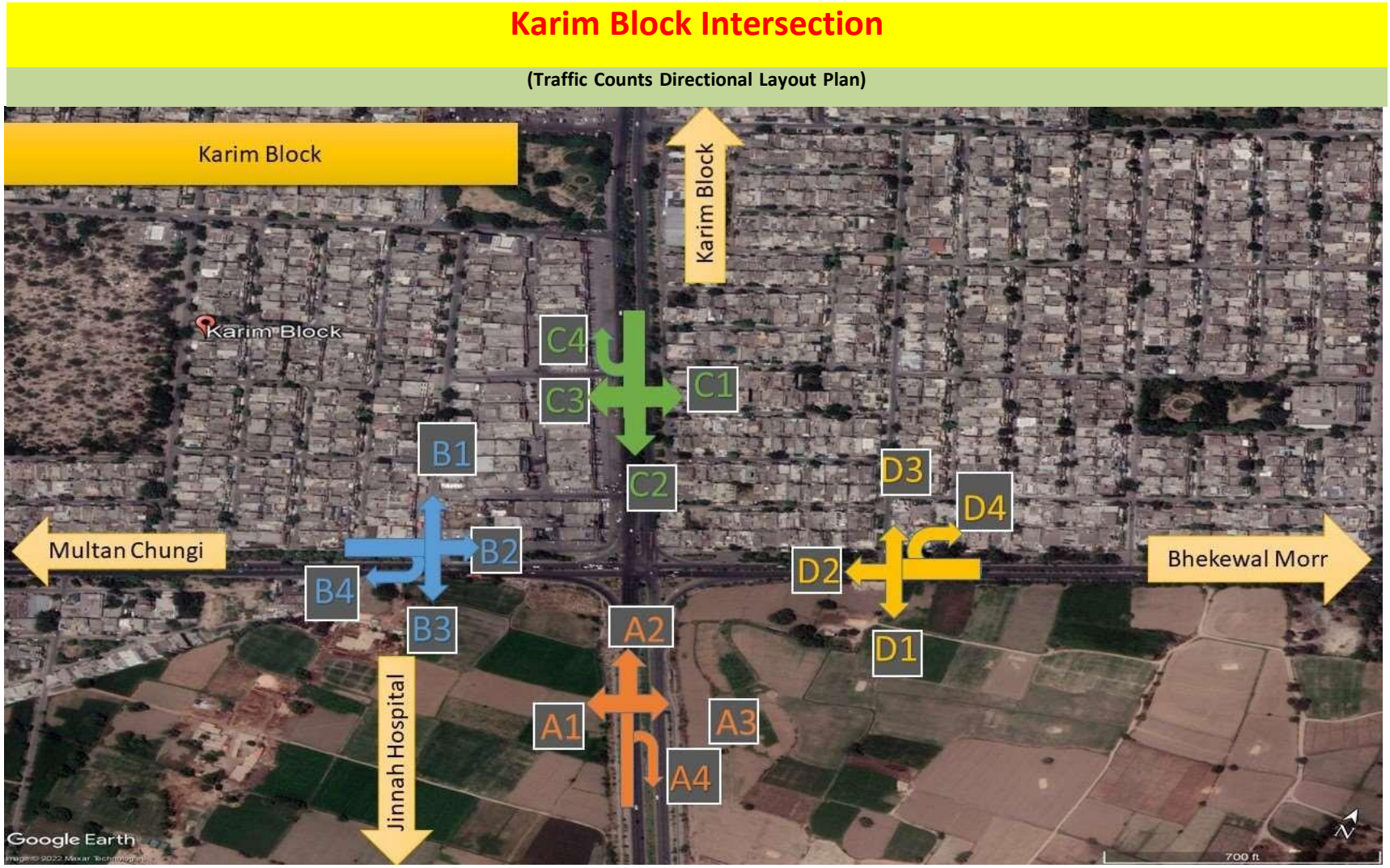

Figure 5-6Traffic Study Locations

Table 5-11Traffic Study

				All Directions Volume (PCUs)	All Directions Hourly Volume (PCUs)	Average Hourly Volume (PCUs)
1	7:00	7:15		942		
2	7:15	7:30		1262		
3	7:30	7:45		1689		
4	7:45	8:00	7:00 - 8:00	1918	5810	9259
5	8:00	8:15		2281	7149	9259
6	8:15	8:30		2122	8009	9259
7	8:30	8:45		2299	8620	9259
8	8:45	9:00	8:00 - 9:00	2175	8877	9259
9	9:00	9:15		2201	8798	9259
10	9:15	9:30		1970	8645	9259
11	9:30	9:45		2088	8434	9259
12	9:45	10:00	9:00 - 10:00	2076	8335	9259
13	10:00	10:15		2022	8156	9259
14	10:15	10:30		2029	8215	9259
15	10:30	10:45		2067	8194	9259
16	10:45	11:00	10:00 - 11:00	1982	8100	9259
17	11:00	11:15		1928	8006	9259
18	11:15	11:30		2003	7980	9259
19	11:30	11:45		1948	7861	9259
20	11:45	12:00	11:00 - 12:00	1972	7851	9259
21	12:00	12:15		1951	7874	9259
22	12:15	12:30		1979	7850	9259
23	12:30	12:45		2115	8017	9259
24	12:45	13:00	12:00 - 13:00	2175	8220	9259
25	13:00	13:15		2161	8429	9259
26	13:15	13:30		2220	8671	9259
27	13:30	13:45		2255	8810	9259
28	13:45	14:00	13:00 - 14:00	2219	8855	9259
29	14:00	14:15		2250	8944	9259
30	14:15	14:30		2432	9156	9259
31	14:30	14:45		2324	9226	9259
32	14:45	15:00	14:00 - 15:00	2668	9674	9259
33	15:00	15:15		2566	9990	9259
34	15:15	15:30		2600	10157	9259
35	15:30	15:45		2396	10229	9259
36	15:45	16:00	15:00 - 16:00	2419	9981	9259
37	16:00	16:15		2374	9789	9259
38	16:15	16:30		2441	9630	9259
39	16:30	16:45		2360	9593	9259
40	16:45	17:00	16:00 - 17:00	2400	9574	9259
41	17:00	17:15		2462	9663	9259
42	17:15	17:30		2334	9555	9259
43	17:30	17:45		2347	9543	9259
44	17:45	18:00	17:00 - 18:00	2479	9622	9259
45	18:00	18:15		2658	9818	9259
46	18:15	18:30		2683	10167	9259
47	18:30	18:45		2773	10593	9259
48	18:45	19:00	18:00 - 19:00	2785	10899	9259
49	19:00	19:15		2928	11169	9259
50	19:15	19:30		2973	11459	9259
51	19:30	19:45		2793	11478	9259
52	19:45	20:00	19:00 - 20:00	2955	11649	9259
53	20:00	20:15		2855	11575	9259
54	20:15	20:30		2618	11220	9259
55	20:30	20:45		2611	11038	9259
56	20:45	21:00	20:00 - 21:00	2239	10322	9259

57	21:00	21:15		2521	9988	9259
58	21:15	21:30		2348	9718	9259
59	21:30	21:45		2423	9531	9259
60	21:45	22:00	21:00 - 22:00	2327	9619	9259
61	22:00	22:15		2353	9451	9259
62	22:15	22:30		2219	9322	9259
63	22:30	22:45		2126	9025	9259
64	22:45	23:00	22:00 - 23:00	1945	8642	9259

Table 5-12Traffic Volume

Vehicle Category		**Volume**	**% Share**	
Non-Motorized	1. Animal Driven Cart	132	0.07%	0.24%
	2. Bicycle	346	0.17%	
Motorized	3. Motor Cycle/Scooter	109806	54.60%	99.76%
	4. Rikshaw/Qingqi	24843	12.35%	
	5. Car/Taxi/Suzuki Pickup	62127	30.89%	
	6. Hiace/Wagon	1006	0.50%	
	7. Medium Bus/Flying Coach	350	0.17%	
	8. Bus	334	0.17%	
	9. Loader Pickup	1464	0.73%	
	10. Truck	641	0.32%	
	11. Tractor with Trolley	53	0.03%	
	Total	**201102**	**100%**	**100%**

5.11 RESTORATION AND CREHABILIATION AT THE END OF PROJEC T SITE

The proposed project, being an enhancement of an existing road, eliminates the necessity for extensive rehabilitation efforts. Safety considerations, continually evolving and paramount in projects of this nature, will be rigorously adhered to at all stages. Anticipating the road's end-of-life scenario, a meticulous plan for its dismantling has been established, prioritizing special precautions to minimize pollution and ensure the safety of human life and property in the vicinity. Debris resulting from the dismantling process will be disposed of with a steadfast commitment to environmentally sustainable practices. Materials deemed suitable for recycling or reuse will be either sold in the market or repurposed for other suitable endeavors. Upon project completion, a

swift and thorough removal of construction materials, debris, and waste will be executed under safe conditions, with any minor spills promptly addressed. Additionally, any pitted land will be diligently leveled, contributing to the overall cleanliness and aesthetics of the project site and its immediate surroundings. This comprehensive approach aligns with the project's commitment to environmental responsibility, safety, and community well-being, ensuring that the project site and its vicinity remain neat, clean, and harmoniously integrated with the natural surroundings. The outlined guidelines underscore the importance of factors influencing successful site rehabilitation and the restoration of disturbed areas.

5.12 MONITORING

In pursuit of continuous improvement and stringent adherence to the activities outlined in contracts, it is imperative to establish a robust system of regular monitoring. This monitoring initiative places a particular emphasis on maintaining a seamless continuity between the unique characteristics of the project site and the surrounding landscapes. Regular and systematic checks enable the project team to assess the ongoing activities, ensuring that they align with the contractual specifications. By closely monitoring the project against predetermined benchmarks, deviations and potential issues can be identified early, facilitating prompt corrective action. This comprehensive monitoring approach not only guarantees compliance with contractual obligations but also fosters an adaptive management strategy that responds to the evolving dynamics of the project site and its interface with adjacent landscapes. The emphasis on continuity ensures that the project not only meets its immediate contractual requirements but also integrates harmoniously with the natural and built environments, contributing to a sustainable and well-aligned development.

6 DESCRIPTION OF THE ENVIRONMENT

The primary objective of a baseline environmental assessment is to establish a database that helps to predict and handle any potential impacts from the proposed project. This section provides a detailed description of the project site, encompassing environmental characteristics that are expected to be influenced by the project's construction and operational phase. The existing environmental conditions in the vicinity of the proposed project have been thoroughly analyzed, taking into account physical, biological, and socio-economic factors. A field survey was conducted during a site visit to gather environmental data related to physical, biological, and socio-economic parameters. Additionally, consultations were conducted with both the general public and stakeholders within the project area to solicit their perspectives on the proposed project's implementation.

6.1 STUDY AREA

Conducting an EIA necessitates defining the Study Area, a geographical region wherein potential significant adverse impacts of the proposed Project are anticipated. This encompasses a broader scope than the designated "Project Area," considering the extent of both direct and indirect impacts on the existing environment. Critical parameters from physical (wind direction, topography), ecological, and social (settlement locations, receptors, land use resources) domains are integral to the established criteria. The Study Area encompasses the proposed Project boundary, including the area earmarked for acquisition, and extends to the surrounding regions where potential adverse impacts may arise from Project implementation. This incorporates spaces like construction camps, residential and non-residential buildings, workshops, etc., ensuring a comprehensive evaluation of potential environmental and social repercussions.

6.2 PHYSICAL RESOURCES

6.2.1 TOPOGRAPHY

Situated in the Lahore, Karim Market exhibits a captivating topography shaped by the passage of time and the meandering Ravi River. It has an average elevation of around 220 meters above sea level. The project area features a predominantly flat terrain, providing a favorable foundation for construction activities. The level topography facilitates efficient road development and minimizes challenges associated with uneven landforms.

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Figure 6-1 Topographical Map of Project Area (Lahore)

6.2.2 SOIL

The soils in the project area are predominantly composed of alluvial deposits, originating from the nearby rivers. These fertile soils support a thriving agricultural sector and contribute to the lush greenery in and around the city. Additionally, the soil composition plays a crucial role in construction activities, offering stability and a solid foundation for infrastructure development.

6.2.3 CLIMATE AND METEOROLOGY OF LAHORE

Karim Market experiences a subtropical climate characterized by four distinct seasons. Summer in the project area, which typically extends from May to September, is hot and dry, with temperatures often exceeding 40℃. The city experiences scorching heat waves during the summer period. The monsoon season occurs from July to September, bringing heavy rainfalls. Winters, from November to February, are mild and cool, the temperature ranges from 5℃ to 15℃. Smog and air pollution are a major concern during the winter season. Autumn and Spring seasons are relatively brief but pleasant. Spring, from March to April, is marked by mild temperatures and blooming gardens. Autumn, from October to November, offers similarly comfortable weather.

Table 6-1 Meteorological and Climatic Features

Classification of Climate	Tropical (Hot/Humid)
Predominant Wind Direction	East/Northeast
Wind Intensity	Weak To Moderate
Average Annual Precipitation	>650 Mm
Rainy Season	July To September
Dry Season	October To June
Average Annual Temperature	19-20 °C
Average Summer Temperature	36-38 °C
Average Winter Temperature	6.5-10.5 °C

Table 6-2Average Monthly Temperature and Precipitation at the Project Area

Months	Average Monthly Temperature (°C)	Precipitation (Millimeters)
January	19	23
February	23	28.6
March	28	41.2
April	34	19.7
May	39	22.4
June	39	36.3
July	36	202.1
August	35	163.9
September	35	61.1
October	32	12.4
November	27	4.2
December	22	13.9

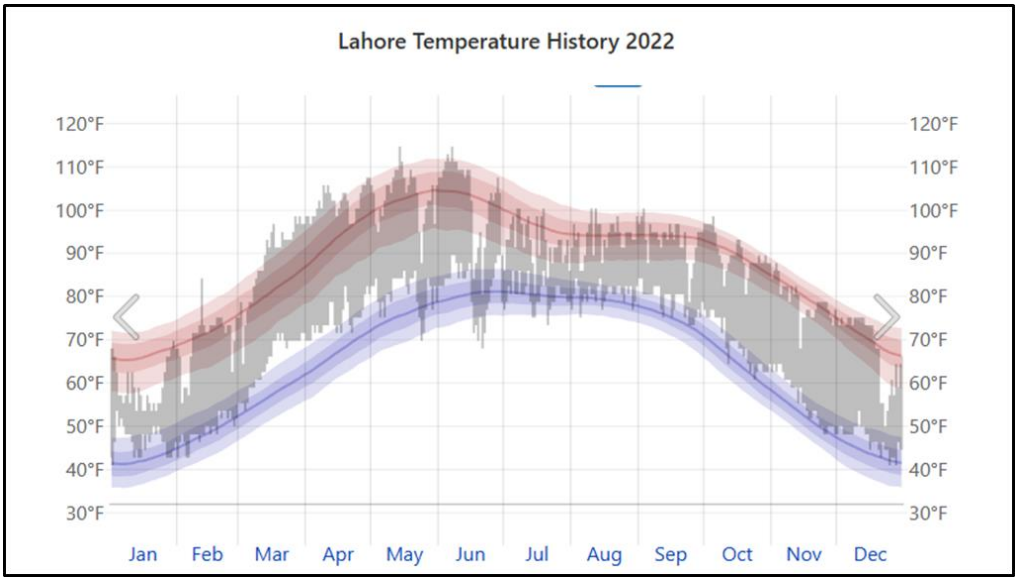


Figure 6-2 Average Temperature in Lahore

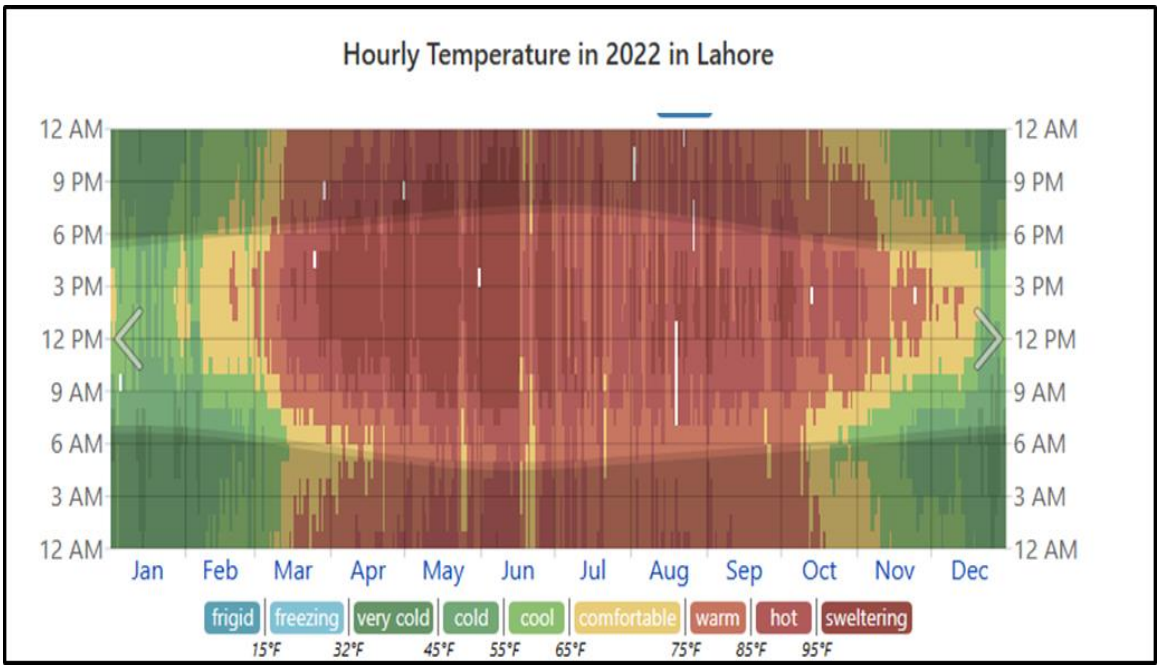


Figure 6-3 Hourly Temperature History in Lahore

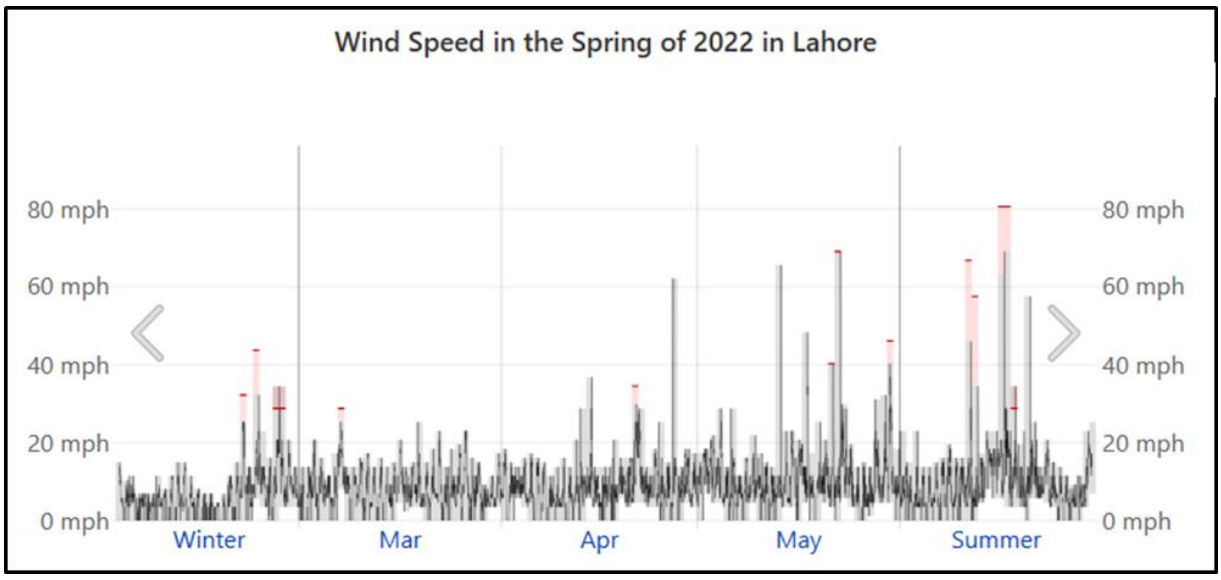


Figure 6-4 Wind Speed in Lahore

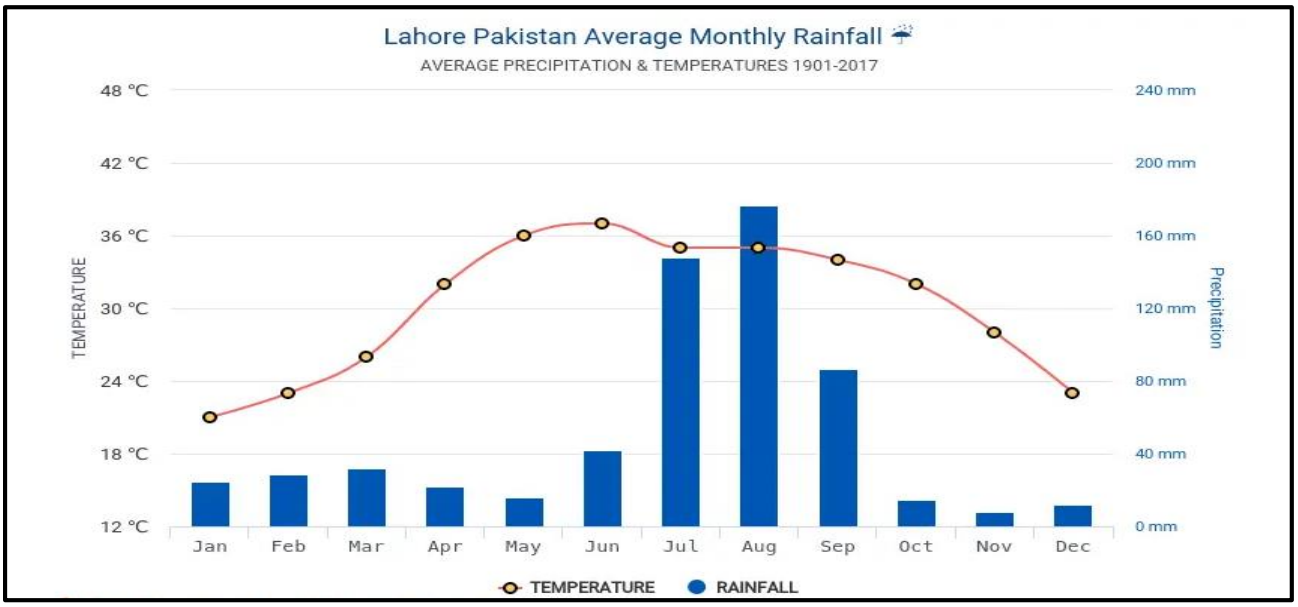


Figure 6-5 Average Monthly Rainfall in Lahore

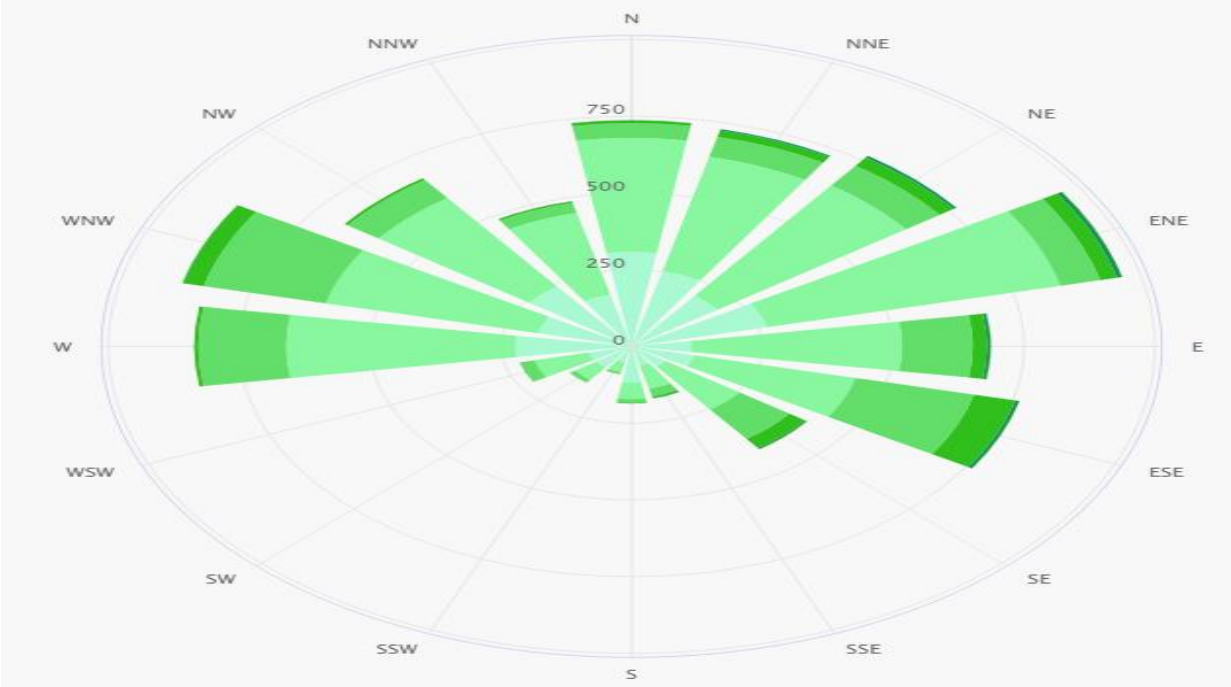


Figure 6-6Wind Rose in Lahore

6.2.4 SOLAR ELEVATION

The figure illustrates the solar elevation throughout the year 2022, featuring black lines representing constant solar elevation (the sun's angle above the horizon in degrees). Background color fills denote the azimuth, indicating the compass bearing of the sun. Additionally, lightly tinted regions at the boundaries of cardinal compass points suggest implied intermediate directions, encompassing northeast, southeast, southwest, and northwest.

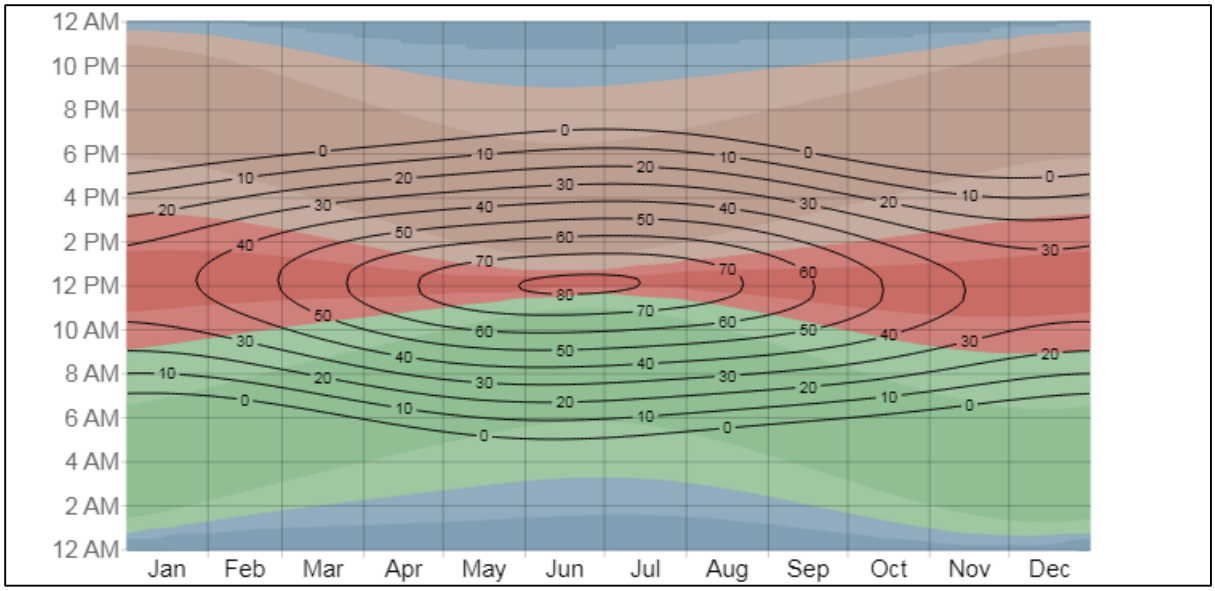


Figure 6-7 Solar Elevation of Lahore

6.2.5 SURFACE WATER AND GROUNDWATER

Karim Market, Lahore situated within the Punjab is geologically characterized as part of the lower Indus Basin. The very name "Punjab" signifies the region's reliance on rivers, as it translates to 'Punj-aab,' meaning the land of five rivers. Historically, the five rivers—Sutlej, Bias, Ravi, Jhelum, and Chenab—have played a vital role in shaping the fertile landscape of Punjab. Notably, while the Bias River no longer flows in Pakistan, the Ravi River courses through Lahore, influencing the city's topography with its southwest-directed flow.

Surface Water

The area is characterized by a scarcity of surface water, reflecting a notable absence of visible water bodies such as rivers, lakes, or ponds.

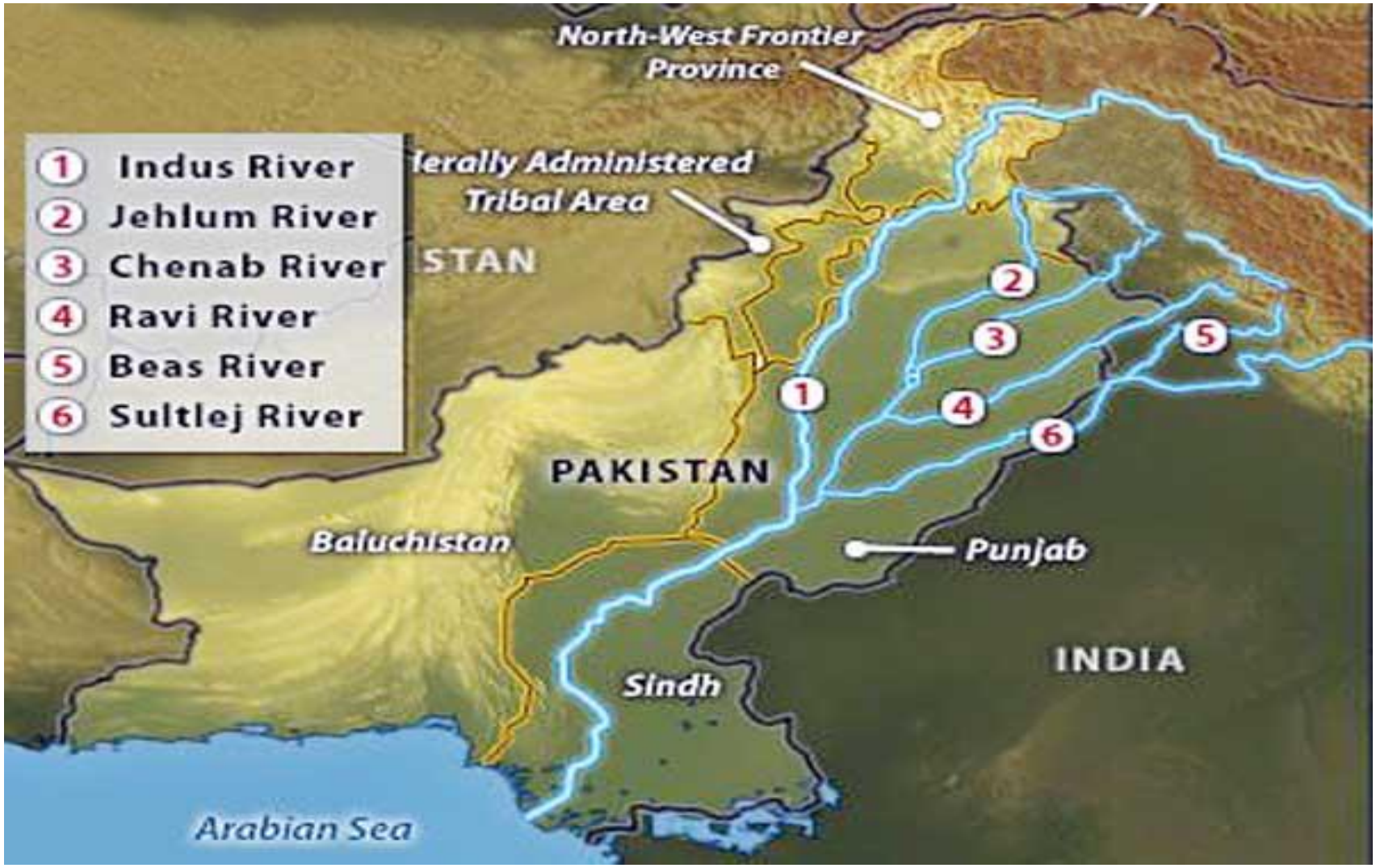


Figure 6-8Water Availability in Pakisatn

Groundwater

Groundwater quality in the project area is generally fresh, meeting salinity standards. Deep tube wells extract bacteria-free raw water. The upper 50 meters of the subsoil may have brackish water. Tube wells, dispersed throughout the area, tap into the groundwater aquifer for drinking purposes. The water is generally suitable for direct consumption, with 83% of the Lahore's population relying on groundwater. The water table, situated 15 to 23 meters below the natural surface level, shows a mean annual decline of approximately 2.03 feet, as per the Master Plan-2030. Groundwater depth varies across the city, being deeper in areas with higher abstraction than recharge, while closer to surface waters like the Ravi River and Canal, the situation is reversed.

6.2.6 GEOLOGY OF PROJECT AREA

The geology of the project area is characterized by a sedimentary rock foundation, with layers of clay, silt, and sand. The region is situated on the Indo-Gangetic Plain, and the geologic formations contribute to the city's relatively flat topography.

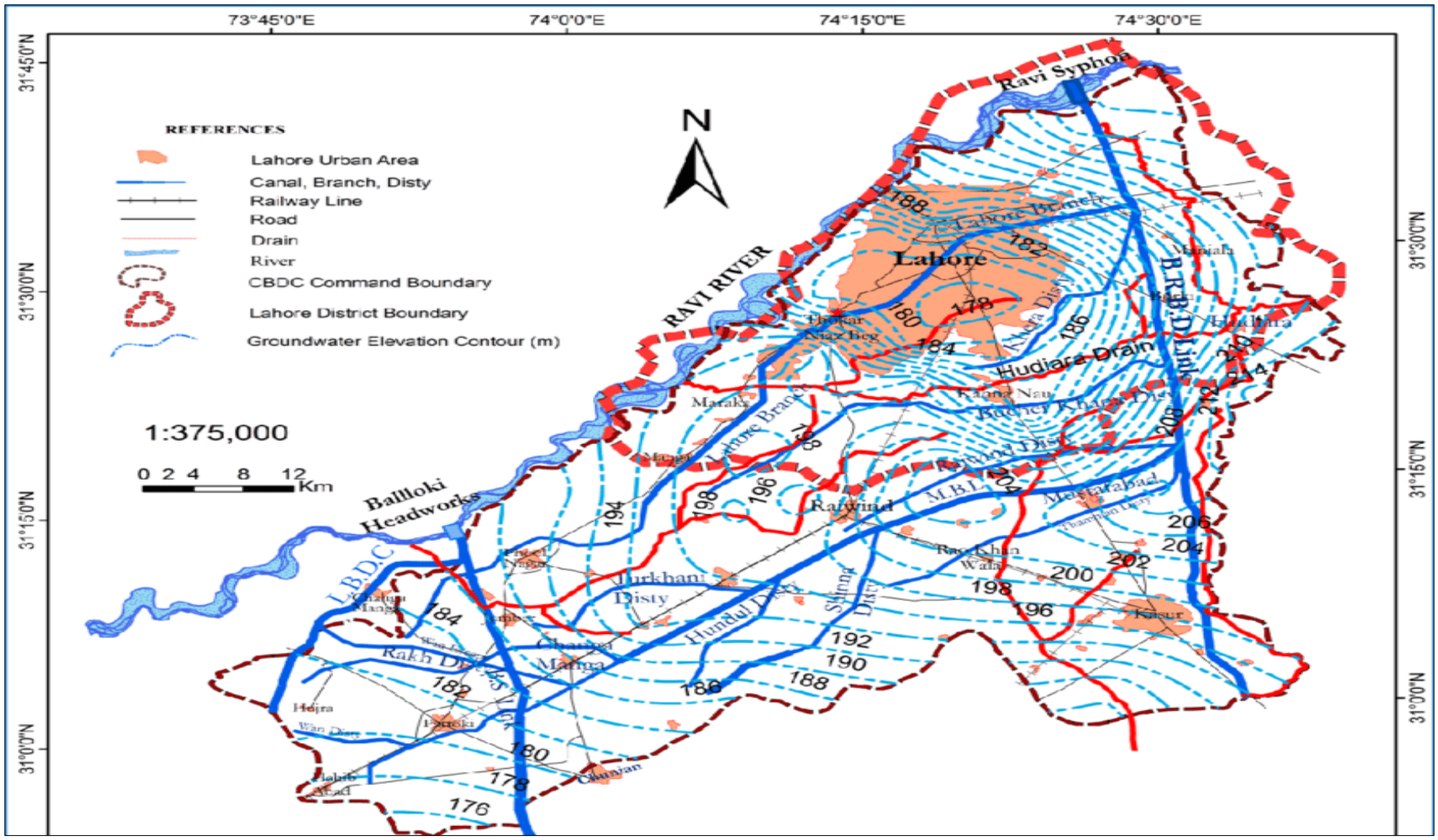


Figure 6-9 Groundwater Contours of Lahore

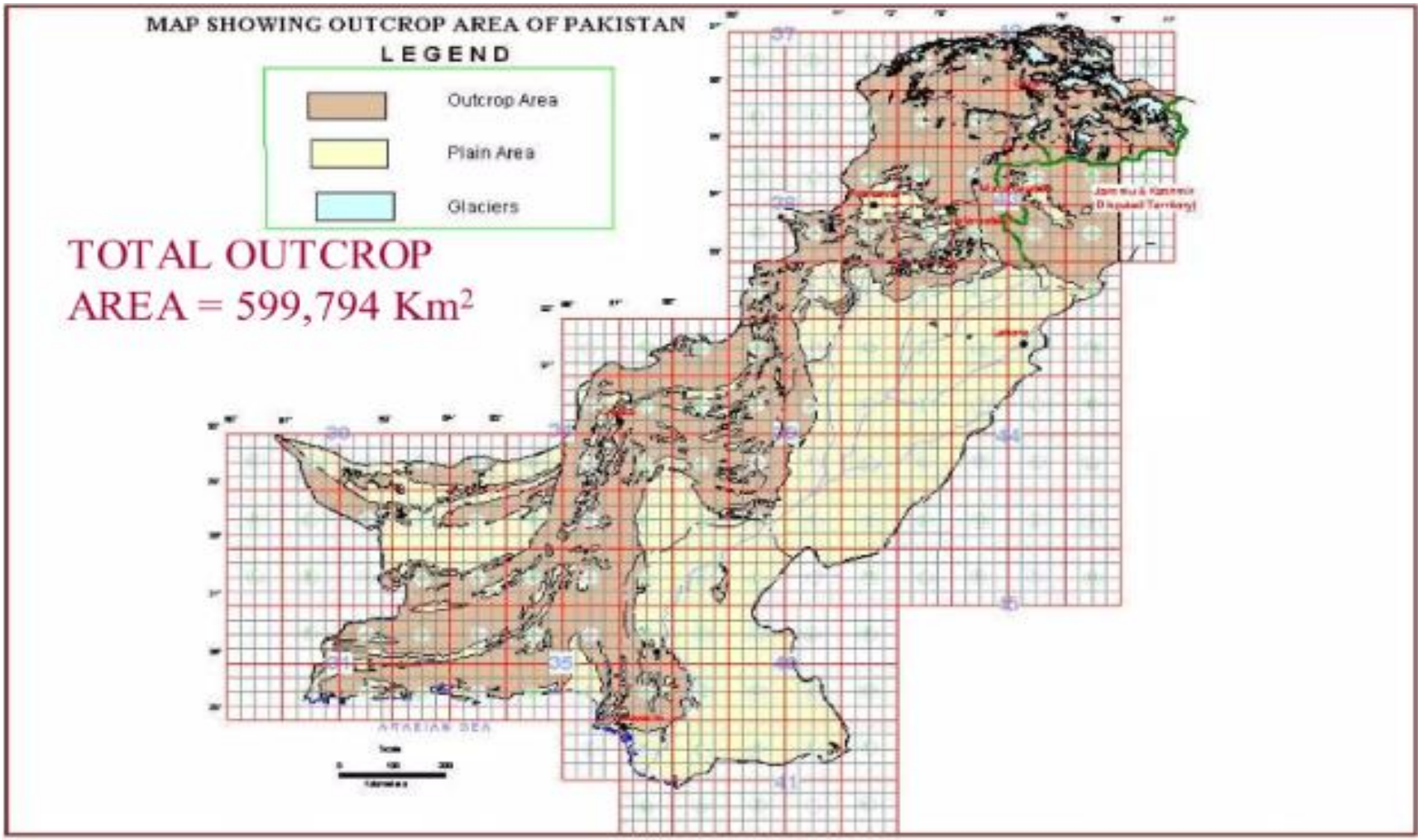


Figure 6-10Geology of the Project Area

6.3 SEISMOLOGY

The Pakistan Building Code categorizes the country into four seismic zones, as depicted in the figure. The project site is situated in the Low Hazard Zone, characterized by a seismic factor ground acceleration of g/10 or less. Consequently, the structural design of buildings and other components will adhere to the specific criteria outlined for the designated zone. Seismic considerations hold significant importance in the planning process, exerting a direct influence on the construction dynamics of the site.

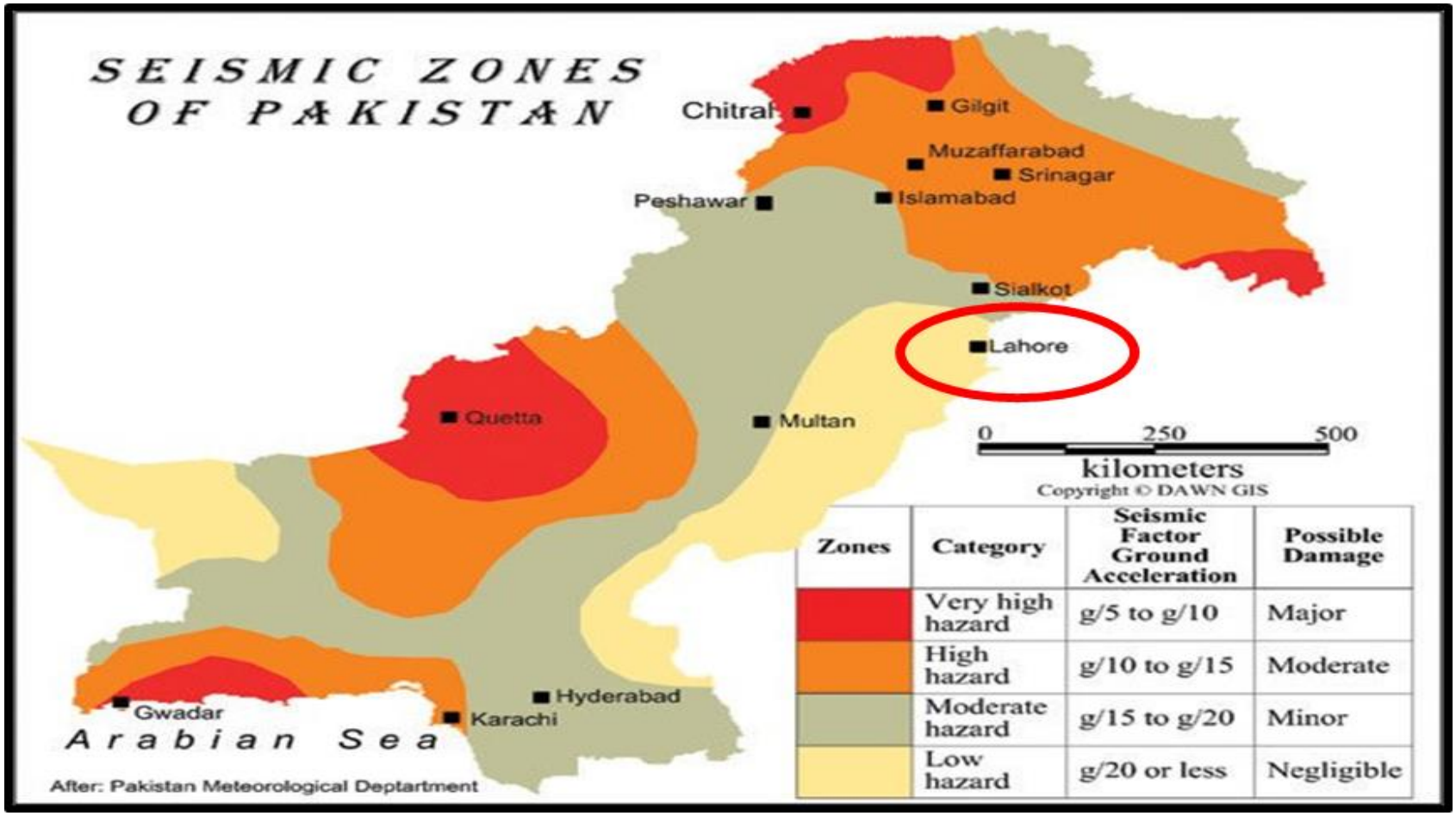


Figure 6-11 Seismic Zones of Pakistan

6.4 ECOLOGICAL RESOURCES

6.4.1 FLORA

Green belts are flanking the road at the project site, offering a refreshing and aesthetically pleasing landscape. These verdant strips are contributing to the visual appeal of the surroundings while providing environmental benefits such as improved air quality.

Table 6-3Flora of the project site

Sr. No.	Common Names	*Botanical Names*
1.	Berri	*Diospyros melanoxylon*
2.	Pipal	*Ficus religiosa*
3.	Neem	*Azadirachta indica*
4.	Desi Kikar	*Prosopis cineraria*
5.	Siris	*Albizia lebbeck*
6.	Toot	*Morus alba*
7.	Ber	*Ziziphus mauritiana*
8.	Bakain	*Melia azedarach*

Figure 6-12 Flora of the Project Area

6.4.2 FAUNA

Karim Market is orchestrated by a diverse ensemble of birds, each contributing its unique melody to the city's soundtrack. Sparrows engage in playful flights between balconies, accompanied by the serene perching of kingfishers along canal edges. Pigeons coo from lofty rooftop perches, harmonizing with the melodious calls of bulbuls and mynahs that resonate through lush gardens. The skies above are graced by soaring kites and vibrant parrots, adding splashes of emerald and crimson to the urban canvas. Squirrels, agile and nimble, dart through tree branches. Chameleons display their color-changing prowess against brick walls

6.4.3 ENDANGERED SPECIES

No endangered species has been found in the project area.

6.5 SOCIOECONOMIC ENVIRONMENT

The project area is strategically positioned in close proximity to major highways, including the Motorway, Multan Road, and Wahdat Road. This location enhances accessibility and connectivity, making it a key residential hub in Lahore.

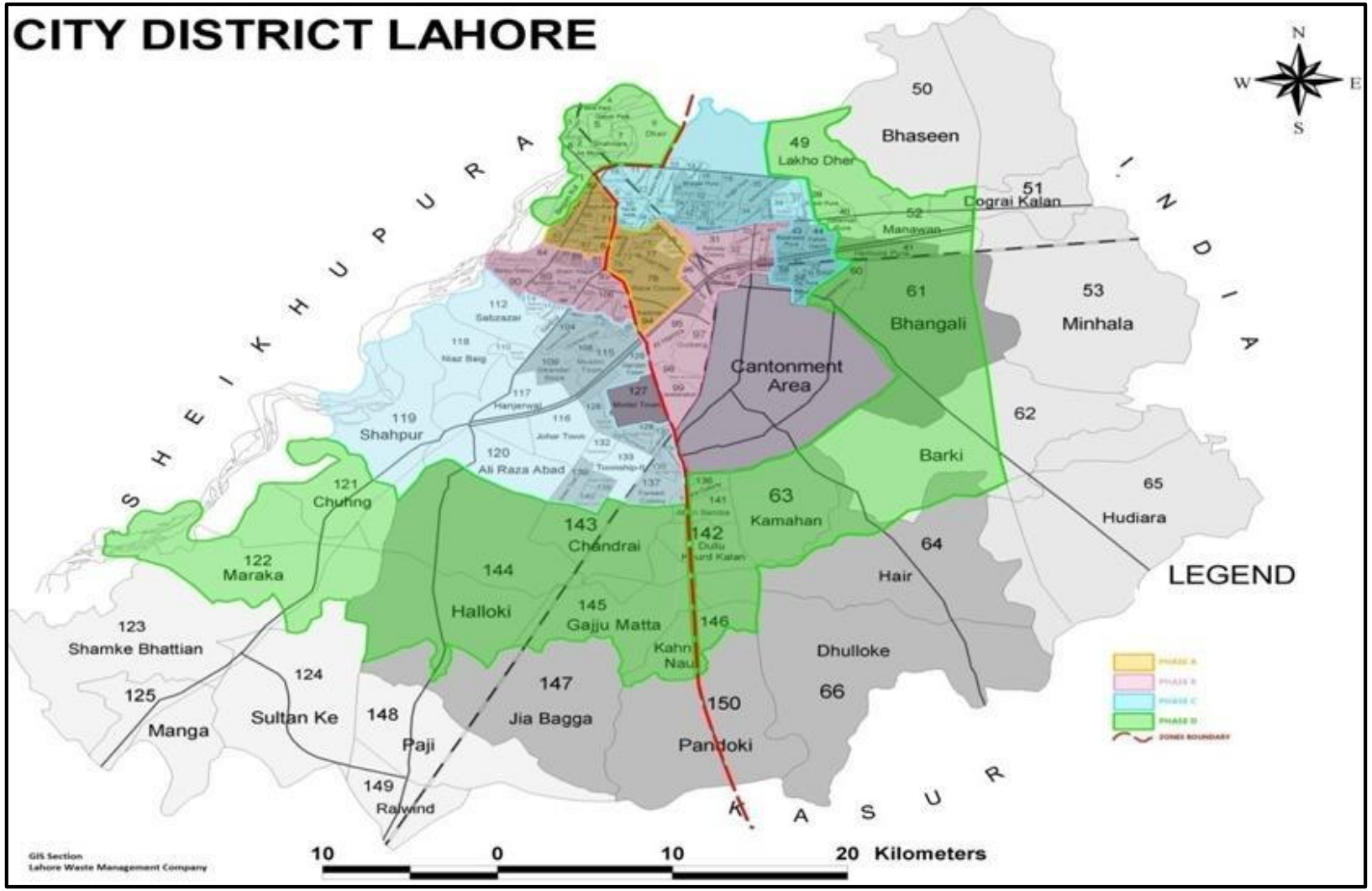


Figure 6-13 District Map of Lahore

6.6 ECONOMIC ACTIVITIES

The area boasts a rich socio-economic environment, characterized by a vibrant blend of commercial activities, educational institutions, and diverse community engagements. The thriving economic landscape is evidenced by a multitude of businesses, ranging from small enterprises to larger establishments, contributing to a bustling and dynamic commercial sector. Educational facilities, including schools and learning centers, underscore the area's commitment to nurturing intellectual capital. Additionally, the diverse demographic and cultural tapestry within the community contribute to a socially dynamic environment, fostering a sense of inclusivity and cultural richness. This socio-economic vibrancy positions the area as a focal point for various opportunities and interactions, making it a dynamic and thriving hub within the larger urban context.

The project site is situated within a bustling commercial area, characterized by a vibrant mix of schools, markets, restaurants, banks and food stalls. This dynamic environment reflects a diverse and active community hub, catering to the educational, commercial, and recreational needs of the local population. The proximity of numerous schools underscores the significance of the area as an educational center, while the presence of markets and eateries adds to its commercial vibrancy. The diverse array of restaurants and food stalls not only contributes to the area's culinary richness but also fosters a lively and engaging atmosphere. This amalgamation of commercial enterprises creates a thriving ecosystem, making the project site a focal point for social, educational, and economic activities within the community. Various Banks such as The Bank of Punjab, United bank Limited (UBL), Habib Bank Limited (HBL) are located at Noor-ul-Amin Road, Karim Market.

Figure 6-14 Economic Buildings on Wahdat Road

6.7 POLITICAL AND ADMINISTRATIVE SETUP

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

6.8 INDUSTRIAL AND AGRICULTURAL ACTIVITIES

The project area itself is marked by a distinctly commercial nature, featuring a diverse array of businesses including restaurants, markets, and banks. This dynamic commercial hub not only provides essential services to the local community but also serves as a catalyst for economic activities. The proximity to the Quaid-e-Azam Industrial Area further amplifies the potential for synergies, creating opportunities for collaboration, trade, and mutual growth. Quaid-e-Azam Industrial Estate is located 10 km away from project area. The presence of restaurants, markets, and banking facilities enhances the overall convenience and accessibility of the project area, positioning it as an integral part of the broader economic ecosystem in the region.

While one side of Maulana Shaukat Ali Road features open land, it is noteworthy that agricultural activities are distinctly absent from the project area. The open land, though available, is not utilized for farming or cultivation. Instead, the project area appears to be oriented toward non-agricultural functions, possibly aligning with commercial, residential, or industrial purposes.

6.9 QUALITY OF LIFE

6.9.1 DERMOGRAPHIC CHARACTERISTICS

- 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

Table 6-4Total Population

Year	Population
2010	8,432,132
2011	8,788,170
2012	9,159,763
2013	9,545,980
2014	9,949,049
2015	10,369,137
2016	10,807,578
2017	11,263,275
2018	11,738,186
2019	12,188,196
2020	12,642,423
2021	13,095,166

2022	13,541,764
2023	13,979,390

Table 6-5Area, Population by Sex, Sex Ration. Population Density, Urban Proportion, Household Size, and Annual Growth Rate

ADMN-UNIT	POPULATION 2017									Population 1998	1998 - 2017 Average Annual Growth Rate
	Area (sq. Km)	All Sex	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	**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
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**	**1817.00**	**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

6.10 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.

6.11 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.

6.12 ETHNIC STRUCTURE

The main castes and groups of the project area district are Arain, Jat, Rajput, Malik, Pathan, Mughal, Sheikh, Komboh, and Gujjar. Karim Market being a prominent area of Lahore stands as a cosmopolitan city, embodying a rich tapestry of cultural diversity and a harmonious blend of tradition and modernity. As one of Pakistan's most cosmopolitan metropolises, it welcomes residents and visitors alike with an eclectic mix of historical landmarks, contemporary infrastructure, and a dynamic social scene. The city pulsates with life through its vibrant bazaars, bustling streets, and a gastronomic landscape that reflects a fusion of flavors. Its cosmopolitan character is also evident in its cultural events, art exhibitions, and educational institutions that attract people from various backgrounds. This melting pot of cultures creates an inclusive and tolerant atmosphere, making it a truly cosmopolitan hub where tradition and progress coexist seamlessly.

6.13 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 of the study area eing 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.

6.14 INSTITUTIONS

Karim Market is a hub of various educational, academic, and flourishing government institutes. In the vicinity of the project, there are many educational institutions like Science College, University of the Punjab, Wahdat College, Comprehensive School and many other private schools such as, The Unique School, The Educators, Beacon house School System , Lahore Grammar School are in the vicinity of the project area.

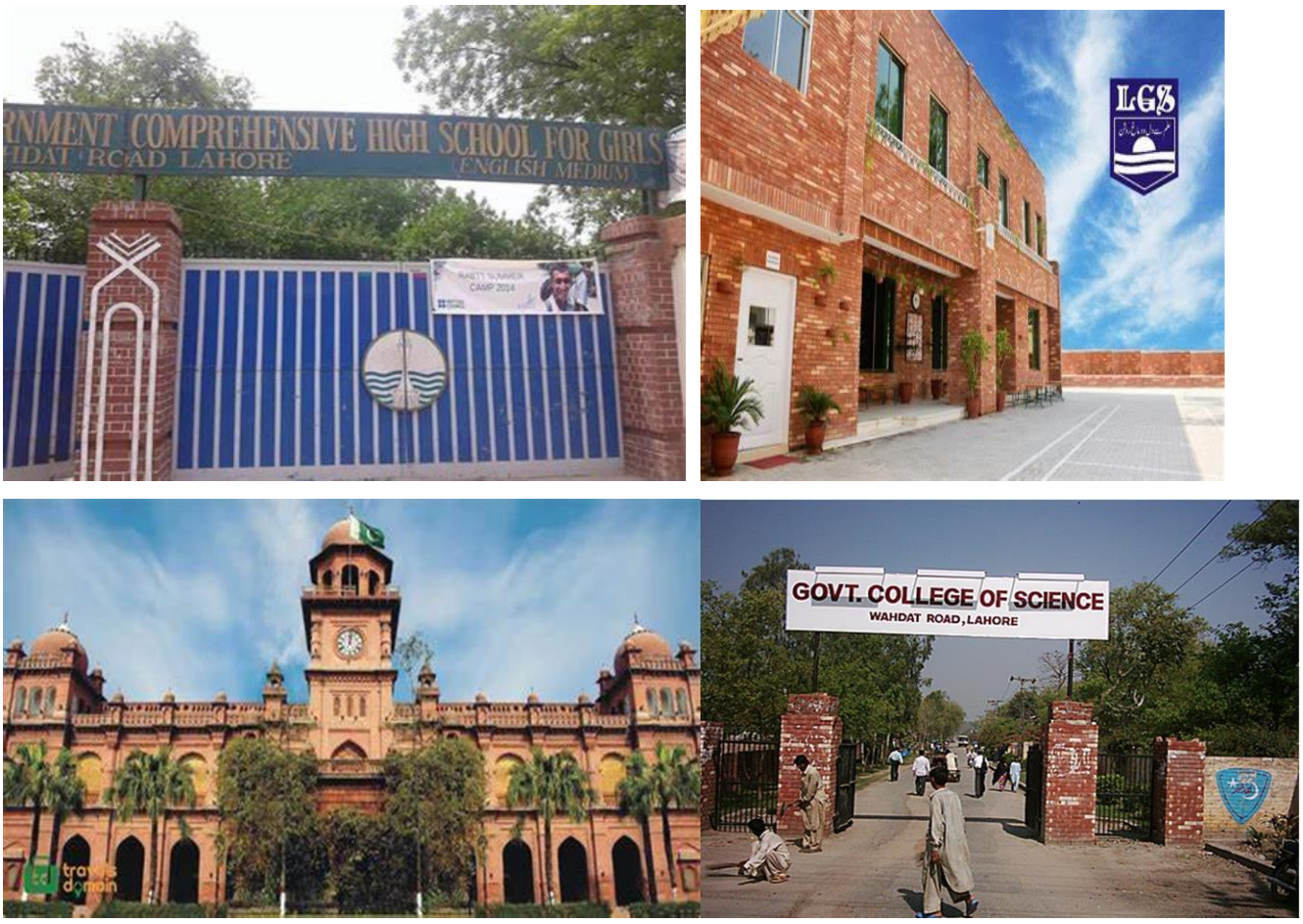


Figure 6-15Educational Institutes in the Project Area

6.15 TRANSPORTATION

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. Buses, rickshaws, Local Vans, Personal Cars are the prominent means of transport in the project Area. Speedo is the most common source of transportation for the people living in the vicinity of Wahdat Road.

Figure 6-16 Transportation in the Project Area

6.16 HEALTH FACILITIES

Ample medical and health facilities are available in the Project Area. Besides, several private medical practitioners, Hakims, and homeopathic doctors are also practicing in the Area. Jinnah Hospital, Sheikh Zaid Hosital, Mumtaz Bakhtarwar, Mansoorah are the nearest healthcare facilities that are present in the vicinity of the project.

Figure 6-17 Hospitals Near Project Area

6.17 ARCHITECTURAL SITES

The vicinity of the project area is devoid of archaeological sites, indicating an absence of historical or cultural landmarks of significant archaeological value. The landscape does not harbor ancient structures, artifacts, or remnants that typically characterize archaeological sites. This absence suggests that the region may not have been historically significant in terms of ancient settlements or cultural remains. While this lack of archaeological sites simplifies the construction planning process, it also underscores the importance of understanding the local history and cultural context, allowing for a comprehensive assessment of the region's historical significance or lack thereof.

Approach of the Project

The designated project area is presently characterized by established development, and through the proposed enhancements, there is a strategic opportunity to further optimize the functionality of the existing traffic facilities. The envisioned improvements are designed to act as catalysts for substantial enhancements, contributing to an overall amelioration of the traffic infrastructure. By implementing the suggested measures, the project aims to alleviate congestion, enhance traffic flow, and optimize the overall efficiency of transportation within the area. These proposed improvements take into account the existing infrastructure, ensuring a harmonious integration that not only addresses current challenges but also lays the groundwork for a more seamless and resilient traffic system. As a result, the project endeavors to bring about a positive transformation, fostering enhanced mobility and accessibility in the already developed project area.

Cultural and Religious Resources

The project site, upon thorough examination, does not reveal any documented or known archaeological or historical sites within its confines. However, it is noteworthy that the area of influence encompasses a significant presence of cultural and religious institutions, including numerous mosques, schools, academies, and a church. While the absence of documented archaeological sites diminishes the likelihood of impacting historical artifacts or structures directly, the project acknowledges the cultural and community significance of the existing religious and educational establishments. Special consideration will be accorded to these institutions during the project's planning and execution phases, ensuring that their integrity and functionality are respected, and any potential indirect impacts are minimized. The project

endeavors to coexist harmoniously with these valuable community assets and uphold the cultural fabric embedded within the project's vicinity.

7 ASSESSING IMPACTS

This chapter serves as a comprehensive exploration of the environmental impact associated with the project, meticulously identifying and evaluating various factors such as timing, nature, duration, magnitude, and significance. Through a detailed analysis, it unveils the intricate interplay between the project and the environment, shedding light on the potential implications across different dimensions. The chapter delves into the nuanced aspects of how the project's activities may unfold over time, the inherent nature of these activities, their anticipated duration, the scale of their magnitude, and ultimately, the overall significance of their environmental consequences. This meticulous examination sets the stage for a thorough understanding of the project's environmental footprint and lays the foundation for informed decision-making and mitigation strategies.

7.1 IMPACT ASESSMENT

EIA stands as a systematic and integrative process crucial for informed decision-making before the approval or rejection of a proposed project. It serves as a proactive tool that meticulously evaluates and anticipates potential environmental impacts that may arise due to the project's implementation. The core objective is to comprehensively assess the consequences on the environment, encompassing factors such as air, water, soil, and ecosystems, among others. By undertaking a holistic examination, EIA aids in identifying potential challenges and benefits, offering stakeholders, decision-makers, and the public a clear understanding of the project's environmental footprint. This transparent and comprehensive approach ensures that environmental considerations are woven into the fabric of decision-making, promoting sustainable practices and responsible development.

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

Table 7-2Impacts Assessed

Environmental 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

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
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

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

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
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

7.2 MITIGATION ASSESSMENT

Mitigation, within the context of EIA, is a strategic approach aimed at minimizing or preventing the potential adverse impacts identified during the assessment process. It serves as a proactive and responsible response to the findings of impact assessments, encompassing a multifaceted strategy to address various dimensions of environmental concerns.

The overarching goal of mitigation measures is to achieve a balanced and sustainable outcome, ensuring that the proposed project aligns with environmental conservation principles. These measures are designed to operate on three main fronts:

- Firstly, through preventive actions that actively avoid the occurrence of impacts, thereby averting harm and potentially yielding positive outcomes.
- Secondly, by implementing measures that effectively limit the severity and duration of identified impacts, thereby mitigating their overall effects.
- Lastly, for impacts that are deemed unavoidable despite preventive efforts, compensation mechanisms come into play, aiming to offset and balance the environmental consequences.

In essence, mitigation represents a comprehensive and forward-thinking strategy that seeks to harmonize developmental goals with environmental preservation.

7.3 PURPOSE OF IMPACT ASSESSMENT AND THEIR MITIGATION MEASURES

The primary objective of conducting an EIA is to systematically identify, understand, and subsequently prevent or minimize any adverse impacts that a planned project may have on the environment and the well-being of communities. The EIA process is pivotal in offering a comprehensive and detailed evaluation of the potential impacts, comparing various project alternatives to inform decision-makers. Importantly, this assessment extends across the entire lifecycle of the project, encompassing construction, operational phases, and post-closure considerations.

The process of impact assessment is indispensable as it provides a structured framework for describing and analyzing the probable impacts associated with each project alternative. This systematic approach ensures that decision-makers are well-informed about the environmental implications of their choices. However, recognizing that the nature and magnitude of impacts can

evolve over time, the assessment must extend beyond the project's construction phase, incorporating the operational period and even post-closure scenarios.

Mitigation measures hold a critical role within the EIA process, representing a proactive strategy to prevent or minimize adverse impacts. These measures are intricately woven into the fabric of the EIA, aiming to maintain unavoidable impacts at levels deemed acceptable. By integrating impact assessment and mitigation strategies, the EIA process strives to strike a balance between development goals and environmental sustainability, fostering responsible decision-making throughout the project's lifecycle.

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.

Table 7-3Environmental 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	LDA through Approved Monitoring Agency

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)?
				Quality Standards for Ambient Air)	
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
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

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)?
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
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,	Weekly	Minimize impacts on the Environment	LDA through Approved Monitoring Agency

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)?
		Recyclables and non-recyclables, Hazardous waste.			
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

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)?
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
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

8 SCREENING OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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.

8.1 ENVIRONMENTAL IMPACTS INCLUDING THE LOCATION OF THE PROJECT

The project's location presents environmental challenges across various domains, encompassing the physical, socioeconomic, ecological, and special areas. The undertaking primarily focuses on the remodeling of Fazal-e-Haq Roundabout and construction of an underpass at Karim Market Intersection, aiming to enhance the efficiency and fluidity of traffic flow. In the physical setting, considerations arise regarding potential disruptions to the existing landscape, soil, and topography as a consequence of road construction activities. The alteration of land use patterns and the introduction of new structures can further impact the physical environment.

On a socioeconomic level, the project's implications extend to the communities and residents in the vicinity. The remodeling of roundabout and construction of an underpass may influence local

accessibility, property values, and overall community well-being. It is essential to assess the potential social disruptions, including changes in traffic patterns and the accessibility of public services, which may affect the daily lives of the local population.

In the ecological setting, the project demands careful scrutiny of its impact on the natural environment, including flora and fauna. Construction activities may lead to habitat disruption, soil erosion, and potential changes in local biodiversity. Measures must be in place to mitigate these ecological concerns, ensuring the preservation and, where possible, the enhancement of the natural surroundings.

Special areas, which could include heritage sites, culturally significant locations, or environmentally sensitive zones, require meticulous attention. The remodeling of roundabout and construction of an underpass may intersect with these areas, necessitating strategic planning to avoid or minimize adverse effects on their integrity.

A comprehensive understanding of the environmental challenges within these varied settings is vital for the successful execution of the project. The integration of sustainable practices, stringent environmental management strategies, and community engagement initiatives will contribute to minimizing negative impacts while fostering a harmonious coexistence between development initiatives and the surrounding environment.

8.2 ENVIRONMENTAL PARAMETERS REGARDING DESIGN

The project's design places a strong emphasis on mitigating potential environmental impacts by adhering meticulously to established environmental standards. Rigorous adherence to these standards is integral to the project's commitment to minimizing any adverse effects on the surrounding environment. This includes a comprehensive consideration of factors such as air and water quality, noise levels, and ecosystem integrity. The project team has undertaken a thorough environmental impact assessment, identifying potential risks and implementing design modifications to address and, where possible, eliminate these concerns.

Beyond the strictly regulatory aspects, the project design also takes into account the local aesthetic values of the surrounding area. Recognizing the importance of preserving and complementing the existing visual character, the design incorporates elements that harmonize with the local

surroundings. This encompasses considerations for architectural aesthetics, landscaping choices, and the overall visual impact of the project on the immediate environment.

Throughout the design process, interdisciplinary collaboration has been pivotal, involving environmental experts, architects, and community stakeholders. This collaborative approach ensures that environmental and aesthetic considerations are seamlessly integrated into the project's design. The goal is not only to meet the required environmental standards but to exceed them, contributing positively to the local landscape and fostering a sustainable and visually appealing infrastructure development.

In summary, the project's comprehensive design approach reflects a commitment to environmental responsibility, meeting or surpassing regulatory requirements, and ensuring that the infrastructure not only functions efficiently but also harmonizes aesthetically with its surroundings. This dual focus on environmental stewardship and local aesthetics underscores the project's dedication to responsible and sustainable development.

8.3 PHASES OF IMPACTS

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

8.4 TYPES OF IMPACTS

The environmental impact assessment categorizes impacts into three main types: direct, indirect, and cumulative.

Direct impacts

Direct impact stem directly from the project itself, encompassing effects like changes in air quality resulting from construction activities, the operation of equipment, and vehicle emissions. Additionally, direct impacts extend to the economic sphere, considering the influence of construction expenditures on the local economy.

Indirect Impacts

Indirect impacts, on the other hand, arise from activities prompted by the project but aren't directly traceable to it. For instance, the use of construction materials, such as rock, creates an indirect impact by increasing the demand for these materials. This acknowledges the broader ripple effects associated with project-related activities.

Cumulative Impacts

Cumulative impacts consider the combined effects of the project alongside other concurrent or planned activities in the area. While a single road improvement project may have limited environmental consequences, the cumulative impact becomes more significant when multiple projects, such as the development of a road network, occur in the same region. This holistic perspective ensures that the assessment captures the synergistic effects of various activities, acknowledging that the combined impact of multiple projects can be more substantial than the sum of individual efforts.

In essence, the comprehensive categorization of impacts enables a nuanced understanding of the project's implications on the environment, economy, and broader context. By delineating impacts into direct, indirect, and cumulative categories, the environmental impact assessment provides a robust framework for evaluating and addressing the diverse repercussions associated with the project.

8.5 POTENTIAL IMPACT SOURCES

Environmental impacts stemming from the project span two distinct phases: the **construction phase** and the **operational phase**. A comprehensive understanding of these impacts is crucial for effective planning and sustainable project management.

During the construction phase, certain impacts are foreseeable and can be proactively addressed through adjustments in the project design. This proactive approach allows for the anticipation and avoidance of potential adverse effects, showcasing the significance of meticulous planning and foresight. Mitigation strategies implemented during construction, such as environmentally conscious construction practices and adherence to established guidelines, contribute to minimizing negative repercussions.

Construction related impacts will heavily dependent on:

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

Transitioning into the operational phase, ongoing impacts are to be expected. However, the key lies in effective mitigation strategies employed through the conscientious implementation of the project and adherence to an operational manual. Collaborative efforts with local communities further enhance the mitigation process, fostering a symbiotic relationship between the project and its surroundings. Such collaboration ensures that the project aligns with community needs and concerns, promoting a sustainable operational phase. Operational impacts of the proposed project will be associated with the movement of vehicular traffic on it and allied activities. These include air and noise pollution, safety hazards, and other similar impacts.

In essence, the project's environmental impacts are dynamic and necessitate a multifaceted approach. By anticipating, avoiding, and mitigating impacts through careful planning, construction-phase adjustments, and collaborative operational strategies, the project can strike a balance between development goals and environmental stewardship.

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

Physical Environment

1. Land Resource
2. Water Resource
3. Air Quality
4. Noise Level

Biological Environment

1. Flora
2. Fauna
3. Endangered Species
4. Cultural and Historical Sites
5. Socio-economic Environment

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

Table 8-1Environmental Impacts and Proposed Mitigations During Construction

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
TOPOGRAPHY	The initial phase involves significant excavation, altering the natural contours of the land. This process may lead to the removal of soil and rock, impacting the topographical features. The cutting of land for clearing ROW. The construction equipment and activities can temporarily disrupt the existing topography	❖ Construction of retaining walls at strategic locations. ❖ Implementation of comprehensive vegetation restoration plans by planting native grasses, shrubs, and trees on disturbed areas. ❖ Establishment of a regular monitoring program. ❖ 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	Exposed soil surfaces during construction will be susceptible to erosion. Soil erosion due to Construction activities, earthwork, cut and fill, stockpiles, etc.	❖ To minimize environmental impact, a sustainable approach involves the careful storage and subsequent reuse of topsoil will be ensured. ❖ During initial excavation, a meticulous separation of topsoil from subsoil will be undertaken. ❖ After construction completion, the site will undergo a comprehensive restoration process. ❖ To minimize soil contamination from asphalt, stringent measures will be implemented, such as storing asphalt in caissons. ❖ Low embankments susceptible to erosion will be safeguarded by the strategic planting of vetiver grass, known for its resilience in dry conditions.
	Compaction of soil and impact on quarry haul roads due to the movement of vehicles and equipment.	❖ Implementation of protective measures, such as the use of temporary road covers or stabilized surfaces, will be explored. ❖ Regular inspection and maintenance of construction vehicles and equipment will be enforced to address any issues that may contribute to increased soil compaction. ❖ During the transportation of heavy materials, a concerted effort will be made to distribute loads evenly. ❖ The movement of quarry materials via heavy vehicles will be carefully orchestrated.

		❖ Approach roads and haulage roads will be meticulously designed, utilizing barren and hard soil areas wherever feasible. ❖ To prevent soil compaction, strict guidelines dictate that construction vehicles, machinery, and equipment shall be stationed exclusively in the designated Right-of-Way (ROW).
	Contamination of soil due to leakage/spillage of oil, bituminous and non–bituminous debris generated from demolition and road construction	❖ In the event of spillage during construction activities, immediate cleanup protocols will be implemented to minimize the duration of soil exposure to contaminants. ❖ Construction sites will be equipped with containment measures such as barriers, bunds, or absorbent materials to confine and control any spilled materials. ❖ The use of secondary containment systems will be mandated. ❖ Implementation of erosion control practices, such as the installation of sedimentation barriers and silt fences, will be enforced. ❖ Construction personnel will undergo training on spill response procedures, emphasizing the importance of quick and effective actions to mitigate soil impacts. ❖ Strict guidelines for the storage and handling of construction materials will be enforced to minimize the likelihood of spills. ❖ Routine inspections of the construction site will be conducted to identify and address potential spillage risks promptly.
This impact is temporary and moderately adverse.		

AIR QUALITY	Dust Generation due to construction activities and transport, storage, and handling of construction materials.	❖ Application of dust suppressants on construction sites to minimize airborne dust particles. ❖ Storage areas will be at least 500m from communities. ❖ Use of water spraying systems to settle dust and prevent its dispersion into the air. ❖ Regular maintenance and tuning of construction machinery to ensure optimal performance and minimal emissions. ❖ Minimization of open-air storage of construction materials to prevent windblown particles. ❖ Implementation of efficient traffic management to reduce congestion and idling, minimizing vehicle emissions. ❖ Comprehensive tree plantation will be maintained. ❖ Proper implementation of the dust management plan.
	Emission of air pollutants (PM_{10}, $PM_{2.5}$, HC, SO_2, 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 which are; ❖ bulldozers, ❖ excavators, ❖ stabilizers, ❖ concrete mixing plant, ❖ pneumatic drills, ❖ stone crushers asphalt plants and ❖ other equipment	❖ Installation of temporary noise barriers around the construction site to minimize the transmission of noise to nearby areas. ❖ Retrofitting construction equipment with noise-reducing technologies, such as mufflers and soundproofing enclosures. ❖ Employing quieter construction machinery and tools to minimize noise generation. ❖ Implementing restrictions on noisy construction activities during sensitive hours. ❖ Utilization of acoustic barriers and enclosures around particularly noisy construction equipment. ❖ Ensuring regular maintenance and proper lubrication of construction equipment to prevent increased noise due to wear and tear. ❖ Prompt repair of malfunctioning equipment to prevent excessive noise emissions. ❖ Adjusting construction practices based on monitoring results to stay within acceptable noise limits.
	This impact is temporary and minor adverse.	
Flora & Fauna	❖ The construction process may disturb existing habitats, leading to the displacement or loss of local flora and fauna.	❖ A comprehensive tree plantation plan has been integrated, prioritizing extensive landscaping initiatives across a large area. ❖ The cleared proposed site must be surveyed and demarcated before construction commences ensuring no unnecessary loss of natural vegetation outside the approved footprint.

	❖ Direct impact on Fauna and Flora as a result of vegetation clearance. ❖ Construction activities will result in the release of pollutants into nearby water bodies or soils, affecting the quality of these ecosystems.	❖ The contractor's staff will not harvest any natural vegetation. ❖ Vehicles and machinery will not encroach into areas outside/surrounding the planned project footprint. ❖ The project area will be monitored for any new growth of invasive plants until completion of construction. ❖ A dedicated short-term monitoring period of 12 months post-construction will be implemented.
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 selection of the campsite undergoes a meticulous reconnaissance process, with a keen focus on minimizing social and physical disruptions to local communities and road users. ❖ Setting up a complaint office for public complaints registration and advertisement of the grievance redress mechanism ❖ the contractor is obligated to provide a comprehensive plan for the removal and rehabilitation of the campsite upon project completion. ❖ 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.
	Deterioration in Surface water quality due to: ❖ leakage from vehicles	❖ 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.

	❖ leakage from equipment ❖ Waste from construction camps.	❖ 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. ❖ 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	
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.	

Table 8-2Environmental Impacts and Proposed Mitigations During Operations

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.	
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. ❖ Conservation practices that limit particulate matter emissions will be incorporated into long–term maintenance plans.
This impact is temporary and minor adverse.		

8.7 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

In pursuit of a comprehensive and enduring commitment to environmental stewardship, several additional measures will be implemented to enhance the roadway environment, ensuring sustained benefits that extend far beyond the project's operational life. These supplementary steps are designed to safeguard the environment of the project area, prioritize the well-being of workers, and enhance the overall experience for road users. To enrich the ecological fabric of the roadway, there will be a deliberate focus on integrating green infrastructure, including sustainable landscaping practices and the strategic planting of native vegetation along the road corridors.

8.8 CONSTRUCTION TRAFFIC MANAGEMENT PLAN (CTMP)

The CTMP plays a pivotal role in an EIA for a construction project involving an underpass. It holds critical importance in mitigating the potential adverse effects of increased vehicular and construction-related activities on the environment and surrounding community. By carefully outlining measures to ensure safe and efficient traffic flow, the CTMP contributes to the overall objective of minimizing disruptions, congestion, and safety hazards during the construction of the underpass. Moreover, it addresses the concerns of pedestrian safety, emergency access, and compliance with traffic regulations, fostering a comprehensive approach to environmental sustainability. The CTMP serves as an essential tool for coordination among stakeholders, including local authorities, transportation agencies, and the public. Its incorporation into the EIA demonstrates a commitment to responsible and sustainable construction practices, facilitating a harmonious integration of infrastructure development with environmental preservation and community well-being.

8.9 OBJECTIVES OF CONSTRUCTION TRAFFIC MANAGEMENT PLAN (CTMP)

A Construction Traffic Management Plan (CTMP) is a crucial document designed to effectively manage the flow of traffic in and around construction sites. The primary objectives of a CTMP include:

- Ensure the safety of both road users and construction site workers by minimizing the risk of accidents, collisions, and other safety hazards associated with vehicular and pedestrian traffic in the vicinity of the construction area.

- Mitigate disruptions to the normal flow of traffic in the surrounding area. By carefully planning construction activities and associated traffic management measures, the plan aims to minimize delays, congestion, and inconvenience to the public.
- Ensure compliance with local, state, and national traffic regulations and standards. The CTMP should outline measures to adhere to legal requirements related to traffic management and construction site safety.
- Optimize the efficiency of traffic flow around the construction site. This involves carefully planning the movement of construction vehicles, ensuring proper signage, and coordinating with relevant authorities to manage road closures or diversions effectively.
- Address the safety concerns of pedestrians in and around the construction site. This includes providing safe walkways, crossings, and clear signage to guide pedestrians safely through or around the construction zone.
- Ensure that emergency vehicles can access the construction site and surrounding areas promptly. The CTMP should include provisions for maintaining clear emergency routes and coordination with local emergency services.
- Establish effective communication channels with the public to keep them informed about ongoing construction activities, potential disruptions, and any changes in traffic patterns. This may include the use of signage, public announcements, and community outreach programs.
- Consider and minimize the environmental impact of construction-related traffic, such as air and noise pollution. The CTMP should incorporate measures to mitigate these impacts and promote environmental sustainability.
- Facilitate coordination among various stakeholders, including local authorities, transportation agencies, and neighboring businesses or residents. Open communication and collaboration are essential for successful traffic management during construction.

Recognize the dynamic nature of construction projects and traffic conditions. The CTMP should be adaptable to changing circumstances, allowing for adjustments and revisions as needed to maintain effective traffic management throughout the construction period.

By addressing these objectives, a well-developed Construction Traffic Management Plan contributes to the overall success of a construction project while minimizing negative impacts on

the surrounding community and environment. Moreover, a detailed Traffic Management Plan has been provided as Annexure-B.

8.10 KEY ISSUES TO BE RESOLVED

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 8-3Proposed Traffic Management Plan

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Construction activities may lead to increased traffic congestion.	Traffic delays cause frustration for commuters.	❖ 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	❖ Conduct comprehensive risk assessments during the project planning phase to identify potential traffic management issues. ❖ Determine traffic routes and engage with the community to refine details. ❖ Develop a robust communication plan outlining key milestones, potential disruptions, and alternative routes. ❖ Confirm pre-existing conditions. ❖ Consider the need for a night assessment. ❖ Identify any short–term corrective actions.
The local community interprets significant traffic delays as a direct	Community dissatisfaction, claims for time delays.	❖ Cultivate positive public relations from the project's inception. ❖ Install early warning information signs utilizing Variable Message Signs (VMS).

consequence of ongoing construction activities.		❖ Initiate early engagement to assess the requirements and potential impacts of altered 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 ❖ 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
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.

9 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

9.1 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

The Environmental Management and Monitoring Program (EMMP) within the EIA framework serves as a crucial component for ensuring the effective oversight and mitigation of environmental impacts associated with a proposed project. This program is designed to systematically identify, assess, and manage potential environmental effects throughout the project lifecycle. It encompasses a set of proactive measures, protocols, and monitoring strategies aimed at minimizing adverse environmental impacts. The EMMP typically includes detailed plans for waste management, air and water quality monitoring, biodiversity protection, and other relevant environmental aspects. Additionally, it outlines the roles and responsibilities of key stakeholders, defines monitoring frequency, and establishes contingency measures to address unforeseen environmental challenges. By integrating the EMMP into the EIA process, regulatory authorities, project developers, and other stakeholders collaborate to ensure that environmental concerns are systematically addressed, and the project's impact on the surrounding ecosystem is effectively managed and monitored.

9.2 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) is a comprehensive document developed as part of project planning to systematically address and mitigate potential environmental impacts. It outlines a set of strategies, protocols, and actions that aim to minimize adverse effects on the environment during various stages of a project's lifecycle. The EMP typically includes measures for waste management, pollution control, habitat preservation, and resource conservation. It specifies roles and responsibilities of stakeholders, sets monitoring and reporting procedures, and establishes contingency plans to address unforeseen environmental challenges. By incorporating the EMP, projects demonstrate a commitment to environmental sustainability, regulatory compliance, and responsible resource utilization, ensuring that ecological considerations are integrated into the project's execution and contributing to long-term environmental stewardship.

9.3 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The objectives of an EMP are multifaceted, aiming to guide and facilitate the integration of environmentally sustainable practices throughout the lifecycle of a project. These objectives typically include:

- Identify, assess, and effectively mitigate potential adverse impacts on the environment resulting from project activities.
- Ensure strict adherence to environmental laws, regulations, and standards at local, regional, and national levels.
- Promote the responsible and efficient use of natural resources to minimize depletion and support long-term ecological balance.
- Implement measures to prevent, control, or minimize pollution, encompassing air, water, and soil quality preservation.
- Safeguard and enhance biodiversity by adopting measures that minimize harm to ecosystems and protect vulnerable species.
- Develop effective waste management strategies to reduce, reuse, and recycle materials, minimizing the ecological footprint of the project.
- Involve and communicate with stakeholders, including local communities, to address concerns, gather input, and build awareness of environmental considerations.
- Establish a robust system for monitoring environmental parameters, assessing the effectiveness of mitigation measures, and providing regular and transparent reporting.
- Develop contingency plans to address unforeseen environmental incidents, ensuring swift and effective response to minimize damage.
- Foster a culture of continuous improvement by regularly reviewing and updating the EMP in response to changing project conditions, technological advancements, and environmental best practices.

By achieving these objectives, an EMP contributes to the overall sustainability and responsible management of a project, balancing development goals with environmental conservation to meet the needs of the present without compromising the ability of future generations to meet their own needs.

9.4 OBJECTIVES DURING PRE-CONSTRUCTION AND CONSTRUCTION STAGES

Following are the objectives

- ❖ 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.
- ❖ 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.

9.5 OBJECTIVES DURING THE OPERATION AND MAINTENANCE (O&M) STAGE

Following are the objectives during the operational and maintenance stages;

- ❖ 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.

9.6 INSTITUTIONAL CAPACITY

In the governance structure of the proposed project, the Project Proponent, represented by the LDA assumes the central role in Monitoring and Evaluation (M&E). Within this framework, the Environment Consultant, designated by the proponent, plays a crucial role in monitoring the implementation of the EMP directly in the field. The Environment Consultant is tasked with the on-the-ground assessment of EMP measures, ensuring their effective execution, and promptly addressing any environmental concerns that may arise during project activities. This consultant is responsible for generating detailed monitoring reports, which will be submitted to the Project Proponent for review and integration into the overarching monthly reports of the project.

Under the supervision of the LDA, the Project Proponent consolidates these comprehensive monitoring reports into the main monthly project reports, offering a holistic view of both project progress and environmental performance. This integrated approach ensures that environmental considerations are seamlessly woven into the overall project monitoring and reporting mechanisms. Simultaneously, the District Office of the Environmental Protection and Climate Change Agency (EPA) in Lahore, situated within the project area, assumes a supervisory role, overseeing the entirety of project activities. This involves a broader assessment, beyond the specific EMP implementation, to monitor the overall environmental impact and compliance of the project with regulatory standards. Through this collaborative and layered monitoring structure, the project endeavors to uphold environmental integrity, fostering transparency, accountability, and continuous improvement in its environmental management practices.

9.7 ORGANIZATIONAL STRUCTURE: ROLES & RESPONSIBILITIES

9.7.1 PRIMARY RESPONSIBILTIES

The Project Manager appointed for the proposed project will serve as the primary representative of the LDA and will bear the responsibility for overseeing and upholding local legislations throughout the entire project lifespan. This role encompasses not only the efficient management and execution of project activities but also the critical task of ensuring adherence to relevant legal frameworks. The Project Manager will navigate and interpret local regulations, working diligently to align project operations with the stipulated legal requirements. This comprehensive responsibility underscores the commitment to legal compliance, effective project leadership, and the seamless integration of the project within the regulatory landscape.

9.7.2 OPERATION MANAGEMENT AND CONTROL

The Project Manager is entrusted with the pivotal responsibility of orchestrating and executing all development activities in a manner that adheres to and promotes environmental sustainability. This comprehensive role involves overseeing the integration of environmentally sound practices throughout every phase of the project. The Project Manager is tasked with implementing measures that mitigate environmental impacts, ensure compliance with relevant regulations, and foster a culture of responsible resource management. From project initiation to completion, the Project Manager will actively strategize, monitor, and enforce practices that prioritize environmental well-being, reflecting a commitment to harmonizing development goals with ecological preservation.

Through this role, the Project Manager plays a central part in fostering a sustainable and environmentally conscious approach to the project's growth and evolution.

9.8 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.

9.9 COMMUNITY AND WORKER HEALTH AND SAFETY

The primary objective of environmental health and safety is to ensure a secure and healthy working environment for personnel while preventing accidents, injuries, and diseases. This encompasses not only the well-being of staff and workers within the subcomponent facilities but extends to safeguarding the health and safety of local communities. The focus is on establishing robust preventive measures, emergency preparedness, and response protocols to proactively prevent, and in cases where prevention is challenging, minimize adverse impacts and risks to the health and safety of nearby residents.

During the construction phase, safety risks are particularly prominent, necessitating a heightened focus on occupational health and safety. In linear construction activities such as road and pipe network construction, which often occur in areas frequented by the public, it is crucial to implement both physical and educational measures to protect residents, especially children, from potential risks.

To address these concerns comprehensively, a detailed Occupational Health and Safety (OHS) plan has been developed. The onus of implementing this OHS plan lies with the contractor, who bears the responsibility of executing the necessary measures to prevent any fatal accidents or injuries. This comprehensive approach underscores the commitment to not only safeguarding the well-being of the workforce but also actively addressing the potential impacts on the health and safety of the surrounding communities, thereby ensuring a holistic and proactive approach to environmental health and safety management.

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;

(v) Conducting regular safety drills and training sessions for construction workers to enhance their awareness and preparedness for potential hazards

(vi) Implementing strict traffic control measures, including temporary road diversions and speed restrictions, to ensure the safety of both construction workers and the general public.

Ensuring construction staff are on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the area 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 the locals and others in the areas;

(iii) Providing periodical health checks to construction workers to ensure their health and well-being.

9.10 INSTITUTIONAL MONITORING ARRANGEMENTS

9.10.1 ESTABLISHMENT OF ENVIRONMENTAL MONITORING CELL

Monitoring and evaluation activities will be diligently conducted throughout both the construction and operational phases of the Project. To efficiently oversee these processes, a meticulously organized Environmental Monitoring Cell (EMC) will be established. Considering budgetary constraints, personnel for the EMC will be drawn from the current workforce to ensure effective environmental oversight within the existing operational framework.

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

9.10.2 ENVIRONMENTAL MANAGEMENT PLAN DURING THE CONSTRUCTION AND OPERATIONAL PHASE

Table planned EMP for the construction of an underpass at Karim Market intersection and remodeling of Fazal-e-Haq roundabout during both the construction and operational phase respectively. This EMP shows the goal of each effect that why we are moderating the undertaking and predicting impacts.

Table 9-1Environmental Management Plan for 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 LDA 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 LDA 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. ❖ Implement Batching and Asphalt Plant Management Plan provided in Annexure-F. ❖ 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;	Construction Contractor	Project Manager LDA Construction Contractor 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. ❖ 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. ❖ Tree Plantation plan will be followed. The details of Tree plantation has been provided in Annexure-K.	Construction Contractor	Project Manager LDA Construction Contractor

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. ❖ Ensure Camp Establishment and Management Plan provided in Annexure-A.	Construction Contractor	Project Manager LDA 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. ❖ Disallow the introduction of exotic species with known environmental setbacks.	Construction Contractor	Project Manager LDA Construction Contractor

		❖ 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 LDA 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 LDA 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. ❖ 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-H) ❖ Furthermore, septic tanks will need to be constructed which will be cemented to prevent the groundwater contamination. ❖ Follow the Spill Prevention and Contingency Plan as provided in Annexure-G.	Construction Contractor	Project Manager LDA Construction Contractor 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	Construction Contractor	Project Manager LDA Construction Contractor

		❖ 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 ❖ 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. ❖ Ensure implementation of solid and hazardous waste management plan as provided in Annexure-J.		
Health and safety of workers	To minimize health risks	❖ Implementation of Health and Safety Plan as given in Annexure-D. ❖ 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; ❖ 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;	Construction Contractor HSE Officer	Project Manager LDA Construction Contractor HSE Officer

		❖ Follow the Emergency Response Plan as given in Annexure-H. ❖ 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. ❖ Implementation of Sanitation Plan as provided in Annexure-E.		
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 LDA Construction Contractor

		❖ 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 LDA 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 LDA Construction Contractor
Maintenance of Construction Equipment	Improper maintenance of construction equipment	❖ Place substantial blocking under any chain–hoist suspended or jack-supported equipment under which people must work.	Construction Contractor	Project Manager LDA Construction Contractor

	may lead to safety and environmental hazards	❖ All work areas shall be provided with proper ventilation. ❖ Secure unbolted heavy parts or engines if necessary to leave the work.		
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 LDA 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; ❖ Implement the resource conservation plan provided in Annexure-I.	Construction Contractor	Project Manager LDA Construction Contractor

		❖ 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.		
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,	Construction Contractor	Project Manager LDA Construction Contractor

		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.		

Table 9-2Environmental Management Plan for 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	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	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	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.	LDA Project Manager	Approved Monitoring Authority

Impact	Objectives	Mitigation	Responsibility	
			Implementation	**Monitoring**
		❖ To avoid the exception of some occasional oil spills due to any road accident emergency plan will be followed. ❖ 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.	LDA Project Manager	Project HSE Officer

Impact	Objectives	Mitigation	Responsibility	
			Implementation	**Monitoring**
		❖ Monitor/ensure that all safety provisions included in the design and construction phase are properly maintained.		
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. ❖ 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.	LDA Project Manager	Project HSE Officer

10 STAKEHOLDER CONSULTATION

10.1 GENERAL

This section delineates the results stemming from the comprehensive public consultation sessions conducted with diverse stakeholders directly or indirectly impacted by the subproject. Inclusive engagement with stakeholders, including government departments, educators, local business representatives, women, NGOs, and various community members, has been a pivotal aspect throughout the planning, design, and implementation stages of the subproject. Recognizing the pivotal role of stakeholder participation in achieving sustainable development objectives, their active involvement has been instrumental in shaping the EIA. The quality and effectiveness of these consultations are fundamental benchmarks for evaluating the subproject's adherence to both national and international safeguard policies. This commitment to meaningful and inclusive engagement stands as a cornerstone in ensuring that the subproject aligns with established standards and addresses the concerns of all relevant stakeholders.

10.2 OBJECTIVES OF STAKEHOLDER CONSULTATION

The consultation process serves as a crucial platform for the exchange of information pertinent to the subproject, fostering a two-way dialogue between stakeholders and project proponents. This participatory approach is indispensable as it establishes a vital link between investors and the public, facilitating the incorporation of essential local knowledge and indigenous expertise into the subproject's design. This integration not only cultivates goodwill but also contributes to a conflict-free implementation of the subproject, promoting its overall success.

Stakeholder engagement encompassed a spectrum of participants, including government representatives, regulatory bodies, and non-governmental organizations (NGOs). Meetings were conducted to evaluate and discuss the environmental and social dimensions of subproject activities. Valuable insights, concerns, and suggestions from these stakeholders were meticulously documented and subsequently integrated into the EIA process.

The objectives of the consultation process are multifaceted.

- It aims to identify, inform, and involve all stakeholders, ensuring inclusivity across various demographic segments, including females, minorities, and persons with disabilities.
- The process seeks to disseminate comprehensive information about the construction of the proposed subproject and its anticipated impacts on the physical, biological, and socio-economic environment.
- Understanding stakeholders' concerns and perceptions regarding different facets of the subproject, including existing facilities and potential impacts, is a pivotal goal.
- The consultation process provides a platform for the public to offer constructive suggestions positively influencing the subproject's design.

This holistic approach underscores the commitment to transparent, participatory, and socially responsible project development. By achieving these objectives, stakeholder consultation contributes to the overall success and sustainability of the project, enhancing its social, environmental, and economic outcomes while fostering positive relationships with the communities it impacts.

Figure 10-1 Stakeholder Management

10.3 IDENTIFICATION OF STAKEHOLDERS

Besides the living population of the surrounding areas, some other stakeholders were identified and consulted which are enlisted below. They are the key players including; residential

community, people doing local businesses, public and government offices, schools, hospitals, hotels and the NGO`s.

The Project Affected Persons (PAP`s); includes the settled families, shopkeepers, vendors etc.) and employees of the commercial entities. PAP`s are of two types, for instance: Direct Stakeholder and indirect stakeholders. Local Community is identified as direct stakeholder while Local Government Bodies have been identified as indirect stakeholders.

- Environmental Protection and Climate Change Agency (EPA)
- Traffic Engineering & Transport Planning Agency (TEPA)
- Water and Sanitation Agency (WASA)
- Civil Defense
- Rescue 1122
- Parks and Horticulture Authority (PHA)

As part of the EIA, the stakeholder consultations were done with aforesaid departments, the process of consultation will continue during the implementation of the project and all stakeholders will be on board during executions of works.

Table 10-1Stakeholders and Their Roles and Responsibilities

Stakeholders	**Roles**
Proponent/Responsible Authority	The discussion with the proponent proposed the mitigation measures and alternatives to control any disparity in the project.
Environmental Expert	Information at the project site was gathered to record the local community stance and behaviors regarding the project. And also the evaluation of socio-economic impacts of the project has been done.
Government Departments	The consulted government department includes Environmental protection agency, wildlife, planning,

	and development. The departments overviewed the proposed projects and its socio-economic impacts.
Local affected communities	The surveys determined the extent of community that could be affected and their verdict about the proposed project.

10.4 APPROACH ADOPTED FOR CONSULTATION

The consultant team contacted the community representatives of the area and informed them about the purpose of these consultation meetings. The representatives played a positive role in information dissemination to locals of the area. The meetings were held in an encouraging environment where people expressed their concerns and views freely. Due to the commercial nature of the area dominated by local shops and vendors, consultation sessions with females were regrettably not conducted as part of the stakeholder engagement process.

In addition to the formal meetings, individual meetings/interviews were also held with the affected females to efficiently involve them in the planning process.

10.5 DISCUSSED POINTS

The points that have been kept in view while consulting stakeholders are as follows:

- Activities of the project and their consequences.
- Requirements of the people likely to be affected.
- Mitigation measures or compensation strategies.
- Role of the affected people in the implementation and development of the project.

10.6 FINDINGS OF STAKEHOLDER MEETINGS

For public consultations, various informal meetings were held with the local community during the social and environmental screening. Details of the proposed project and related activities were explained to the local community and their responses were listened to and addressed.

The issues and suggestions raised were recorded in field notes for analysis, and interpretation, by reaching out to a wider segment of the population and using various communication tools such as

participatory needs assessment, community consultation meetings, and focus group discussions. The findings of consultation meetings with community are summarized in the tables 10-2 of the EIA report.

Figure 10-2Stakeholder Consultation

Table 10-2Public Consultation

Sr. No.	Individuals Name	Address	Date	Feedback
1.	Muhammad Amir	Sikander Block, Karim Market	05-01-2023	He was concerned about the potential impact of the underpass on property values.
2.	Muhammad Naeem	Umer Block, Karim Market	05-01-2023	He discussed about the expected improvement in traffic flow and reduced travel time.
3.	Muhammad Jamshaid	Umer Block, Karim Market	05-01-2023	He said our businesses should not be adversely affected by the construction of the underpass.
4.	Zeeshan Khan	Umer Block, Karim Market	05-01-2023	Local labor should be hired on a priority basis.
5.	Mubashir Ahmad	Mustafa Town, Wahdat Road	05-01-2023	Clear working hours and notifications to the public regarding excessively noisy activities.
6.	Zain Sikander	Sikander Block, Karim Market	05-01-2023	He said our businesses should not be adversely affected by the construction of the underpass.
7.	Asad Zaka	Neelum Block, Iqbal Town	05-01-2023	During the project implementation traffic should remain uninterrupted.
8.	Dr. Basam Amir	Nishtar Block, Karim Market	05-01-2023	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.

9.	Qasim Sohail	Mustafa Town, Wahdat Road	05-01-2023	He said our businesses should not be adversely affected by the construction of the underpass.
10.	Arham Humayun	Karim Block, Karim Market	05-01-2023	Local labor should be hired on a priority basis.

11 GRIEVANCE REDRESS MECHANISM

A Grievance Redress Mechanism is a structured system established to address and resolve complaints, concerns, or issues raised by individuals or entities regarding their experiences or interactions. This mechanism typically involves clear channels for lodging complaints, whether through written communication, online platforms, or dedicated grievance officers. Once a grievance is registered, the mechanism ensures a systematic and fair investigation of the matter, taking into account all relevant information and perspectives. Timely resolution and effective communication with the aggrieved party are essential components, helping to restore trust and rectify any perceived injustices. An efficient Grievance Redress Mechanism not only safeguards the rights and interests of individuals but also contributes to organizational transparency, accountability, and continuous improvement in service delivery.

11.1 OBJECTIVES OF GRIEVANCE REDRESS MECHANISM

The objectives of a GRM are designed to provide an effective and transparent process for addressing and resolving complaints or grievances raised by individuals or entities affected by a project or organization. The key objectives of a Grievance Redress Mechanism include:

- Ensure that the grievance redress process is easily accessible to all stakeholders, providing a straightforward means for individuals or communities to voice their concerns.
- Promote a fair and impartial mechanism that treats all grievances with equal consideration, regardless of the stakeholder's background, status, or affiliation.
- Establish a system that addresses grievances in a timely manner, minimizing delays and providing prompt resolution to concerns to prevent prolonged dissatisfaction.
- Foster transparency in the grievance redress process, ensuring that stakeholders are informed about the status of their complaints and the steps taken to address them.
- Hold the organization or project accountable for addressing and resolving grievances in accordance with established policies and procedures.

- Utilize the grievance redress process as an opportunity for organizational learning, collecting feedback to identify areas for improvement in project implementation or organizational practices.
- Empower affected individuals or communities by giving them a voice in the decision-making process and acknowledging the importance of their concerns.
- Serve as a mechanism for resolving conflicts and disputes in a constructive manner, minimizing the potential for escalation and promoting harmonious relationships.
- Use insights gained from the grievance redress process to enhance project design, implementation strategies, and overall organizational practices for continuous improvement.
- Ensure that the grievance redress mechanism aligns with legal requirements, industry standards, and the principles of social responsibility.
- Strengthen community engagement by demonstrating a commitment to addressing concerns and maintaining open communication channels.

By achieving these objectives, a Grievance Redress Mechanism contributes to building trust, fostering positive relationships with stakeholders, and enhancing the overall social and environmental sustainability of a project or organization.

11.2 COMPONENTS OF GRM

GRM typically involves several basic steps to address and resolve complaints or grievances effectively. While specific procedures may vary depending on the organization or context, the following are common steps in a basic GRM:

- Individuals submit their grievances through designated channels, which may include online platforms, written communication, or direct contact with a grievance officer.
- The received grievance is formally registered in the system, assigning a unique identifier. This step ensures proper tracking and documentation of each complaint.

- A preliminary assessment is conducted to determine the nature and severity of the grievance. This step helps in categorizing grievances and prioritizing them based on urgency.
- A thorough investigation is carried out to gather relevant information and facts related to the grievance. This may involve interviews, document reviews, or other means of inquiry.
- Clear and timely communication is maintained with the aggrieved party throughout the process. Regular updates and feedback are provided to keep them informed about the progress of the investigation.
- Once the investigation is complete, appropriate measures are taken to address the grievance. This may involve corrective actions, policy changes, compensation, or other forms of redress, depending on the nature of the complaint.
- The resolution is communicated to the aggrieved party, and feedback is sought to ensure their satisfaction. Follow-up may be conducted to confirm that the resolution has been implemented and to monitor any lingering concerns.

The entire process, from grievance registration to resolution, is documented for record-keeping and reporting purposes. This documentation aids in analyzing trends, identifying systemic issues, and improving the overall grievance-handling process.

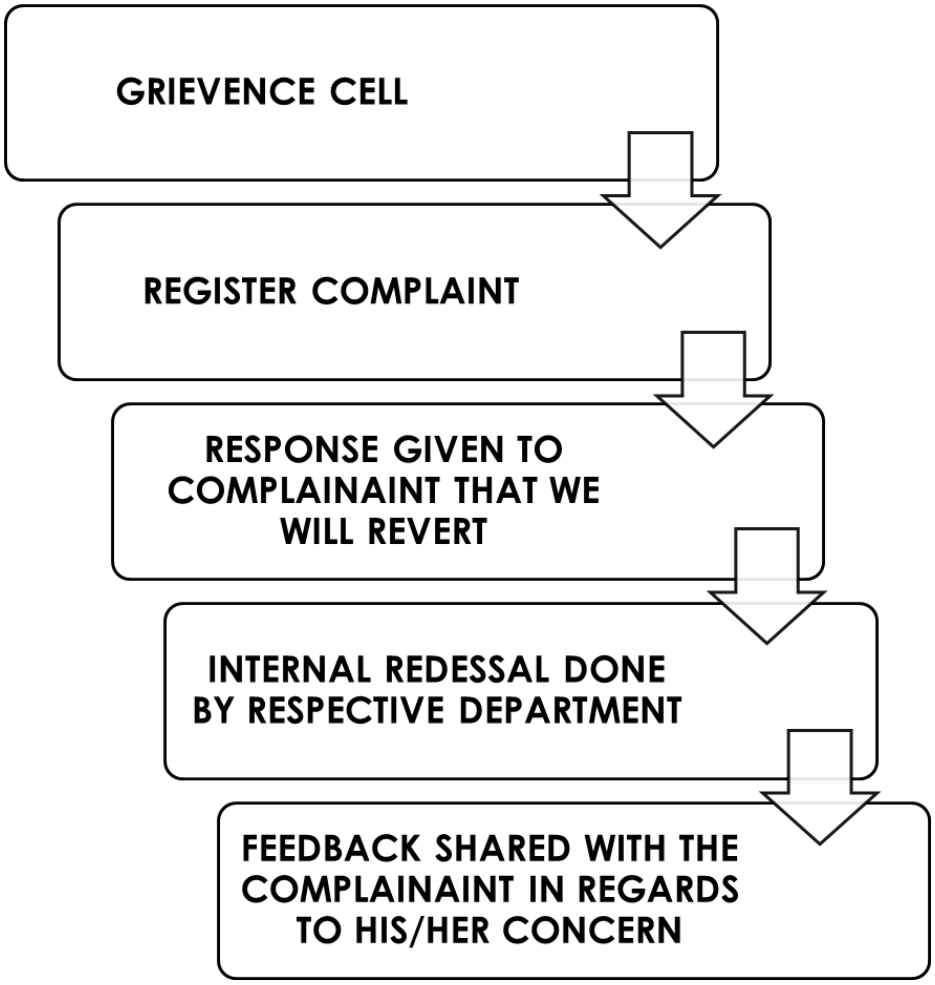


Figure 11-1 GRM Mechanism

12 CONCLUSIONS AND RECOMMENDATIONS

The assessment of environmental impacts for the project road involved the utilization of both primary and secondary data. The comprehensive evaluation presented in the EIA Report offers insights into all potential environmental consequences associated with the project, accompanied by suitable recommendations for mitigation measures.

The chosen roadway largely adheres to existing alignments, deemed the most favorable option from environmental, legal, engineering, and socioeconomic perspectives. To address environmental impacts, existing institutional arrangements will be employed and augmented for optimal resource utilization.

Anticipated environmental impacts are concentrated during the construction phase, and the responsibility for implementing mitigation measures will be delegated to the contractors. Recognizing the potential knowledge gap among contractors regarding environmental issues, the contract documents must explicitly outline required environmental mitigation measures. An environmental supervising consultant will oversee the implementation process. The EIA Report, along with the EMP, should serve as the foundation for an environmental compliance program.

The EIA Report provides a thorough examination of potential environmental impacts, deeming them manageable with mitigation efforts to be executed by the LDA and contractors at various project stages. Conclusively, the project is acknowledged to have some negative impacts that can be effectively mitigated through proper implementation of measures outlined in the Environmental Management Plan. Consequently, it is recommended that the competent authority issues Environmental Approval for the project's operation.

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

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
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
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.
Roundabout	A roundabout is a circular intersection where traffic moves in one direction around a central area promoting efficient and continuous traffic flow.
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.
Underpass	Underpass is an underground passage allowing one road to pass beneath another, enhancing traffic flow and safety.

ANNEXURE-A

CAMP ESTABLISHMENT AND MANAGEMENT PLAN (CEMP)

Camp Establishment and Management Plan

Purpose of the Plan

The objectives of a Camp Establishment and Management Plan typically include:

- Ensure the systematic establishment of camp facilities, including accommodations, sanitation, and administrative spaces, to meet the needs of the workforce in an organized and efficient manner.
- Adhere to local regulations and guidelines governing camp establishments, ensuring that the camp operates within legal and regulatory frameworks.
- Implement robust health and safety protocols to safeguard the well-being of camp occupants, emphasizing measures such as emergency response plans, medical facilities, and sanitation standards.
- Mitigate the environmental impact of the camp through waste management, energy conservation, and other eco-friendly practices, aligning with sustainability goals and minimizing the camp's ecological footprint.
- Foster positive relations with the local community, addressing any concerns, and ensuring that the camp's presence has a minimal adverse impact on the surrounding areas.
- Implement security measures to safeguard the camp, its occupants, and assets, including surveillance, controlled access, and collaboration with local law enforcement if necessary.
- Establish clear lines of communication within the camp, ensuring that occupants are well-informed about camp rules, regulations, and emergency procedures.
- Facilitate efficient logistical operations within the camp, including transportation, catering, and maintenance, to ensure smooth day-to-day activities.
- Implement mechanisms for ongoing evaluation and improvement of camp operations, incorporating feedback from occupants and addressing any emerging issues promptly.
- Manage the camp within the allocated budget, optimizing resources and expenditures while delivering a safe and comfortable living and working environment for the occupants.

These objectives collectively contribute to the effective establishment and management of construction camps, aligning with best practices in camp planning, operations, and sustainability.

Roles and Responsibilities

The Project Manager assumes the overarching responsibility for the establishment and management of the construction camp. This pivotal role involves coordinating all aspects of camp operations, from infrastructure setup to logistical coordination, ensuring the camp functions seamlessly and aligns with project objectives. The Project Manager plays a central role in maintaining a conducive and organized environment within the camp, contributing to the overall efficiency of the construction project.

Simultaneously, the Health, Safety, and Environment (HSE) Officer is entrusted with the specific responsibility of overseeing the rigorous implementation of health, safety, and environmental guidelines, rules, and regulations set forth by the Contractor. This role focuses on creating and sustaining a secure and environmentally conscious atmosphere within the camp. The HSE Officer actively monitors compliance, conducts regular safety audits, and implements corrective measures to mitigate risks and uphold the well-being of camp occupants.

Camp occupants are integral to the success of the established guidelines and rules. They are bound to adhere to these regulations, observing prescribed safety measures and environmental guidelines. Their commitment to abiding by the established rules is crucial in fostering a secure and orderly living and working environment. Additionally, occupants play an essential role in reporting any untoward incidents or prohibited activities promptly to the management, ensuring a proactive approach to addressing concerns and maintaining a culture of safety and compliance within the camp. This comprehensive collaboration among the Project Manager, HSE Officer, and camp occupants is vital for the successful functioning of the construction camp, prioritizing the health, safety, and well-being of all individuals involved in the project.

Contractor Construction Camp Location

The strategic selection of the construction camp location is a priority, guided by a comprehensive approach aimed at preventing potential conflicts and minimizing social impacts. The ideal placement involves situating the camp at a considerable distance from existing settlements, mitigating the risk of conflicts and disturbances within local communities. Moreover, the camp's location is meticulously chosen to avoid any encroachment on productive land, particularly

agricultural areas. This precautionary measure ensures the preservation of valuable agricultural resources and prevents disruptions to local livelihoods.

Equally important is the conscientious consideration of the camp's proximity to water bodies. To prevent pollution and safeguard water quality, the camp is positioned at a suitable distance from rivers, lakes, or other water sources. This approach aligns with environmental conservation principles, recognizing the significance of preserving water ecosystems and minimizing potential adverse effects on aquatic environments.

In essence, the comprehensive site selection strategy not only prioritizes the logistical and operational needs of the construction camp but also underscores a commitment to responsible and sustainable practices. By avoiding conflicts with existing settlements, preserving productive land, and preventing water pollution, the project aims to establish a construction camp that harmonizes with its surroundings, demonstrating a proactive approach to social and environmental stewardship.

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

- 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

To ensure a clean and environmentally responsible camp environment, a systematic waste management approach will be implemented. Garbage receptacles will be strategically distributed across various sections of the camp, including offices, living quarters, dining areas, kitchens, and other communal spaces. The placement of receptacles aims to promote the efficient disposal of waste and maintain cleanliness throughout the camp.

To further enhance sustainability, separate receptacles will be provided for recyclable and non-recyclable wastes. This segregation facilitates the proper handling and disposal of different types of waste materials. Specifically, recyclable materials will be systematically recovered and temporarily stored within the camp premises.

This comprehensive waste management strategy not only encourages responsible disposal practices among camp occupants but also aligns with environmental conservation goals. The emphasis on recycling underscores the commitment to minimize the ecological footprint of the camp, contributing to a more sustainable and environmentally conscious living and working environment. Through the proper distribution of receptacles and the implementation of recycling measures, the camp endeavors to foster a culture of waste reduction and environmental stewardship among its occupants.

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.

ANNEXURE-B

TRAFFIC MANAGEMENT PLAN

Introduction

The implementation of a comprehensive Traffic Management Plan (TMP) is paramount for the construction of an underpass due to its multifaceted significance. An underpass construction project invariably involves intricate engineering and excavation activities, often impacting the normal flow of vehicular and pedestrian traffic in the vicinity. The TMP serves as a strategic blueprint, meticulously designed to minimize disruptions, ensure the safety of road users and construction personnel, and optimize the overall traffic flow during the construction phase. By delineating clear procedures for traffic diversion, incorporating effective signage, and establishing safety protocols, the TMP aims to mitigate potential congestion, reduce travel delays, and enhance overall road safety. Moreover, it addresses critical aspects such as site security, project identification, and the management of construction-related impacts on local roads. Ultimately, a well-executed TMP not only safeguards the well-being of the community and commuters but also contributes to the efficient and systematic execution of the underpass construction, aligning with the broader goals of safety, convenience, and responsible urban development.

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.

Objectives of Traffic Management Plan

This Traffic Management Plan (TMP) is meticulously designed to address a range of critical issues, ensuring a comprehensive approach to the management of traffic and construction-related activities. The key objectives of this TMP are as follows:

- Prioritize the safety and amenity of both road users and the public, implementing measures that mitigate risks and enhance overall well-being.
- Ensure site security through effective control measures, manage site access, and implement clear signage to guide both construction personnel and the general public safely.
- Clearly identify the project through appropriate advertising and on-site signage, promoting transparency and awareness among stakeholders.

- Implement strategies to minimize traffic delays and inconvenience for road and street users, fostering a smoother flow of transportation during construction activities.
- Enforce appropriate speed limits through clear and visible signage, enhancing overall road safety within the construction zone.
- Establish efficient procedures and arrangements for diverting traffic, if required, ensuring a well-coordinated and organized flow of vehicles.
- Address the ongoing maintenance needs during the construction phase, promoting the longevity and functionality of the infrastructure.
- Clearly define and allocate responsibilities for traffic and safety management, ensuring accountability and a systematic approach to risk mitigation.
- Develop a comprehensive construction staging plan, including detailed layouts for intersections and cap areas for each construction stage, facilitating an organized and phased approach to construction activities.
- Assess and mitigate the impact of construction traffic on local roads, minimizing disruptions and preserving the integrity of the surrounding road network.

By addressing these key objectives, the TMP aims to create a robust framework that not only prioritizes safety but also optimizes traffic flow, minimizes inconvenience, and ensures the effective and responsible management of construction-related activities.

KEY TRAFFIC MANAGEMENT AND SAFETY ISSUES

Safety and Amenity for General Roads and Streets Users and Public

Throughout the project's duration, safety considerations will be meticulously tailored to the specific nature of the construction activities. An integral facet of ensuring public safety involves establishing a clear separation between the public and construction workers. This imperative will be addressed through the strategic use of barriers, barricading tape, the creation of service roads for contractor machinery, and the deployment of flagmen. These measures are designed to provide adequate separation, ensuring the safety of both road users and the construction team, thereby minimizing the impact of the works on public safety.

Additionally, specific traffic management measures will be implemented only when absolutely necessary. The primary goal is to reduce traffic speed, manage traffic volumes, and optimize road

alignment to enhance safety for both construction crews and the general public. Clear instructions will be communicated to vehicle drivers, directing them to use service roads and designated approach streets.

Recognizing the importance of minimizing disruption, the project will limit the working hours of activities that could significantly impact road users and the public. Efforts will be made to avoid substantial disruptions during peak traffic periods, public holiday weekends, and school holidays. Visual barriers will be strategically employed to mitigate potential distractions for road users, promoting a focused and safe driving environment.

Furthermore, active community consultation and notification processes will be implemented to keep road and street users, as well as the general public, consistently informed about traffic management measures and restrictions. This commitment to transparency aims to foster a collaborative approach with the community, ensuring that stakeholders are aware of and prepared for any necessary adjustments, thus contributing to an overall safer and more informed construction environment.

Safety and Amenity for Pedestrians

In the meticulous planning of construction activities, a comprehensive set of safety control measures specifically tailored for pedestrians will be developed. This involves a thorough consideration of various factors, including the number of pedestrians, the nature of their activities (such as office, residential, recreational), the origin and destination points of their journeys, the presence of vulnerable pedestrians (such as young individuals, the elderly, vision-impaired, and disabled persons), and the proximity of pedestrian generation developments, such as schools, shopping centers, railway stations, and bus terminals.

In creating a secure environment for pedestrians, the contractor will implement a series of measures. Work areas will be clearly demarcated, with defined walking paths established as needed. Hazardous zones will be barricaded to restrict physical access, ensuring the safety of pedestrians. Appropriate safety awareness signboards will be strategically installed to provide clear guidance and convey potential hazards to pedestrians. Furthermore, pathways designated for pedestrians will be meticulously maintained to be free of trip hazards, ensuring a smooth and safe passage for individuals on foot. This comprehensive approach underscores the commitment to

pedestrian safety throughout the construction process, addressing diverse needs and potential risks associated with their movements in and around the construction site.

Safety and Amenity for Public Transport

A comprehensive review will be conducted for local roads, streets, and property accesses utilized by public transport to ascertain safe alternatives or temporary stop locations throughout the project's execution. The identification and confirmation of these alternative or temporary stop locations will be a collaborative process involving affected transport services and regular users. To facilitate the safe movement of vehicles, particularly during peak hours, a set of safety control measures will be developed. This proactive approach underscores the commitment to optimizing public transport operations while prioritizing the safety and convenience of both passengers and the general public throughout the project's implementation.

Managing Construction Vehicular Movement

The successful execution of all projects hinges on the efficient management of construction vehicle movements both on-site and throughout the road and street network. Intensive planning will be undertaken to orchestrate construction vehicle movements with a primary goal of mitigating risks to other road and street users. The overarching objective is to curtail the traffic generated by the project to an absolute minimum, emphasizing a strategic approach that prioritizes safety and minimizes potential disruptions to the broader transportation network.

Driver's Responsibilities

It is imperative to guarantee that all drivers engaged in the project, whether as direct employees or subcontractors, possess a clear understanding of their responsibility to uphold safe driving practices. Furthermore, the credibility of these drivers will be thoroughly evaluated, taking into account their past experiences and reviews from previous employers. This comprehensive approach underscores the commitment to ensuring a safe and qualified driving force for the project, emphasizing both a proactive safety mindset and a history of reliable performance in previous roles.

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 barriers will be strategically deployed, particularly in areas where traffic is redirected from one route to another during the course of the project. To optimize the visibility of these safety barriers, reflective tapes will be employed. This proactive measure aims not only to delineate the construction zones effectively but also to enhance visibility, especially during low-light conditions. The use of reflective tapes on safety barriers underscores a commitment to ensuring that these

crucial safety features are readily apparent to drivers, pedestrians, and other stakeholders, contributing to an overall safer construction environment.

Signage

Sign boards constitute a pivotal element in the traffic management strategy, serving as indispensable tools to impart crucial road safety information to all road users. Throughout the project's execution, a diverse array of sign boards will be strategically employed, encompassing Existing Information Signage, Speed Limit Signage, Safety Information Signage, Directional Signage for local roads, and Advance Warning Signage, among others. These varied sign boards play a multifaceted role in providing clear guidance, conveying essential safety information, regulating speed limits, offering directional assistance, and issuing advance warnings. The comprehensive integration of these sign boards aims not only to enhance the overall effectiveness of traffic management but also to foster a safer and more informed environment for all road users during the project's implementation.

Traffic Signs

Safety Cones

Safety cones will be strategically positioned on roads to facilitate the temporary redirection of traffic in a secure and organized manner. These cones will serve a crucial role in various scenarios, including traffic redirection, providing advance warnings of potential hazards or dangers, and preventing the flow of traffic in specific areas. Their deployment is geared towards ensuring the safety of both drivers and pedestrians by clearly signaling alterations in traffic patterns, highlighting potential risks, and delineating areas where traffic must be avoided. This comprehensive approach to utilizing safety cones underscores a commitment to proactive safety

measures and effective traffic management during the project, prioritizing the well-being of all road users.

Safety Cones

Studs

Extensive use of studs will be implemented across the project site to effectively manage and control vehicle speed. Utilizing both high-profile and low-profile studs as per specific requirements, these elements will play a pivotal role in diverse settings. Their application will encompass reducing vehicle speed, delineating lanes, marking diversions, regulating access and egress routes, securing areas near schools and public spaces, and enhancing safety in proximity to construction sites. This comprehensive deployment strategy underscores a commitment to leveraging studs as versatile tools, strategically positioned to address varying traffic management needs and enhance overall safety across the project site.

Traffic Triangles

Traffic triangles will be employed as a proactive measure to alert drivers about potential issues ahead on the road. Typically utilized when a vehicle is parked or disabled near moving traffic, these triangles play a crucial role in notifying other drivers at a safe distance. By strategically placing traffic triangles, drivers are effectively prompted to slow down and proceed with caution, mitigating the risk of accidents or collisions. This comprehensive approach to deploying traffic

triangles underscores a commitment to enhancing road safety by providing clear and early warnings to drivers, contributing to a safer and more informed traffic environment.

Traffic Triangles

Revolving Lights

During nighttime or low-light conditions, revolving lights will be strategically employed to communicate to other road users the commencement of a construction area. These revolving lights serve the crucial purpose of signaling drivers and road users to approach the area with heightened caution, advocating for reduced speed and careful navigation. This comprehensive approach to utilizing revolving lights emphasizes the commitment to enhancing visibility and safety during periods of limited light, ensuring that all road users are adequately informed and able to navigate the construction zone with increased awareness and precaution.

Revolving Lights

Review and Improvement

A dynamic process of continuous improvement for this plan will be realized through the ongoing evaluation of environmental management performance in alignment with established policies, objectives, and targets. The framework for continuous improvement will be structured to:

- Systematically pinpoint areas within traffic management where opportunities for improvement exist, fostering a proactive approach to refining strategies and methodologies.
- Conduct comprehensive assessments to identify the root causes of any non-conformances or deficiencies within the traffic management framework, facilitating a thorough understanding of underlying issues.
- Formulate and execute robust plans of corrective and preventive actions designed to address identified non-conformances and deficiencies, ensuring a strategic response to enhance the effectiveness of traffic management.
- Rigorously verify the effectiveness of implemented corrective and preventive actions through systematic evaluations, confirming their impact and addressing any residual issues.

- Continuously compare the outcomes of the improvement process with established objectives and targets, facilitating a feedback loop to refine and align traffic management practices with overarching goals.

This comprehensive approach to continuous improvement underscores a commitment to adaptability, responsiveness, and the sustained enhancement of traffic management practices through a systematic evaluation of performance and the implementation of targeted improvement measures.

Maintenance

The maintenance and upkeep of all vehicles and machinery utilized throughout the Project will be a paramount consideration. To ensure optimal functionality, construction vehicles will undergo regular inspections by qualified mechanics, commencing at defined intervals after the Project's initiation. The Project Managers will diligently oversee these inspections, affirming that construction vehicles remain in excellent working condition and adhere to permissible load limits. In an effort to mitigate dust generation, gravel roads will be treated with water, where both economically feasible and environmentally acceptable.

Any potential road hazards or defects in vehicles that could compromise safety will be promptly reported to the Project Managers. Subsequently, the concerned vehicle or road segment will be withheld from use until necessary repairs have been completed. The contractor bears the responsibility for ongoing road maintenance, and any section of the road that incurs damage will be rehabilitated under the contractor's purview. This comprehensive approach underscores a commitment to proactive maintenance practices, ensuring the safety, efficiency, and environmental compliance of all equipment and road infrastructure throughout the Project's duration.

Transport of Equipment and Materials

The Contractor assumes the responsibility for ensuring that all equipment and materials transported to or from the site are securely fastened to, or enclosed within, the designated vehicles. Strict adherence to the manufacturer-specified weight-bearing capacity is mandated, with no construction vehicles permitted to be loaded beyond these specified limits. Each vehicle employed throughout the Project must possess the requisite load-bearing capacity suitable for the intended

transportation of materials and equipment. Moreover, drivers will undergo appropriate training in driving techniques specific to the nature of their loads, ensuring a comprehensive understanding of the safe and efficient transport of materials during the Project. This comprehensive approach underscores a commitment to stringent safety standards, preventing overloading and promoting secure transport practices throughout the project duration.

Signage for the Transport of Heavy Equipment

Pictorial View of Traffic Management at a Construction Site

Pictorial View of Traffic Management at a Construction Site

ANNEXURE-C

DUST MANAGEMENT PLAN (DMP)

DUST MANAGEMENT PLAN

A meticulous Dust Management Plan (DMP) holds paramount significance in the construction of an underpass, serving as an essential framework to mitigate environmental, health, and operational challenges. The excavation, material handling, and construction activities inherent in underpass projects can generate substantial dust, posing risks to air quality and potentially impacting the health of nearby communities. A well-structured DMP plays a crucial role in implementing effective dust control measures, such as water spraying, dust suppressants, and dust barriers. By minimizing airborne particulate matter, the DMP not only ensures compliance with environmental regulations but also safeguards the well-being of workers and nearby residents. Moreover, the plan aids in maintaining clear visibility at the construction site, enhancing safety for both workers and commuters. Overall, a robust Dust Management Plan is indispensable in promoting environmental sustainability, protecting public health, and facilitating the smooth execution of underpass construction projects.

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

A comprehensive approach to dust management will be grounded in a systematic evaluation that considers the nature of the activity generating dust, the probability of dust production, and the potential consequences based on the sensitivity of nearby receptors. By carefully assessing these factors, the most effective control measures can be discerned and subsequently implemented. This tailored strategy ensures that control measures are not only efficient but also specifically aligned with the unique characteristics of the construction activity and the sensitivities of the surrounding environment. Whether through the application of water spraying, dust suppressants, or other suitable techniques, this proactive identification and implementation process optimize dust control measures, promoting environmental sustainability, adhering to regulatory standards, and safeguarding the well-being of both workers and the surrounding community. Water sprinkling will be ensured thrice a day.

Step 3 – Monitor effectiveness of control

The Supervision Consultant will bear the crucial responsibility of overseeing and ensuring the proper implementation and effectiveness of dust control measures. This pivotal role involves

vigilant monitoring of construction activities to verify the application of prescribed dust control measures. The consultant will conduct regular assessments to ascertain the efficiency of these measures, considering factors such as the nature of construction activities, prevailing weather conditions, and the sensitivity of nearby receptors. In the event of any identified deficiencies or shortcomings in the dust control measures, the Supervision Consultant is tasked with initiating corrective actions promptly. This comprehensive oversight not only ensures compliance with environmental standards but also underscores a commitment to proactive environmental management throughout the construction process. The Supervision Consultant's role is integral in promoting a construction site that prioritizes dust control, environmental responsibility, and the well-being of the surrounding community.

Step 4 – Record and report result of monitoring

A systematic record-keeping process will be instituted to document and retain all inspections, audits, and monitoring outcomes as an integral component of the site filing system. This comprehensive approach ensures that a detailed and organized repository is maintained, encompassing records of inspections conducted, audit findings, and the results obtained through ongoing monitoring activities. Each documented piece of information contributes to a comprehensive archive that serves multiple purposes, including regulatory compliance, internal reporting, and retrospective analysis. The meticulous maintenance of these records within the site filing system not only facilitates transparency but also provides a valuable historical reference, aiding in continuous improvement efforts and ensuring accountability throughout the project's lifecycle.

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.

Dust Control Measures

Haulage Routes, Vehicles and Concrete Batching Plant	
Dust Source	**Dust Control Methods**
Major haul roads and traffic routes	Haul roads will be adequately moistened using a mobile bowser as needed.
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	The movement of site traffic will primarily adhere to constructed access roads whenever feasible. Additionally, a site speed limit of 10 mph will be instituted to minimize dust production.
Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	Efforts will be made to minimize the handling of materials, reducing instances of double handling and avoiding unnecessary handling of dusty materials.
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.

	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.

Water Sprinkling for Dust Control

Monitoring

Comprehensive monitoring will take place at identified sensitive receptor locations within the project area, as outlined in the Environmental Management Plan (EMP). In instances where particulate matter (PM) levels surpass applicable guidelines, additional stringent measures will be promptly implemented at the respective location(s) across the project area. This proactive approach aims to effectively control dust levels and mitigate potential environmental impacts.

ANNEXURE-D

OCCUPATIONAL HEALTH AND SAFETY PLAN

OCCUPATIONAL HEALTH AND SAFETY PLAN

Occupational health and safety in the construction of an underpass are of paramount importance, representing a cornerstone for the well-being and protection of all individuals involved in the project. The construction site poses inherent risks and challenges, and a robust occupational health and safety framework is essential to safeguard workers from potential accidents, injuries, and health hazards. By adhering to stringent safety protocols, implementing proper training programs, and ensuring the use of personal protective equipment, the construction process becomes not only more secure but also more efficient. Moreover, a focus on occupational health and safety fosters a positive work culture, boosting morale and productivity. Ultimately, prioritizing the health and safety of those engaged in the underpass construction not only aligns with ethical responsibilities but also contributes to the overall success and sustainability of the project.

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

In accordance with the worker hiring procedure, all contractors and labor agencies are obligated to subject prospective workers to comprehensive medical tests, screening for diseases and illnesses before their selection and employment. The contractor assumes the responsibility of ensuring that individuals with a criminal record are not employed at the project site. Furthermore, a rigorous protocol is established to ensure that all workers undergo medical screenings for diseases both during the hiring process and periodically at the project sites, in coordination with the designated Health Officer.

Additionally, the Project Management Unit (PMU) will conduct unannounced checks on workers to detect and address conditions such as HIV, STDs, and hepatitis, adhering to the contractual agreement between the Contractor and the Workers. This multifaceted approach underscores a commitment to prioritizing the health and well-being of the workforce while maintaining compliance with contractual obligations.

Minimizing hazards and risks at the workplace.

Ensuring safety at all work sites involves implementing a comprehensive safety management system and fostering a safety-conscious culture among workers. Here are key steps to achieve safety at work sites:

- Conduct thorough risk assessments before commencing any work to identify potential hazards.
- Regularly review and update risk assessments as the project progresses or conditions change.
- Develop and communicate clear safety policies and procedures tailored to the specific work activities.
- Ensure all workers are familiar with and adhere to safety guidelines.
- Provide comprehensive safety training for all workers, emphasizing the identification and mitigation of potential hazards.
- Conduct regular safety briefings to keep workers informed about current risks and preventive measures.
- Mandate the use of appropriate PPE for specific tasks.
- Ensure the availability, proper fit, and regular maintenance of PPE.
- Establish and communicate emergency procedures, including evacuation plans, first aid protocols, and emergency contacts.
- Conduct regular drills to ensure workers are familiar with emergency response procedures.
- Conduct frequent site inspections to identify and rectify potential safety issues promptly.
- Involve workers in reporting hazards and near misses to encourage a proactive safety culture.
- Establish open lines of communication between workers, supervisors, and management regarding safety concerns.
- Encourage reporting of hazards without fear of reprisal.
- Ensure all tools and equipment are well-maintained, regularly inspected, and meet safety standards.
- Train workers on the safe operation of machinery and equipment.
- Implement health and wellness initiatives to address both physical and mental well-being.
- Provide access to medical services and health screenings.

- Regularly review safety performance and incident reports to identify areas for improvement.
- Encourage feedback from workers and use it to enhance safety measures.
- Stay informed about and comply with local safety regulations and standards.
- Conduct regular audits to ensure adherence to legal requirements.
- Promote a safety-first culture from top management down to frontline workers.
- Lead by example and encourage a sense of responsibility for safety at all levels of the organization.
- 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.
- 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.

By adopting a holistic and proactive approach that integrates these measures, organizations can foster a culture of safety, minimize risks, and create a work environment where the well-being of every individual is a top priority.

Provision of Personal Protective Equipment

Risks to the health and safety of workers can be prevented by provision of 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.
- 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.

Personal Protective Equipment

Type of Work	**PPEs**
Electrical Work	Insulated gloves Earplugs or earmuffs
Drilling	Safety glasses or goggles Earplugs or earmuffs Heavy-duty gloves Steel-toed or composite-toed boots
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 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 Respirator.
Concrete and masonry work	Hard hat Eye protectors Hearing protection Safety footwear Leather gloves Respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat Safety boots Gloves Hearing protection.

Pictorial View of Workers Wearing PPE

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

First aid provisions will be consistently accessible during the entire construction duration through the efforts of respective contractors. Given that many work sites will be situated at a considerable distance from the nearest hospital, the availability of first aid kits is paramount. In conjunction with the provision of first aid kits, the following measures should be implemented:

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 Project Management Unit (PMU) will meticulously document all accidents and injuries transpiring at the work site. The contractor will delegate this responsibility to the site supervisor, with regular quarterly reviews conducted by the project management. Comprehensive reports prepared by the contractor will encompass details such as the location, date, and time of the incident, the names of individuals involved, the root cause of the incident, the presence of witnesses along with their statements. Drawing insights from these reports, the management will collaboratively pinpoint any unsafe conditions, actions, or procedures, and recommend specific mitigative actions for the contractor to address and rectify such hazardous conditions.

Compensation for Injuries and Death

In the event of any casualty or injury arising from occupational activities, due compensation will be provided in accordance with local labor laws. Should the injured party seek compensation,

meticulous procedures for documenting the case will be adhered to. This includes the preparation of a comprehensive accident report, written statements from witnesses, and the examination report from the attending doctor, along with their recommendations for appropriate treatment. The onus of ensuring compensation for their respective workers lies with each individual contractor.

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

PPE for Construction Site

ANNEXURE-E

SANITATION PLAN

SANITATION PLAN

The purpose of a sanitation plan at a construction site is multifaceted, aiming to safeguard the health and well-being of workers while maintaining environmental and community hygiene standards. This plan outlines systematic measures for the proper disposal of waste, provision of clean and accessible sanitary facilities, and regular maintenance of hygiene practices. By delineating clear guidelines for waste management, including the removal of construction debris and hazardous materials, the sanitation plan mitigates environmental impact. Additionally, it ensures that construction personnel have convenient access to sanitary facilities, promoting overall health and hygiene on the site. Overall, the sanitation plan plays a crucial role in fostering a safe, healthy, and environmentally responsible working environment during the construction phase.

OBJECTIVES OF SANITATION PLAN

The primary objectives of a sanitation plan at a construction site include:

- Ensure the well-being of construction personnel by providing clean and accessible sanitation facilities, reducing the risk of waterborne diseases and promoting overall hygiene.
- Implement effective waste management practices to minimize the environmental impact of construction activities. Proper disposal of construction debris and hazardous materials helps maintain ecological balance.
- Adhere to local, regional, and national regulations related to sanitation and waste management, ensuring that the construction site operates within legal and environmental compliance.
- Demonstrate commitment to community well-being by implementing measures that prevent pollution, maintain cleanliness, and minimize disturbances to the surrounding areas.
- Foster a positive and healthy work environment by providing adequate and well-maintained sanitation facilities, contributing to overall worker satisfaction and productivity.
- Mitigate the risk of water and soil contamination by implementing measures to control the disposal of construction waste, chemicals, and other potentially harmful materials.

- Establish protocols for handling emergencies related to sanitation, such as spills or leaks of hazardous materials, to ensure a prompt and effective response to unforeseen incidents.
- Contribute to the long-term sustainability of the construction project by integrating sanitation practices that align with environmental and health considerations, promoting responsible construction practices.

In essence, the sanitation plan serves as a comprehensive strategy to create a safe, healthy, and environmentally conscious construction site that complies with regulations and fosters positive relationships with both workers and the surrounding community.

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:

- 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

In case of storm water drains and sewer pipes clogging, the concerned department LDA 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

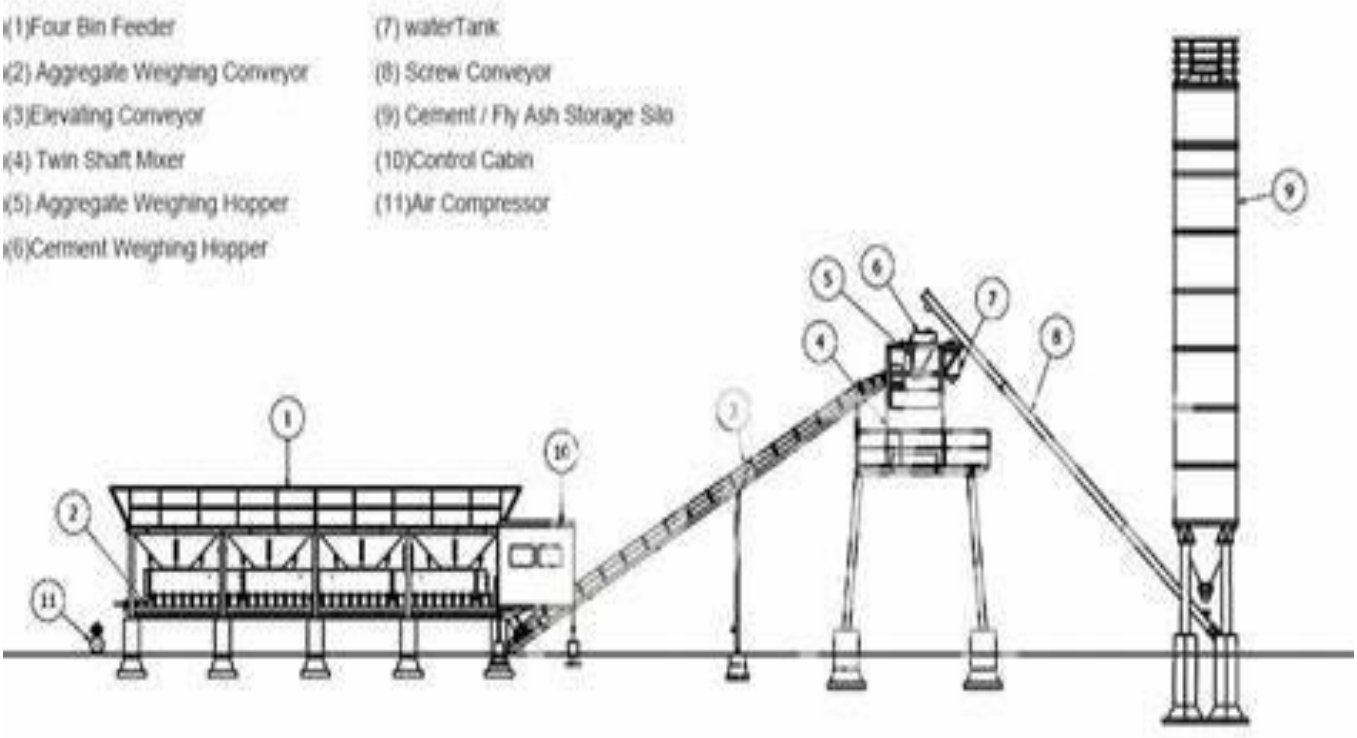
Training and awareness sessions shall be conducted for workers before the commencement of the project. The implementation of a sanitation plan would be more effective if the importance of hygiene; sanitation and safety are known to the workers

ANNEXURE-F

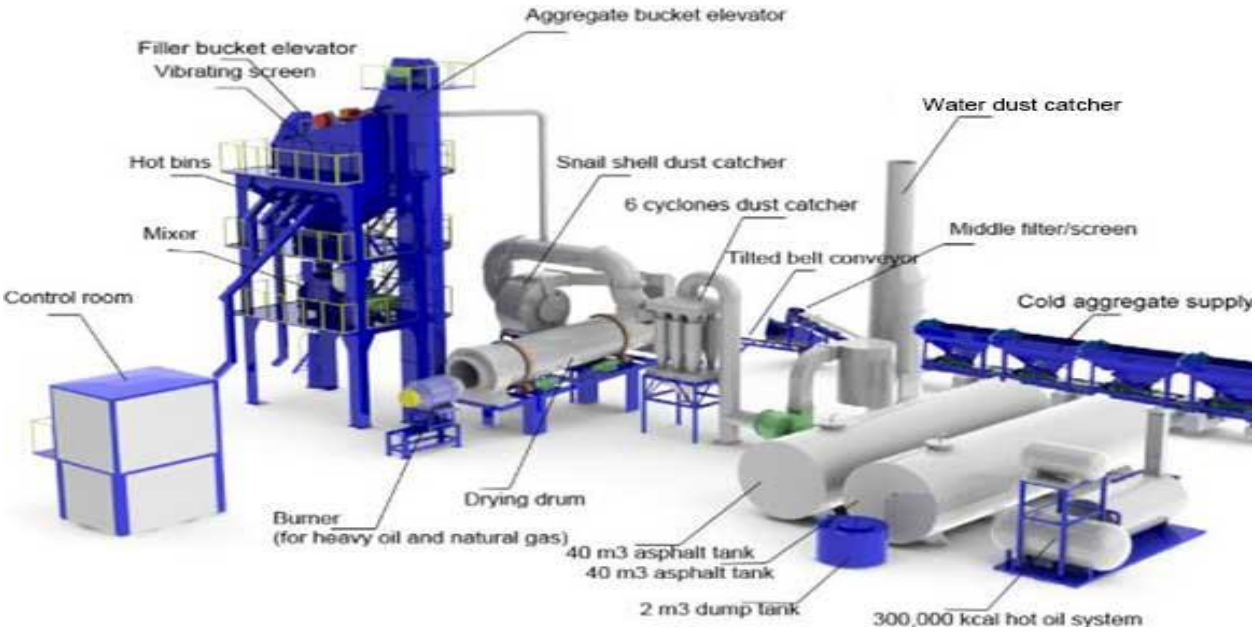
BATCHING AND ASPHALT PLANT MANAGEMENT PLAN

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

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

- 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;

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

ANNEXURE-G

SPILL PREVENTION AND CONTINGENCY PLAN

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

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 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.

ANNEXURE-H

EMERGENCY RESPONSE PLAN

EMERGENCY RESPONSE PLAN

The importance of an Emergency Response Plan (ERP) at a construction site is paramount for ensuring the safety and well-being of personnel, protecting property, and orchestrating a swift and effective response to unforeseen incidents. This structured plan outlines procedures for evacuation, medical response, and communication during emergencies, reducing the risk of injuries and fatalities. Additionally, it addresses the protection of property by securing equipment, materials, and infrastructure. Beyond the construction site, an ERP considers the potential impact on the surrounding community and environment, incorporating measures to contain spills, manage hazardous materials, and communicate with stakeholders. Regulatory compliance, risk reduction, clear communication protocols, worker training, and project continuity are all integral components of an ERP, contributing to an overall resilient and safe construction environment.

OBJECTIVES OF ERP

The objectives of an Emergency Response Plan (ERP) at a construction site include:

- Ensure the safety and well-being of construction personnel by providing clear and effective procedures for evacuation, medical response, and emergency communication.
- Facilitate a swift and organized response to emergencies, minimizing the impact of incidents and reducing the risk of injuries or fatalities.
- Outline measures to secure construction equipment, materials, and infrastructure during emergencies to minimize property damage and financial losses.
- Mitigate potential adverse effects on the surrounding community and environment by incorporating measures to manage hazardous materials, prevent spills, and communicate effectively with stakeholders.
- Adhere to legal and safety regulations related to emergency preparedness, ensuring compliance with local, regional, and national standards.
- Identify potential hazards, assess risks, and implement proactive measures to reduce the likelihood and severity of emergencies before they occur.
- Establish clear communication protocols to disseminate information efficiently to construction personnel, emergency services, and relevant stakeholders during emergencies.

- Provide training programs to educate construction personnel about emergency procedures, fostering a culture of preparedness and ensuring workers are equipped to respond appropriately.
- Maintain project continuity by developing contingency plans for critical operations, minimizing disruptions, and adhering to project timelines during emergencies.
- Establish mechanisms for coordination with local emergency services, ensuring a collaborative and effective response to emergencies.
- Maintain records of emergency response activities, conduct regular drills and exercises to evaluate the effectiveness of the plan, and update it based on lessons learned.
- Build overall resilience by cultivating a proactive approach to emergency management, instilling confidence among workers, project stakeholders, and the community in the site's ability to handle emergencies.

These objectives collectively contribute to creating a comprehensive and effective Emergency Response Plan that safeguards live, property, and the environment, while ensuring regulatory compliance and project success.

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 Table below.

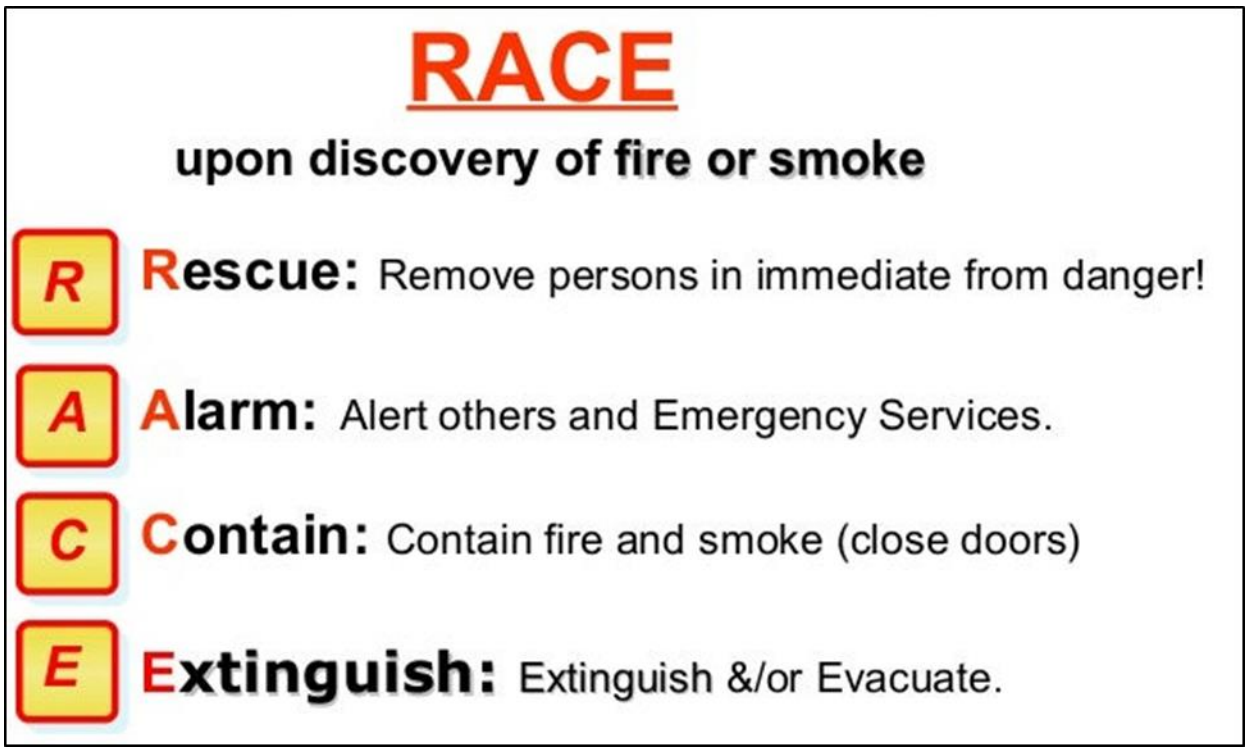
Action Group	Responsibility
Emergency Coordinator	➢ Overall control of personnel and resources. ➢ The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. ➢ Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with 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.

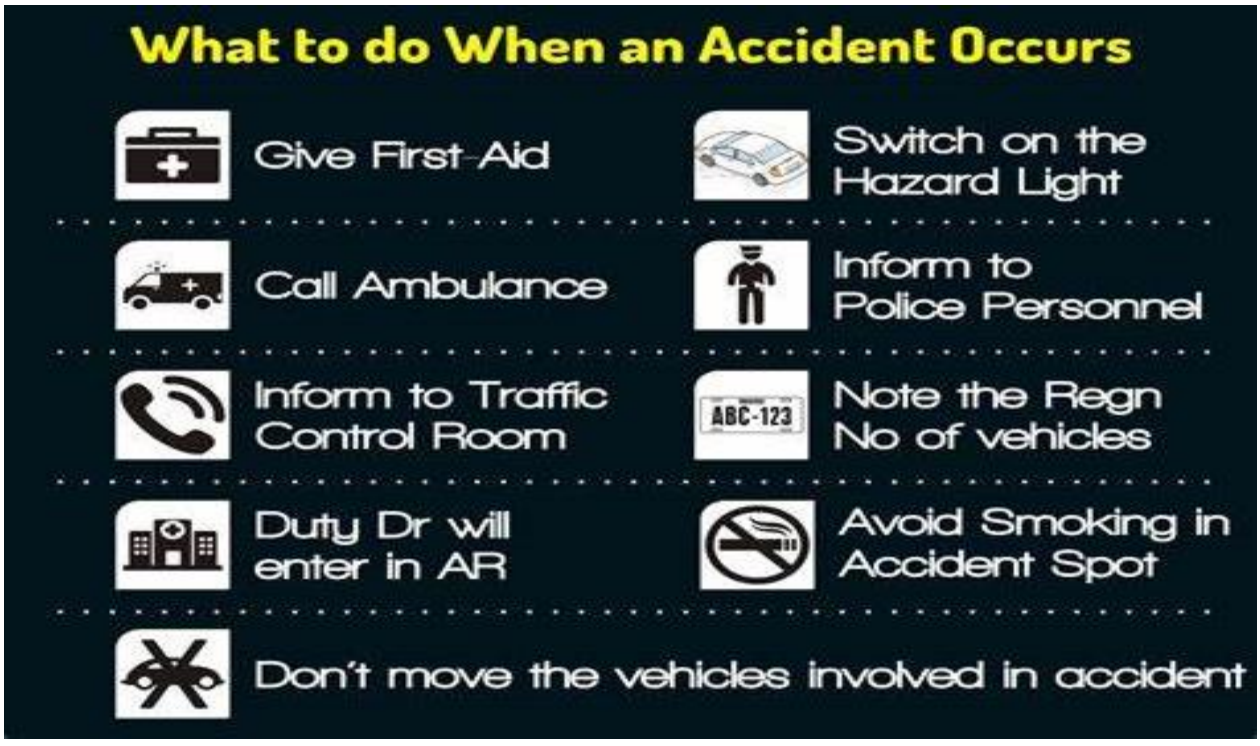
	➢ Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. ➢ Ensure resources available to purchase needed emergency response equipment and supplies. ➢ Assures that all persons on the Emergency Response Team aware and 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. ➢ Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. ➢ Assist with strong/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 by 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

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.





Communication with Authorities / Press at Site

In the event of an accident or incident, only designated senior staff members are authorized to provide factual information to authorities to mitigate potential liability exposure. It is imperative to diplomatically avoid engaging with the press, emphasizing that "the matter is under investigation, and pertinent details will be communicated by our Head Office once available." Expressly refrain from offering personal opinions or narratives to ensure a measured and controlled response to the situation.

First Aid Persons

- 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

In case of a medical emergency, stay in communication with the designated first aid personnel and, if necessary, promptly call for an ambulance based on their expert advice.

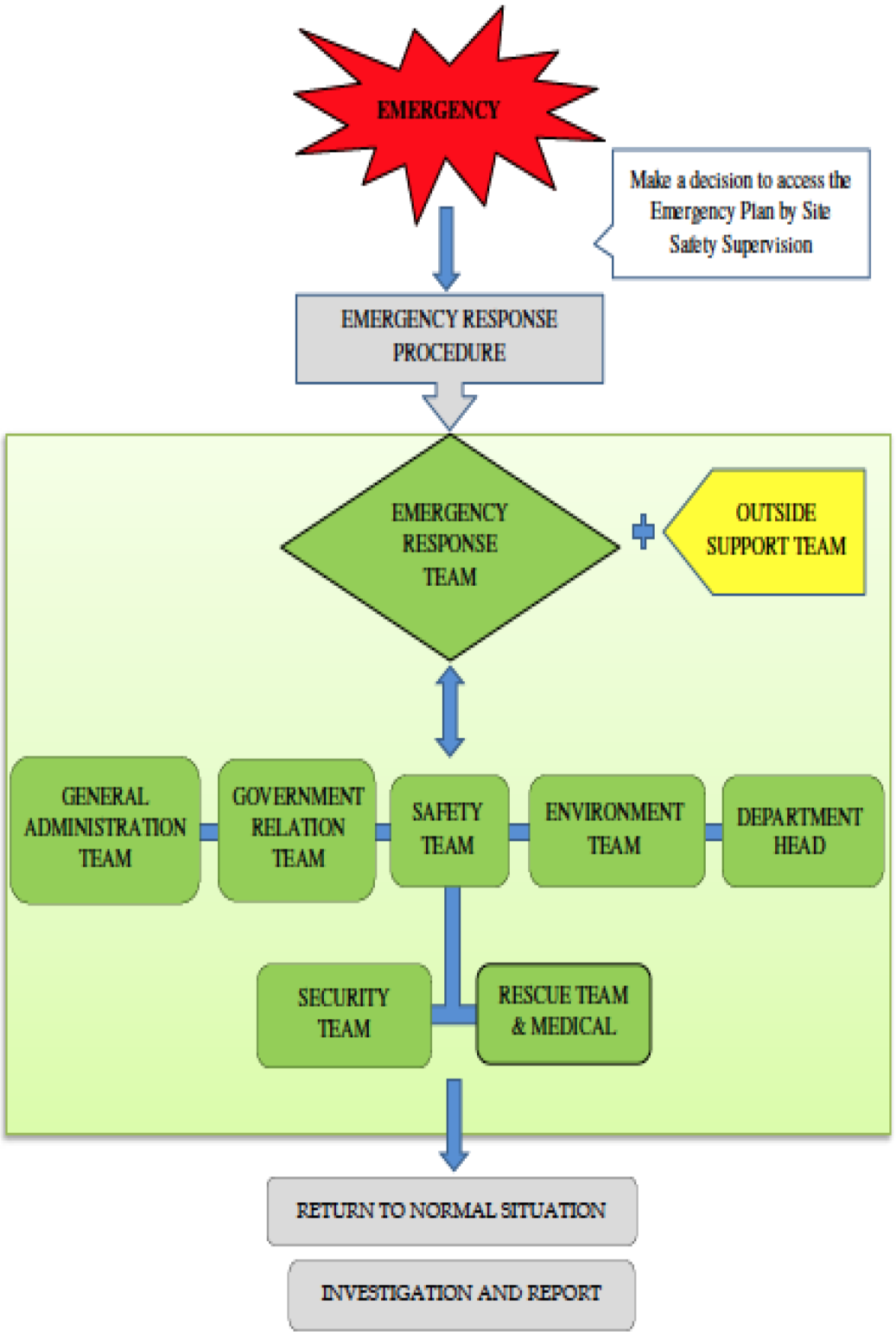
Security Team

- 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.



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

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

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 (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

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

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

Part of Body Injured or Affected:

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Remark: .....

Nature of Injury or Illness:

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

Remark: .....

Section E: Accidents/incident Details

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

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	☐ Marking 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

Section H: Witness Statement	
Witness Name	Interviewer Name

Section I: Reviewed & Recommend by			
Recommendation:			
Reviewed By:	Position:	Signature:	Date:

Remarks : If Accident or Incident happened with lost time injury and affected to the publicity must further report to Safety Department;

: First Aid Cases will not applicable to this form;

: The accident report shall submit to Safety Department within 3 days

: Attached the photograph or sketch the location of accident/incident;

ANNEXURE-I

RESOURCE CONSERVATION PLAN

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.

The objectives of a Resource Conservation Plan at a construction site encompass sustainable practices to minimize environmental impact, promote efficient resource utilization, and enhance long-term ecological and economic balance. Key objectives include:

- Implement measures to reduce energy consumption, optimize equipment operation, and explore renewable energy sources to enhance energy efficiency at the construction site.
- : Adopt strategies for responsible water use, including efficient irrigation, proper stormwater management, and the implementation of water recycling systems, aiming to minimize water consumption and prevent pollution.
- Develop and implement waste minimization strategies, emphasizing recycling, reuse, and responsible disposal practices to reduce the overall environmental footprint of construction activities.
- Promote the judicious use of materials, including sourcing sustainable and recycled materials, optimizing material usage, and adopting practices that minimize waste generation during construction.
- Incorporate measures to safeguard local ecosystems and biodiversity by minimizing habitat disruption, implementing erosion control, and preserving natural features within and around the construction site.
- Implement measures to control dust and air pollution, such as utilizing dust suppression technologies, maintaining equipment properly, and adhering to emission control standards to enhance air quality.
- Employ strategies to mitigate noise pollution during construction activities, including scheduling noisy tasks during appropriate times, using noise barriers, and adhering to local regulations to minimize disturbances to the surrounding environment.

- Optimize land use by adhering to sustainable land development practices, minimizing habitat disruption, and considering long-term ecological impacts in site planning and construction activities.
- Involve local communities in resource conservation efforts, fostering awareness, and garnering support for sustainable practices. Communication and collaboration with stakeholders can contribute to a more holistic resource conservation plan.
- Ensure strict adherence to environmental regulations, permits, and standards relevant to resource conservation, promoting a culture of compliance and accountability within the construction project.
- Provide training for construction personnel on resource conservation practices, raising awareness about the importance of sustainability and encouraging a collective commitment to responsible resource management.
- Regularly assess and evaluate the effectiveness of resource conservation measures, seeking opportunities for improvement and innovation to continually enhance the sustainability of construction operations.

By pursuing these objectives, a Resource Conservation Plan contributes to responsible and sustainable construction practices, aligning the project with environmental stewardship and long-term ecological balance.

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. ln 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 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.

ANNEXURE-J

SOLID AND HAZARDEOUS WASTE MANGEMENT PLAN

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

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 interceptor 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:

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.

ANNEXURE-K

TREE PLANTATION PLAN

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 at 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 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.
- 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**	**Pictures**
Shade Giving Trees			
1	Neem	300	

2	Ficus	300	
3	Kikkar	300	
4	Other local species	100	
Total		**1000**	