



**PUNJAB CENTRAL BUSINESS DISTRICT (CBD)
DEVELOPMENT AUTHORITY
GOVERNMENT OF PUNJAB**

REMODELING OF WALTON ROAD, LAHORE



ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

MAY, 2023



National Engineering Services Pakistan (Pvt) Limited
1C, Block N, Model Town Ext, Lahore 54700, Pakistan
Phone: +92-42-99090000 Ext 233 Fax: +92-42-99231950
Email: geotech@nespak.com.pk , info@nespak.com.pk
<http://www.nespak.com.pk>

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Consultant



National Engineering Services Pakistan (Pvt) Limited
1C, Block N, Model Town Ext, Lahore 54700, Pakistan
Phone: +92-42-99090000 Ext 233 Fax: +92-42-99231950
Email: geotech@nespak.com.pk, info@nespak.com.pk
<http://www.nespak.com.pk>

Client



Lahore Central Business District (CBD) Development Authority
Executive Lounge, Walton Airport, Ferozepur Road, Lahore
Lahore, Punjab 54000
Telephone Number: 0305 5550344

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0	22-10-2021	Draft	Mr. Saqib Rahman (Senior Environmental Scientist) Ms. Shehnila Hanif (EIA Expert) Mr. Waseeem Shah (Sr. Sociologist) Mr. Ibadullah Khan (Sr. Ecologist)		Muhammad Shariq Ahmed (Team Leader/Head ERSD)		Irfan-ul-Haq (VP / Head GT&GE)	
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Remodeling of Walton Road, Lahore

Environmental Impact Assessment Report (EIA)

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LIST OF ABBREVIATIONS

AOI	Area of Influence
AQI	Air Quality index
BOD	Biochemical Oxygen Demand
BP	Bank Procedures
BRBD	Bambawali Ravi Bedian Depalpur
CAA	Civil Aviation Authority
CAR	Crude Activity Rate
COD	Chemical Oxygen Demand
CBD	Central Business District
CDM	Clean Development Mechanisms
CDA	Canal and Drainage Act
CSC	Construction Supervision Consultant
DCRs	District Census Reports
DMCs	Developing Member Countries
EIA	Environmental Impact Assessment
EC	Environmental Committee
ECO	Economic Cooperation Organization
EE	Environmental Expert
EMP	Environmental Management Plan
EMMM	Environmental Mitigation and Management Matrix
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
ERP	Emergency Response Plan
ESEs	Environmental and Social Experts
GoPb	Government of Punjab
HVAC	Heating, Ventilation, Air Conditioning
HSE	Health, Safety and Environment
IAQ	Indoor Air Quality
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labour Organization
LLA	Land Acquisition Act
LDA	Lahore Development Authority
MSL	Mean Sea Level
MBT	Main Boundary Thrust
NEQS	National Environmental Quality Standards
NCS	National Conservation Strategy
NDMA,	National Disaster Management Authority
NOC	No Objection Certificate
NESPAK	National Engineering Services Pakistan
NPZs	Noise Perimeter Zones
OHSAS	Occupation Health and Safety Assessment Series
OHS	Occupational Health and Safety
O&M	Operation and Maintenance
OIC	Organization of the Islamic Conference
OD	Operational Directives
OP	Operational Policies



OMS	Operational Manual Statements
PHA	Punjab Horticulture Authority
PEQS	Punjab Environmental Quality Standards
PPE	Personnel Protective Equipment
P&D	Planning & Development
PMTA	Punjab Mass Transit Authority
PGA	Peak Ground Acceleration
RAR	Refined Activity Rate
RE	Resident Engineer
SAARC	South Asian Association for Regional Cooperation
SC	Supervisory Consultant
SSEMP	Site Specific Environmental and Management Plan
SDGs	Sustainable Development Goals
STDs	Sexually-Transmitted Disease
SOPs	Standard operating procedure
TA	Technical Assistance
UNO	United Nations Organization
UCC	Upper Chenab Canal
USFC	Ultra-Light and Sports Flying Club
WASA	Water and Sanitation Agency
WCB	Walton Cantonment Board



EXECUTIVE SUMMARY

ES-1 INTRODUCTION

Walton is one of the most urbanized areas in Lahore. The existing roads, including Main Boulevard Gulberg, already face traffic congestion during peak hours and with the addition of vehicles, generating from the CBD, on the Walton Road, the situation is only bound to get worse. In order to cope with traffic issues and to control this situation, CBD has proposed some improvements. The proposed Project aims Up-gradation of Walton Road that involves construction of the elevated and at-grade u-turns, flyovers, underpasses along with installation Conduit system for Drainage and rehabilitation of Ada Nullah for smooth traffic flow and to avoid disruption to the existing traffic in the vicinity during rainy season.

Punjab Central Business District (CBD) Development Authority has engaged National Engineering Services Pakistan (NESPAK) Limited to provide Consultancy Services for the preparation of Environmental Impact Assessment (EIA) study of the proposed Remodeling of Walton Road and Lying of Conduit to fulfil the requirements of the Punjab Environmental Protection Agency (Punjab-EPA).

ES-2 LEGAL AND ADMINISITRATIVE FRAMEWORK

The EIA Study has been conducted for the subject project as a mandatory requirement of Punjab Environmental Protection Act, 1997 (Amended 2012 & 2017). Section 12 (1) of the Act states that “No proponent of a Project shall commence construction or operation unless he has filed with the Provincial Agency an Environmental Impact Assessment or, where the Project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.” Other relevant laws have also been discussed briefly in Chapter-2.

According to the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2022, the proposed project falls under Category ‘D’ of the Schedule-II. This category requires an EIA study to be conducted for urban development projects to initiate the process of environmental approval.

ES-3 DESCRIPTION OF THE PROJECT

The proposed Project is the up-gradation of Walton road, starts at Defense Chowk and ends at Qainchi with approx. length of 05 km. A conduit system will also be installed for drainage purposes along the Walton road. It mainly involves widening of existing carriageway, construction of Elevated and At-Grade U-Turns, construction of Flyover and underpass, installation of Conduit system for Drainage and Up-gradation of Ada Nullah for Storm water Management. It is expected to be completed in approximately three (03) years. Tentative cost of the proposed Project is about PKRs. 16.825 Billion. The details of other infrastructure e.g. water consumption, sewerage, etc. are provided in Chapter-3.



ES-4 DESCRIPTION OF THE ENVIRONMENT

The baseline profile regarding physical, ecological and socioeconomic environment has been developed through primary and secondary sources.

a) Physical Environment

The proposed Project falls under administrative jurisdiction of District Lahore. Lahore is generally flat and slopes towards south and south-west, city lies on the alluvial plain called Bari Doab. The Project area has moderate to extreme climate conditions, with hot summers and cold winters.

As per Building Code of Pakistan (BCP), 2007 (Seismic Provisions), the proposed Project falls entirely in the Zone-2A with Peak Ground Acceleration (PGA) 0.08 to 0.16 g of the seismic zonation. Major sensitive receptors, i.e. health and educational institutions, and religious places (mosques, shrines and graveyard) recorded based on site survey and by using the GIS tool for the proposed Project.

b) Ecological Environment

The study area has a variety of trees. The major tree species in the Project Area are Shisham (*Dalbergia sissoo*), Eucalyptus (*Eucalyptus camaldulensis*), Bakain (*Melia azedarach*), Neem (*Azadirachta indica*), Sirris (*Albizia lebbek*), Jaman (*Syzygium cumini*), Pipal (*Ficus religiosa*), Ber (*Ziziphus mauritiana*), Banyan (*Ficus bengalensis*), Alstonia (*Alstonia scholaris*), Toot (Mulberry) (*Morus alba*), Kikar (*Acacia modesta*) and Bottle Brush (*Callistemon lanceolatus*).

Common mammals found in the area are dogs, cats, house rats and bats. Small Indian Mongoose and Indian Palm Squirrel have also been reported. House sparrow (*Passer domesticus*), House crow (*Corvus splendens*) and Mynah (*Acridothera tristis*) are the most common in the area. There are no wetlands in the Project Area. There is no game reserve, wild sanctuaries and National Park present in the Project Area.

c) Socio-Economic Environment

The total population of Lahore District was 6,340,114 as enumerated in March 1998. The average annual growth rate of population in the district during intercensal period 1998-2017 was 03 percent. The population of the district is predominantly Muslims i.e. 93.9 percent. In the Project area, private and government educational institutions are present, which include: Government High School for Boys, Walton and Government High School for Girls, Walton. Moreover, private educational institutions up to middle and high level are also working in neighboring localities. Private medical clinics are also available in the surrounding of the Project area. There is no declared heritage site in the Project area.

ES-5 STAKEHOLDER CONSULTATION



A series of public consultations were conducted to get the feedback/ concerns of the different category of stakeholders including provincial departments Bab-e-Pakistan Foundation, Lahore Development Authority (LDA), Environment Department, Forest and Wildlife Department, Punjab Horticulture Authority (PHA), Punjab Boy Scouts Association etc.), potential Project Affected Peoples, local community and other general public residing near the Study Area. Consultation process included focus group discussion, semi-structured interviews, one to one meeting and interviews with the government, private and civil society institutions. Basic concerns of the stakeholders were related to construction phase impacts and implementation of mitigation measures.

ES-6 ANTICIPATED PROJECT IMPACTS AND MITIGATION MEASURES

Significant efforts were made to identify the main environmental (physical, ecological, social, and cultural) issues related to the design, construction and operation of the proposed project. The significant adverse impacts and their mitigations during the construction and operation phases are here under:

- The noise and vibration will be produced due to the operation of construction machinery and equipment. Noise and vibration are perceived as one of the most undesirable consequences of construction activities. There are a variety of ways by which construction equipment and worksite noise can be controlled that includes use of Quieter Equipment, Modification of Existing Old Equipment, Barrier Protection, change in Work Activity Schedule and Maintenance of vehicle/equipment.
- Wastewater will be generated at the construction camps and from construction activities. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains and water channels. The wastewater generation is estimated to be 3,712 liters/day; and sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit;
- A total of about 52 kg of solid waste will be generated from construction camps on daily basis. All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system;
- Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers. In addition to that, regular maintenance activities comprising changing of lubricating oil, changing the air and fuel filter, cleaning the fuel system, draining the water separators and proper tuning may also help in reducing the emissions from diesel generators;
- The project will involve clearing of vegetation cover on construction areas particularly along proposed road construction. It is initially examined that approximately 693 or say 700 (tree count is provided by GIS which may be authenticated physically during construction or design phase of the project). A tree plantation program has been formulated with the recommendations of compensatory planting of 7000 trees against fallen trees of similar floral function at the available spaces in/around the project area;
- Due to the construction camps, number of impacts may arise that include waste, soil pollution, groundwater pollution, dust, etc. The construction activities and vehicular movement at construction sites may result in road side accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. Institutions



along the route may also suffer during construction period due to air, noise and road accidents. Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Contractor will ensure the proper control on construction activities. Contractor will also take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions.

ES-7 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) of the proposed project mainly comprises Institutional Requirements; Environmental Mitigation and Management Matrix; Environmental Monitoring Plan; Plantation plan; Training and Capacity Building; Communication & Documentation; Management Plans; and EMP Cost. Contractor in coordination with Punjab CBD Development Authority will be responsible for implementation of EMP of the proposed project during construction and operational phase. The total cost required to effectively implement the mitigation measures is approximately Rs. 35.78 Million, which includes cost of training, environmental monitoring, tree plantation and Health and Safety etc. during construction and operational phases. The EMP will be part of the contract document with the Contractor.

ES-8 CONCLUSION AND RECOMMENDATIONS

Project is socio-economically viable and environment friendly, if EMP is implemented in true letter and spirit. Results of the EIA Study have shown that the impacts of the Project activities on the physical, ecological and social environment will be low to moderate significant. These impacts could be reduced by proper management and well planned meticulous design of the Up-gradation of Walton Road and by implementing an appropriate tree plantation plan. An EMP for both the phases (construction and operation) has been developed as part of the report, which provides a detailed mitigation matrix that covers impacts, mitigation measures roles and responsibilities and timings to avoid, minimize or mitigate the adverse impacts of the Project.



1 INTRODUCTION

1.1 PROJECT BACKGROUND

Lahore is Pakistan's second largest city with a population of around eleven million (census 2017) people. It is a regional urban center of key commercial, financial, industrial and socio-cultural significance. Over the years, rapid urbanization has changed the socio-economic and physical characteristics of Lahore. Due to lack of / insufficient infrastructure facilities, unprecedented and un-planned growth of population has contributed towards deterioration in lifestyle of general public.

For the sustainable economic development of any city, congestion alleviation and ensuring an excellent transport system is one of the most important tasks. The economic development has been leading urban traffic states to more critical situations and cities in developing countries are facing this problem the most because traffic congestion is very frequent and has become a normal phenomenon in big cities. A good transportation system in city is very important for sustainable urban development.

Walton is one of the most urbanized areas in Lahore. The existing roads, including Main Boulevard Gulberg, already face traffic congestion during peak hours and with the addition of vehicles, generating from the CBD, on the Walton Road, the situation is only bound to get worse. In order to cope with traffic issues and to control this situation, CBD has proposed some improvements.

The proposed Project aims Up-gradation of Walton Road that involves construction of the elevated and at-grade u-turns, flyovers, underpasses along with installation Conduit system for Drainage and rehabilitation of Ada Nullah for smooth traffic flow and to avoid disruption to the existing traffic in the vicinity during rainy season.

Punjab Central Business District (CBD) Development Authority has engaged National Engineering Services Pakistan (NESPAK) Limited to provide Consultancy Services for the preparation of Environmental Impact Assessment (EIA) study of the proposed Remodeling of Walton Road and Lying of Conduit, to fulfill the requirements of the Punjab Environmental Protection Agency (Punjab-EPA).

1.2 REQUIREMENT FOR EIA STUDY OF THE PROPOSED PROJECT

The Proposed Project is located in Punjab Province, therefore the Punjab Environmental Protection Act, 1997 (Amended 2012 & 2017) is the core environmental law for the Proposed Project. Under Section 12 (1) EIA is mandatory for the subject project, which states that:

"No proponent of a project of public and private sector shall commence construction or operation unless he has filed an Initial Environmental Examination / Environmental Impact Assessment with the Punjab Environmental Protection Agency, as the case may be, or,



where the project is likely to cause adverse environmental effects; and has obtained approval from the Provincial Agency in respect thereof”.

According to the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2022, the proposed project falls under Category D of the Schedule-II. This category requires an EIA study to be conducted for transportation and road projects to initiate the process of environmental approval.

1.3 OBJECTIVE OF EIA

The prime objective of the EIA study is to fully meet the statutory requirements set forth by the Punjab Environmental Protection Act, 1997 (Amended 2012 & 2017) to facilitate decision making by the Punjab-EPA regarding grant of No Objection Certificate (NOC)/ Environmental Approval for the Proposed Project.

The overall objective of this EIA is to elucidate the anticipated aspects of the proposed intervention and to propose necessary mitigation measures to prevent/minimize adverse impacts on surrounding environment and community. To achieve this objective, an assessment of the existing environmental conditions of the project's Area of Influence (AOI) is a prerequisite. Therefore, baseline data of major environmental attributes has been acquired from primary and secondary sources. This EIA has been prepared to ensure adequate environmental and social management during pre-construction, construction and implementation stages of the proposed project. It provides mechanisms to ensure that potentially significant environmental and social impacts of the proposed project are identified, assessed and mitigated as appropriate.

Specific objectives of this EIA report are to:

- Facilitate proponents of the project in ensuring environmental and social sustainability of the project;
- Establish a baseline of existing social and environmental conditions prior to project initiation by collecting secondary data/ information on physical, biological and socio-economic environment of the project area;
- Identify potentially significant environmental and social impacts (both positive and negative) during all stages of the Project;
- Avoid, minimize, and suggest mitigation measures for significant adverse impacts;
- Conduct, record and report and ensure consultations with major stakeholders; and
- Provide an Environmental Monitoring Framework and institutional arrangements for the proposed project as a tool for the implementation of the suggested measure and evaluation mechanism with adequate resources including implementing agencies capacity building.

1.4 NATURE, SIZE AND LOCATION OF THE PROJECT

The proposed Project involves widening of existing carriageway, construction of Elevated U-Turn, construction of At-Grade Protected U-Turns, construction of flyover and underpass, installation of Conduit system for Drainage and Up-gradation of Ada Nullah for Storm water Management. The proposed project is planned in an integrated manner to remodel the



Walton road along with the laying of conduit to cater the sewerage flow from Walton and Bab-e-Pakistan. **Figure 1.1** shows the Location Map of the proposed Project.

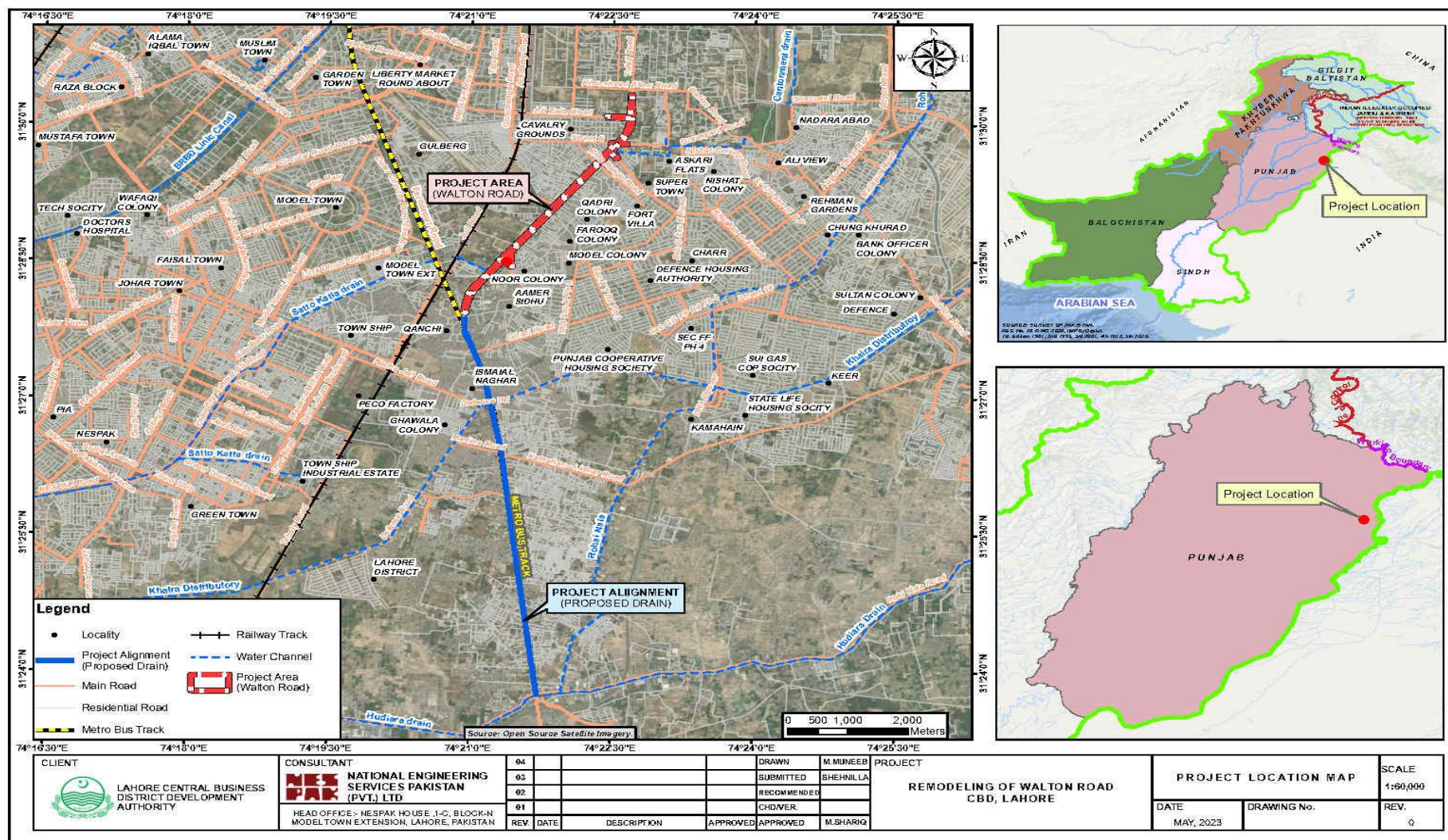


Figure 1.1: Location Map of the Proposed Project



1.5 PROJECT PROPONENT

Proponent details of the proposed Project are provided here under:

Mr. Imran Amin (Chief Executive Officer)
Punjab Central Business District (CBD) Development Authority
Executive Lounge, Walton Airport, Ferozepur Road, Lahore, Punjab 54000
Telephone Number: 0305 5550344

1.6 PROJECT CONSULTANT

The details of Consultant are provided below:

National Engineering Services Pakistan (Pvt.) Limited (NESPAK)
NESPAK House: 1-C, Block-N, Model Town Extension, Lahore, 54700,
(P.O. Box 1351), Pakistan
Telephone Number: 92-42-99090233
Fax Number: 92-42-99231950
E-mail Address: info@nespak.com.pk
Website: www.nespak.com.pk

1.7 CONSULTANT'S EIA TEAM

Based on the requirements of the study, NESPAK formed a team of experts comprising a team leader (Environmental Specialist) with professional support from the Environmental Engineer, Environmental Scientists, Sociologist and Ecologist. The professional staff was involved in analyzing the data, impact assessment and mitigation measures and report compilation. In addition, the EIA team worked in close coordination with the design team and several inputs were provided by the design specialists to the EIA team. Detail of EIA team is given in **Table 1.1** below:

Table 1.1: Team Composition for the EIA Study

Sr. No.	Name of Expert	Designation
1.	Mr. Jamshed Faisal	Project Manager
2.	Muhammad Shariq Ahmed	Team Leader/Head ERSD
3.	Mr. Saqib Rehman	Senior Environmental Scientist
4.	Mr. Tahir Qureshi	Senior Environmental Scientist
5.	Mr. Shehnila Hanif	EIA Expert
6.	Mr. Waseem Abbas	Senior Sociologist
7.	Mr. Ibadullah Khan	Senior Ecologist

1.8 APPROACH AND METHODOLOGY

The following approach and methodology was adopted for carrying out the EIA study of the proposed project:



1.8.1 Orientation

Meetings and discussions were held among the members of the EIA Consulting Team. This activity was aimed at achieving a common ground of understanding of various issues of the study. Subsequent to the concept clarification and understanding, a detailed data acquisition plan was developed for the internal use of the EIA consulting team. The plan identified specific data requirements and their sources; determined time schedules and responsibilities for their collection; and indicated the logistics and facilitation needs for the execution of the data acquisition plan.

1.8.2 Desktop Studies

Prior to mobilization, the consultants conducted a desktop study through collection and review of guidelines, data and reports related to the proposed project, that included (a) review of National Environmental Legislations; (b) Google Earth Satellite Imagery; (c) Relevant District Census Reports (DCR) and other relevant documents/drawings; and (d) Data available in previously conducted studies; *Census Survey by Pakistan Bureau of Statistics, 1998 and 2017 for socio-economic data; and other design data provided by the Client.*

1.8.3 Review of Environmental Laws and Institutional Requirements

All applicable national and international laws, legislations, guidelines along with relevant international protocols were reviewed relevant to the proposed project components.

1.8.4 Delineation of Study Area / AOI

For an EIA Study, a clear delineation of the Study Area / Area of Influence (AOI) is required. Study Area / AOI is the area within which the potentially significant impacts of the proposed Project activities (direct or indirect) are envisaged. In this report, the Study Area / AOI is the area where the Project impacts has been accessed on the environment due to the proposed Project activities.

Based on the available Google Earth Imagery and ARC GIS software, Project footprints were overlaid on the existing Project Area Imagery. Utilizing the information collected through the detailed site visit, consultations with the locals and concerned departments and foreseen impacts of the proposed Project, a tentative AOI of 25m from project boundary was delineated for road component and 10m for conduit. Map of the Study Area / AOI is shown as **Figure 1.2**.

1.8.5 Survey of AOI

A team of Environmental Scientists, Ecologist and Sociologist carried out the environmental and social survey of the AOI in February, 2023 to familiarize themselves with the local conditions and the environmental settings. During the survey, the information regarding the topography, soils, surface water, groundwater, flora & fauna, affected infrastructure, social settings and major settlements along the AOI were observed.

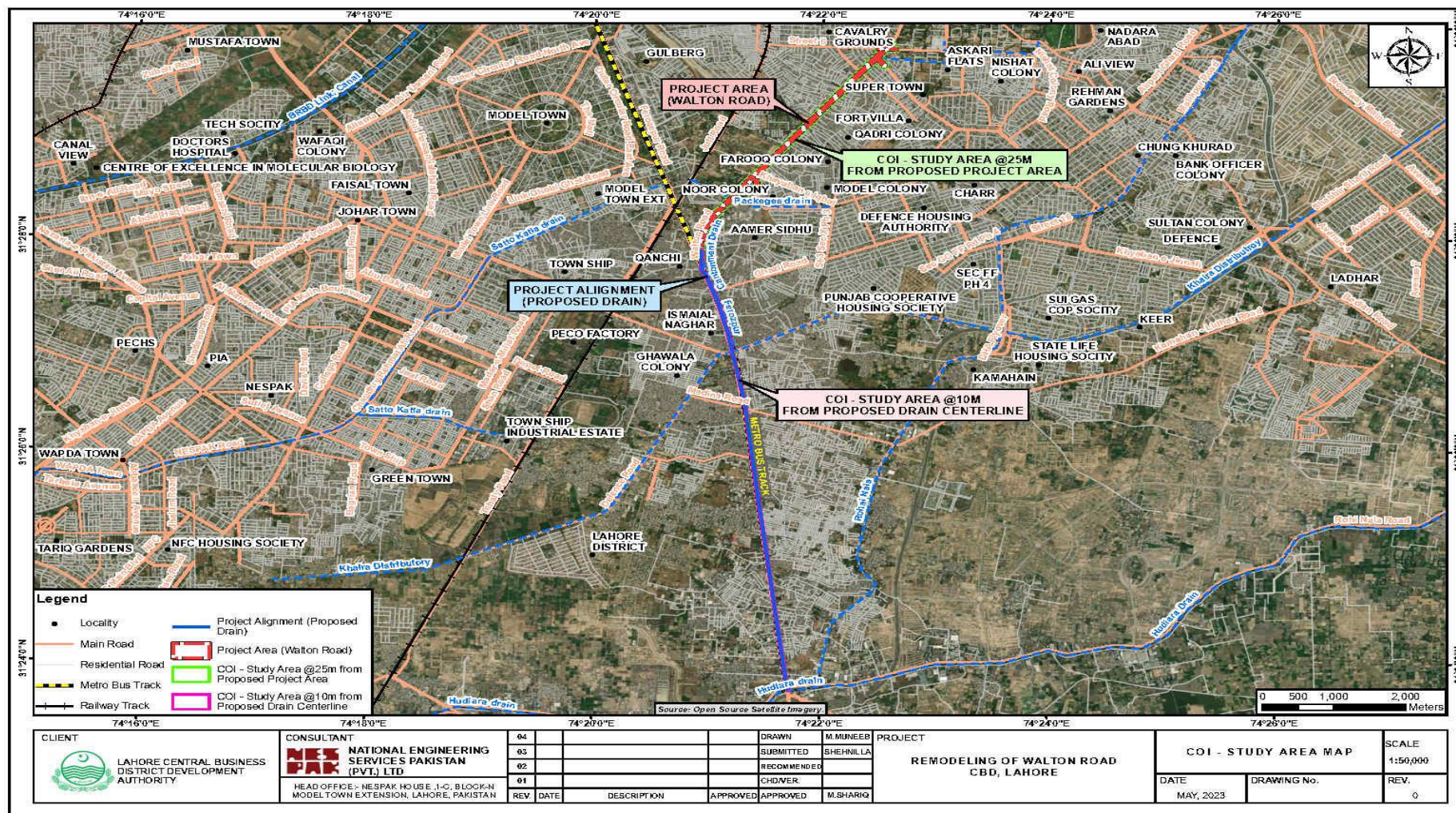


Figure 1.2: AOI/COI Map of the Proposed Project



1.8.6 Environmental Baseline Survey of the Project

Detailed environmental and social survey was carried out within the AOI as mentioned before. For data collection, formal meetings were held and data collected through visual observations, interviews with the local residents and officials. In order to collect the relevant published information, government offices were also visited.

Prior to the start of field activities comprehensive checklists, proformas and maps were developed to collect the information related to following parameters:

Physical Environment

The information acquired for the establishment of physical environment baseline included the following main parameters:

- Land resources (including landuse pattern, soil composition, contamination of soil and soil erosion etc.);
- Water resources (including available surface and groundwater resources and natural streams, hydrology, spring water, water supply, water contamination etc.);
- Climate data (including temperature, rainfall, humidity, wind speed and direction etc.);
- Ambient air quality and noise level monitoring data;
- Existing solid waste management and effluents disposal practices and storm water drainage;
- Buildings and infrastructure details, including residential, commercial and animal shed for complete/partial relocation;
- Religious, cultural and heritage information (mosques, shrines, graveyards);
- Archaeological monuments; and
- Other private/public infrastructures such as roads, telephone poles, hand pumps, tube wells etc.

Ecological Environment

The status of the flora and fauna of the study area were determined by a review of literature of the area, and an assessment of both terrestrial and aquatic environments.

a) Flora

The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling), etc.

b) Fauna

Information on fauna was gathered from existing literature on reported species as well as from observations in the field.



c) Endangered Species

Data/ information of endangered species (both flora and fauna, if any) was collected.

Socio-Cultural Environment

The consultants utilized a combination of literature, field investigations, census report, meetings through public consultation and interviews to describe the existing social environment and assessment of the potential impact of the construction of the proposed project. Data was gathered on the following aspects of the social environment:

- Land use and Municipal Status;
- Demographics;
- Livelihoods;
- Community Facilities;
- Solid Waste Management;
- Proposed Developments;
- Archaeological and Cultural Heritage; and
- Identification and Evaluation of Environmental Impacts.

1.8.7 Stakeholder Consultations

The Consultant identified Project stakeholders and held meetings with them during the surveys to receive feedback on the expected environmental issues related to the Project and suggested mitigation measures. Meetings were carried out with the Lahore Cantonment Board, Project affectees, relevant departments including Lahore Development Authority (LDA), Bab-e-Pakistan Foundation, Punjab Boy Scout Association, Environment Department, Forest and Wildlife Department, Punjab Horticulture Authority (PHA) etc. to discuss the issues/constraints and get their views and feedback to mitigate the potential environmental as well as social impacts associated with the implementation and operation of the Project.

1.8.8 Screening of Potential Environmental Impacts and Mitigation Measures

Based on the generally established baseline conditions in the adjacent as well as in the Project Area, potential physical, ecological and social impacts of the proposed Project were identified, evaluated and quantified, wherever possible. A logical and systematic approach was adopted for impact identification and assessment by utilizing a combination of the secondary data, satellite imagery, environmental checklists, socioeconomic survey proformas, field observations and discussion with the local residents of the Project Area. To mitigate the significant adverse impacts, adequate mitigation measures and implementation framework were proposed so that the proponent could incorporate them beforehand in the design phase.



1.8.9 Environmental Monitoring Program and Institutional Requirements

An Environmental Monitoring Program and Institutional Requirements has been prepared to ensure the adequacy and effectiveness of the suggested mitigation measures by clearly identifying the roles and responsibilities of the agencies, monitoring mechanism, monitoring plan for environmental and social parameters to be monitored with their frequency, existing and suggested framework, necessary approvals and the required further studies. Similarly, costs for environmental monitoring and social component/social mitigation measures were also estimated.

1.9 STRUCTURE OF THE REPORT

Section 1 **“Introduction”** briefly presents the project background, objectives, methodology and need of the EIA study.

Section 2 **“Legal and Administrative Framework”** comprises policy guidelines, statutory obligations and roles of institutions concerning EIA study of the proposed Project.

Section 3 **“Description of the Project and Alternatives”** furnishes information about the studied alternatives, location of the proposed project, cost and size of the project, its major components and alternatives considered for the proposed project to select at the preferred alternative for detailed environmental assessment.

Section 4 **“Description of Environment”** describes physical, biological and socio-economic conditions prevalent in the project area.

Section 5 **“Public Consultation”** identifies the main stakeholders and their concerns raised through scoping sessions, and deals with the measures to mitigate the social impacts.

Section 6 **“Anticipated Environmental Impacts and Mitigation Measures”** identifies and evaluates impacts of the project activities during the construction and operation stages and recommends with the measures proposed to mitigate potential environmental impacts of the road project.

Section 7 **“Environmental Management Plan”** outlines environmental mitigation plan, institutional arrangements for the implementation of the proposed mitigation measures, monitoring requirements, monitoring cost etc.

Section 8 **“Conclusion and Recommendations”** elaborates the conclusion of subject environmental study and suggests the recommendations to address the issues raised from proposed construction activities.



2 LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

This section provides an overview of the policy framework and legislation that applies to control the environmental consequences as a result of proposed project implementation and operation. The project needs to comply with all the applicable environmental policies, laws, guidelines, acts and legislations of Government of Pakistan and provincial government as well as international guidelines i.e. World Bank (WB) Operation Policy, Asian Development Bank (ADB) safeguard policy and IFC's Performance Standards.

2.2 SUMMARY OF RELEVANT STRATEGIES, POLICIES, ACTS AND LEGISLATION

The summary of major relevant strategies, policies, acts and legislation from environmental perspective are briefly described in **Tables 2.1 & 2.2** below:

Table 2.1: Main Strategies/Policies Related to Environment and their Relevance to the Project

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
1	National Conservation Strategy, 1992	Pakistan National Conservation Strategy (NCS), which was approved by the federal cabinet in March 1992, is the principal policy document on environmental issues in the Country. The NCS outlines the Country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment.	The core areas that are relevant in the context of the proposed project are pollution prevention during construction, conserving biodiversity and supporting forestry and plantation.
2	National Environmental Policy, 2005	In March 2005, GoP launched its National Environmental Policy, which provides a framework for addressing the environmental issues. Section 5 of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments to address their environmental concerns and to ensure effective management of their	Clause (b) of sub-section 5.1 states that Environmental Assessment related provisions in Environmental Protection Act, 1997, will be diligently enforced for all developmental projects.

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
3	National Climate Change Policy, 2012	environmental resources. The National Climate Change Policy provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. In view of Pakistan's high vulnerability to the adverse impacts of climate change, in particular extreme events, adaptation effort is the focus of this policy document. The vulnerabilities of various sectors to climate change have been highlighted and appropriate adaptation measures spelled out. The policy covers measures to address issues in various sectors such as water, agriculture, forestry, coastal areas, biodiversity and other vulnerable ecosystems. Notwithstanding the fact that Pakistan's contribution to global Greenhouse Gas (GHG) emissions is very small, its role as a responsible member of the global community in combating climate change has been highlighted by giving due importance to mitigation efforts in sectors such as energy, forestry, agriculture and livestock. Furthermore, appropriate measures relating to disaster preparedness, capacity building, institutional strengthening; technology transfer; introduction of the climate change issue in higher education curricula; ensuring environmental compliance through Initial IEE and EIA in the development process; addressing the issue of deforestation and illegal trade in timber; promoting Clean Development Mechanisms (CDM); and raising Pakistan's stance regarding climate change at various international forums, have also been incorporated as important components of the policy. The policy thus provides a comprehensive framework for the development of Action Plans for national efforts on adaptation and mitigation.	This policy document is a 'living' document and will be reviewed and updated regularly to address emerging concepts and issues in the ever-evolving science of climate change. This policy will accelerate due to the emissions from the construction machinery and equipment.



Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
4	National Drinking Water Policy, 2009	The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the people. Drinking water is the constitutional responsibility of the provincial governments and the specific provision function has been devolved to specially created agencies in cities and Town and Tehsil Municipal Administrations under the Local Government Ordinance 2001.	This policy is applicable for the proposed project during construction phase in terms of regular water quality monitoring.
5	National Water Policy, 2018	The National Water Policy aims at efficient management and conservation of existing water resources, optimal development of potential water resources, steps to minimize time and cost overruns in completion of water sector projects, improving urban water management by increasing system efficiency and reducing non-revenue water through adequate investments to address drinking water demand, sewage disposal, handling of wastewater and industrial effluents; equitable water distribution in various areas and canal commands, measures to reverse rapidly declining groundwater levels in low-recharge areas, increased groundwater exploitation in high-recharge areas, effective drainage interventions to maximize crop production, improved flood control and protective measures, steps to ensure acceptable and safe quality of water, minimization of salt build-up and other environmental hazards in irrigated areas, institutional reforms to make the managing organizations more dynamic and responsive.	The core areas that are relevant in the context of the proposed project are drinking water demand, sewage disposal, handling of wastewater.



Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
6	National Forest Policy, 2015	The goal of this policy is to expansion, protection and sustainable use of national forests, protected areas, natural habitats and watersheds for restoring ecological functions, improving livelihoods and human health in line with the national priorities and international agreements. In line with the Federal functions of national policy, planning and implementation of international agreements, specific objectives of the National Forest Policy include: - Promoting ecological, social and cultural functions of forests through sustainable management and use of forest produce including wood and non-wood forest products; - Implementing a national level mass afforestation programme to expand and maintain optimum forest cover; - Maximizing forest areas by investing in available communal lands/ shamlat, and Guzara forests and urban forestry; - Facilitating and harmonizing inter-provincial movement, trade and commerce of wood and non-wood forest products through the Federal Forestry Board; - Inter-linking natural forests, protected areas, wetlands and wildlife habitats to reduce fragmentation; - Enhancing role and contribution of forests in reducing carbon emissions and enhancing forest carbon pools; - Facilitating implementation of international conventions and agreements related to Forestry, Wetlands, Biodiversity and Climate Change; and - Promoting standardized and harmonized scientific forest planning, research and education including for community-based management.	The proposed Project dose not involves any national forests, protected areas, natural habitats and watersheds, so this policy is not applicable.
7	Pakistan Labour Policy, 2010	The main objective of the Labour Policy, 2010 is the social and economic well-being of the labour of Pakistan. The Labour Policy, 2010 has following 4 parts: - Legal Framework; - Advocacy: rights of workers and employers; - Skill development and employment;	The labour force will be employed for construction of the proposed Project. The provision of policy will apply to all the employed labourers.



Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
		and • Manpower export.	
8	National Disaster Risk Reduction Policy, 2013	NDMA, being the lead focal agency for disaster preparedness and management, has therefore, embarked upon formulation of a comprehensive National Disaster Risk Reduction Policy through wider consultations with all stakeholders including all provinces, state of AJ&K and regions. This policy covers disasters risk reduction in a more holistic way and introduces a proactive and anticipatory approach by laying special emphasis on risk assessment and prevention.	This policy will be elicited if any unforeseen natural and man-made disaster occurs during construction and operation phase.
9	National Action Plan for COVID-19 Pakistan	Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-V2-13-March-2020.pdf . The Government of Pakistan has launched the real-time data portal for COVID-19 http://covid.gov.pk/ . These measures are mostly relating to the containment and awareness and capacity building. Besides this COVID-19 daily situation report is also available at https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf .	This Action Plan for COVID-19 is applicable to the proposed project as it is being launched during this pandemic.

Table 2.2: Main Legislation/Acts Related to Environment and their Relevance to the Project

Sr. No.	Act	Brief Coverage	Relevance to Project
1	Punjab Environmental Protection Act, 1997 (Amended, 2012 & 2017)	The Punjab Environmental Protection Act, 1997 (Amended, 2012 & 2017) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The 'environment' has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d)	The provision of the act is applicable to proposed Project for conducting an IEE/EIA according to section 12 and to obtain environmental approval from the EPA. The section 11 of the act is applicable in term of compliance with Punjab



Sr. No.	Act	Brief Coverage	Relevance to Project
		the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses 'a' to 'f'. The notable points of the law are: • No proponent of a project shall commence construction or operation unless he has filed an IEE/EIA with the Provincial Agency designated by the Provincial EPAs an EIA, and has obtained an approval; • Establishment and formation of the Punjab Environmental Protection Council(PEPC); • Prohibition of certain discharges or emissions; • Punjab Environmental Quality Standards (PEQS) for wastewater, air emissions and noise; and • Provincial Government can issue notices and enforce them to protect the environment. In the recent amendment of 2012, legislatives powers related to environment and ecology are given to provincial governments from the Federal government. The provinces are required to enact their own legislation for environmental protection. Other amendments include increasing the penalties for violations. For the proposed Project, Environmental Protection Department (EPD)/Environmental Protection Agency (EPA), Government of Punjab (GoPb) is the concerned authority. The capability of regulatory institutions for environmental management is ultimately responsible for the success of environmental assessments and that development projects are environmentally sound and sustainable.	Environmental Quality Standards (PEQS). Similarly, section 13 of the act prohibits the import of hazardous waste. The provisions of section 16 are also applicable to comply with the discharge or emission of any effluent, waste, air pollutant or noise or disposal of waste or handling of hazardous substance. Under section 17, penalties will apply if anyone fails to comply with the provisions of section 11, 12, 13 and 16.



Sr. No.	Act	Brief Coverage	Relevance to Project
2	Punjab Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2022	These regulations set out: • Key policy and procedural requirements for filing an EIA; • The purpose of environmental assessment; • The goals of sustainable development; • The requirement that environmental assessment be integrated with feasibility studies; • The jurisdiction of the Federal and Provincial EPA's and Planning & Development (P&D) Departments; • The responsibilities of proponents; • Duties of responsible authorities; • Provides schedules of proposals that the project requires either IEE or an EIA; • The environmental screening process of the projects under schedule I, II and III; and • The procedure for the environmental approval for filing the case with the concerned EPA for the granting of the NOC.	The provisions of these regulations are applicable for environmental screening of the project, which implies that an EIA is required for the proposed project. The process described in the regulation will be useful for client to follow the procedure to file an EIA with Punjab EPA and to understand its review process along with timelines to be followed.
3	Punjab Environmental Quality Standards (PEQS), 2016	PEQS promulgated recently in 2016. Specified standards under PEQS are for: • Drinking Water; • Ambient Air; • Noise; • Industrial Gaseous Emissions; • Municipal and Liquid Industrial Effluents; • Motor vehicle exhaust and noise; and • Treatment of Liquid and Bio-Medical Waste.	All projects to be implemented in Punjab must conform to PEQS during all the phases i.e. construction and operation.
4	Guidelines for the Preparation and Review of Environmental Reports, 1997	These guidelines describe the format and content of IEE/EIA reports to be submitted to Punjab-EPA for obtaining NOC/approval. The guidelines present: • The environmental assessment report format; • Assessing impacts; • Mitigation and impact management and preparing an environmental management plan; • Reporting; • Review and decision making; • Monitoring and auditing; and • Project Management.	The guidelines are applicable for the preparation of the EIA.



Sr. No.	Act	Brief Coverage	Relevance to Project
5	Guidelines for Environmental Assessment	Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development Projects. The guidelines that are relevant to the proposed Project are listed below. - Guidelines for the Preparation and Review of Environmental Reports, Pakistan Environmental Protection Agency, 1997; - Guidelines for Public Consultation, Pakistan Environmental Protection Agency, May, 1997; and - Sectoral Guidelines: Pakistan Environmental Assessment Procedures, Pakistan Environmental Protection Agency, October 1997.	The guidelines are applicable for the preparation of the EIA.
6	Punjab Wildlife Act, 1974	The Punjab Wildlife Act (1974) is developed for the regulation of activities relating to protection, conservation and management of wildlife in Punjab.	The proposed project involves the cutting of trees which may result in loss of habitat, therefore, the provisions of this law are applicable.
7	Punjab Plantation and Maintenance of Trees Act, 1974	The Punjab Plantation and Maintenance of Trees Act, (1974) regulates tree plantations and enforces measures for their protection.	The requirements of this act are applicable in terms of planting new trees and their maintenance by the occupier of the existing land who would have the physical possession.
8	Protection of Trees and Brushwood Act, 1949	The Protection of Trees and Brushwood Act, 1949 prohibits cutting or chopping of trees and brushwood without prior permission of the relevant department in the provincial government.	The proposed Project may involve tree cutting, therefore, the provisions of this law will be applicable.
9	Pakistan Antiquities Act 1975 & Punjab Antiquities Amendment Act 2012	The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following: “Ancient” is any object that is at least 75 years old; - All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology; - The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise; - All new construction within a distance of 200 feet from protected antiquities is forbidden;	The law will be applicable to the project mainly due to its two provisions: According to the law, any construction activity within 61 m or 200 ft. of protected antiquities, are prohibited. The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed Project.



Sr. No.	Act	Brief Coverage	Relevance to Project
		- No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and - The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	
10	The Punjab Special Premises (Preservation), Ordinance, 1985	The Punjab Special Premises (Preservation), Ordinance (1985) provides the legal framework for preservation of premises of historical, cultural, archaeological, and architectural value in the Punjab province. This legislation empowers the provincial government to notify heritage sites and sites of cultural and archaeological importance and to prohibit implementation of developmental schemes or new constructions within the notified areas around the special premises. So far 246 sites stand notified under the Punjab Ordinance.	The provision of the ordinance is applicable for protection and conservation of special premises declared by department of Youth Affairs, Sports, Archeology & Tourism, Punjab. The ordinance is applicable in terms of land acquisition, entrance, exploitation and destruction of special premises near site.
11	Pakistan Penal Code, 1860	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
12	Labour Laws as part of Constitution of Pakistan 1973,	The Constitution of Pakistan contains a range of provisions with regards to labour rights, in particular: - Article 11 of the Constitution prohibits all forms of slavery, forced labour and child labour; - Article 17 provides a fundamental right to exercise the freedom of association and the right to form unions; - Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and - Article 37(e) makes provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.	The labour laws will be relevant as it would deal with employment of labour for the construction of propose project. Following are the major labour laws which are applicable to the project: - Bonded Labour System (Abolition) Act, 1992 - Employment of Child Act, 1991 - Minimum Wages Ordinance, 1961 - Industrial Relations Act, 2010 - West Pakistan Minimum Wages for Unskilled Workers' Ordinance, 1969



Sr. No.	Act	Brief Coverage	Relevance to Project
		Labour law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labour laws. The labour laws are a comprehensive set of laws in Pakistan dealing with the following aspects: • Contract of Employment; • Termination of Contract; • Working Time and Rest Time; • Working hours; • Paid Leave; • Maternity Leave and Maternity Protection; • Other Leave Entitlements; • Minimum Age and Protection of Young Workers; • Equality • Pay Issues; • Workers' Representation in the Enterprise; • Trade Union and Employers Association Regulation; and • Other Laws.	
13	Employment of Children Act, 1991	Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any construction, or any other hazardous employment. In accordance with this Article, the Employment of Child Act 1991 prohibits child labour (a child is under 14 years old).	The relevance of this act to the project will be to prohibit child employment for construction of the proposed project.
14	Pakistan Climate Change Act, 2017	This Act aims to meet obligations under international conventions relating to climate change and to provide for adoption of comprehensive adaptation and mitigation policies, plans, programmes, projects and other measures required to address the effects of climate change and for matters connected herewith and ancillary thereto.	This Act will accelerate due to the emissions from the construction machinery.
15	National Clean Air Act, 2000	The Act aims to control vehicular emissions, pollution from industry, and indoor air pollution in rural and urban areas.	This Act will trigger if vehicles and machinery used for construction activities emanate air pollutants above the permissible limit.
16	Punjab Parks and Horticulture Authority Act, 2012	This act entails regulation, development, and maintenance of public parks, green belts and green areas in the Punjab; regulation of billboards, sky signs and outdoor advertisements; to promote open and unrestricted views of the Punjab.	This act will trigger as green belts along the proposed project route will be affected during construction phase.



Sr. No.	Act	Brief Coverage	Relevance to Project
17	Land Acquisition Act (LLA), 1894 Including Later Amendments	The Land Acquisition Act, 1894, is a “law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition”. The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. The land needed for the construction of development projects will be acquired under normal conditions based on prevailing market prices or negotiated prices between client and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.	This Act will anticipate if proposed project involves permanent acquisition of land in the project area.
18	Punjab Municipal Water Act, 2014	The basic aim of the Act is to recognize, regulate and manage present and future municipal water supply and sanitation services and to establish rights of access to basic water supply and basic sanitation, and to ensure conservation of water resources in the Province. This Act is in draft stage.	This Act will elicit if there is misappropriation of water supply during construction activities.
19	The Punjab Polythene Bag Rules, 2004	This rule prohibits the manufacturing, sale, use and import of polythene bags that is below 15-micron thickness.	This rule will be applicable if polythene bags with more than 15-micron thickness used during construction activities.
20	The Punjab Water Act, 2019	This act ensures comprehensive management and regulation of water resources in the Punjab in the interest of conservation and sustainability.	This this act will be triggered as Main Canal is existed in and around the Project area.
21	Punjab Environmental Protection (Motor Vehicles) Rules, 2013	Subject to the provisions of this act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants and noise are being emitted in an amount, concentration or level which is in excess of the Punjab Environmental Quality Standards, or where applicable the standards established under clause (g) of subsection (1) of section 6 of the act.	This act will be elicited during construction and operational phase due to use of motor vehicles that produces air pollutants and noise.



Sr. No.	Act	Brief Coverage	Relevance to Project
22	ISO 18001 Occupation Health and Safety Assessment Series (OHSAS)	OHSAS 18001 is an Occupation Health and Safety Assessment Series for health and safety management systems to help organizations to control occupational health and safety risks. The OHSAS specifications are applicable to any institute that desires to establish an OH&S management system to eradicate or reduce risk to employees and other interested parties who may be exposed to the risks allied with the project activities. The construction of the proposed project may involve various health and safety issues to construction labour, therefore these ISO 18001 guidelines will be applicable and pertinent.	This series will be elicited during construction and operational phase to ensure health and safety of workers associated with the project activities.
23	The Punjab Occupational Safety And Health Act, 2019	This Act entails provision of occupational safety and health of the workers at workplace and to protect them against risks arising out of the occupational hazards; to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace.	The Act will trigger during construction and operational phase to ensure health and safety of workers at workplace associated with the project activities.
24	Punjab Restriction on Employment of Children Act, 2016	According to the sub-section 11(a) of this Act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven days, and a mandatory fine between 10,000 and 50,000 rupees.	This Act will trigger if contract hire skilled and unskilled labour under age 15.
25	Electricity Act, 1910	The Act provides a legal basis for distribution of Power. It enables a licensee to conduct operations for supply of electricity and binds the licensee to payment of compensation in respect of any damages caused during the construction, Operation and Maintenance (O&M) of Power distribution facilities.	This act will be applicable if any damages occur during construction of the power facilities.
26	Cutting of Trees (Prohibition) Act, 1975	The Act was enforced in 1975 to place restrictions on cutting of trees in order to restrain unchecked trend of tree felling without replacement plantations.	This act will be applicable to the subject project where the cutting of tree will be involved.
27	The Punjab Protected Areas Act, 2020	The Act provides provisions for the protection, preservation, conservation and management of ecologically important areas such as National parks, Nature reserves, Wildlife sanctuaries, Wilderness areas,	This act will not be triggered as there is no protected area in and around the study area.



Sr. No.	Act	Brief Coverage	Relevance to Project
		Buffer zone, Wetlands, etc.	
28	The Canal and Drainage Act, 1873	The Canal and Drainage Act 1873 (CDA) focuses on construction and maintenance of drainage channels and defines powers to prohibit obstruction or order their removal. It also covers issues related to canal navigation. It briefly addresses issues relating to environmental pollution. Section 70(5) of the CDA clearly states that no one is allowed to "corrupt or foul the water of any canal so as to render it less fit for the purposes for which it is ordinarily used." In addition, Section 73 of the CDA gives power to arrest without warrant or to be taken before the magistrate a person who has wilfully damaged or obstructed the canal or "rendered it less useful."	This act will be applicable as the proposed project is at near premises of the main canal through which water is being utilized at local level.
29	The Punjab Emergency Service Act, 2006	It deals with the establishment of emergency service for a purpose of maintaining a state of preparedness to deal with emergencies, to provide timely response, rescue and emergency medical treatment to the affected persons and recommending measures to be taken by related organizations to avoid any emergency situation. It describes procedures to establish emergency service, emergency board, emergency fund, emergency ambulance and rescue vehicles, offence and punishment, etc.	This act is applicable to the proposed project to provide timely response, rescue and emergency medical treatment to the affected persons during construction and operation phase of project.
30	National Disaster Management Act, 2010	National Disaster Management Act, 2010 was passed by Parliament of Pakistan in 2010. The Act applies to whole Pakistan. The Act was passed in backdrop of 2010 Floods in Pakistan and strengthens Disaster Management system.	This act is applicable to the proposed project. The proposed project will require special consideration to disasters and risk management strategies as per the Act.
31	Hazardous Substance Rule, 2003	The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. Inter alia, general safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are described in these rules. Requirements for project waste management plans are also defined. These include a requirement for updating the plan every three years, the need to provide for	This rule is applicable to the proposed project due to involvement of hazardous waste handling, use and disposal during the construction stage.



Sr. No.	Act	Brief Coverage	Relevance to Project
		management of hazardous waste in a manner that will prevent adverse environmental impacts and to ensure that hazardous and non-hazardous waste are not mixed.	
32	Building Code of Pakistan, 2007	The provision of Building Code of Pakistan shall apply for engineering design of building like structure and related components. The construction in violation of the Building code shall be deemed as violation of professional engineering work. Moreover, a certificate for the proposed action will be obtained from Provincial Building Control Authority.	These codes shall be used in structural design of building area components constructed under this proposed project.
33	Seismic Building Code of Pakistan 2007	This code stipulates the minimum requirements for seismic safety of building and structures and the provisions of the Building Code of Pakistan (Seismic Provisions-2007) shall apply for engineering design of buildings, like structures and related components. Construction of buildings shall be considered as violation of professional engineering work specified under clause (XXV) of section 2 of the Act.	This Code is applicable to the proposed project as it includes the formation of structures.
34	LDA Landuse Rules 2020	These Rules describes the procedures for permitted and permissible use of residential, commercial, industrial, institutional areas, Land Use Classification, Re-Classification, Re-Development Plan and provide lists of segments permitted for future commercial use, etc.	These rules shall be used to classify the landuse of the CBD, its future use, etc.
36	LDA Building and Zoning Regulations 2019	The Regulations provides specifications for establishment of Built Up Areas in Approved Schemes, site requirements for commercial & public buildings and requirements for development of Central Business District i.e. construction of Main Civic and Commercial Centers & Neighborhood Commercial Areas, Parking, structural design of multi storey buildings, fire safety plan. it also describes roles and responsibilities of builder, consultant, Contractor, Authority and requirements of necessary NOCs from concerned agencies i.e. EPA, TEPA, etc.	These regulations are applicable to the proposed project as it defines the specifications for establishment of Central Business District.
37	Lahore CBD Development Authority	The Ordinance defines procedures for Establishment of the Authority, Powers and Functions of	The Ordinance is directly related to the establishment of proposed CBD and any



Sr. No.	Act	Brief Coverage	Relevance to Project
	Ordinance 2021	the Authority, Establishment of housing schemes, projects, modification of Land use of any area, Acquisition of land and relevant Compensation, etc. The ordinance also describes the offences of Discharging any dangerous chemical, inflammable, hazardous or offensive article in any drain, or sewer, public water course or public land vested in, as causes or is likely to cause danger to persons passing by or living or working in neighborhood, or risk or injury to property or causing harm to the environment and related penalties.	constraint and nuisance caused due to construction activities.

2.3 INTERNATIONAL PROTOCOL / CONVENTIONS

As Pakistan is a member of a number of international organizations such as United Nations Organization (UNO), Organization of the Islamic Conference (OIC), South Asian Association for Regional Cooperation (SAARC), Economic Cooperation Organization (ECO) etc., so it has to follow the international protocols and obligations related to the environment. The major protocols, ratification dates by Pakistan and obligations related to the proposed project are provided in the **Table 2.3** below:

Table 2.3: International Agreements/Conventions Relevant to the Project

Sr. No	Agreement/Convention	Ratification	Description/Relevance
1.	UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972 Web Link: http://whc.unesco.org/en/%20convention%20text/	Pakistan ratified this convention on 23 July 1976.	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adopt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection.
2.	The Rio Declaration, 1992 Web Link: http://www.unesco.org/education/pdf/RIO_E.PDF	Pakistan signed the treaty on 13Jun 1992 and ratified on 1 June 1994	The Rio Declaration comprises 27 principles which address important issues such as; sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption.



Sr. No	Agreement/Convention	Ratification	Description/Relevance
3.	Kyoto Protocol, 1992 Web Link: https://unfccc.int/kyoto_protocol	Pakistan has ratified Kyoto Protocol in 2005	The Kyoto Protocol is a protocol to reduce Greenhouse gasses that cause climate change. It was agreed on 11 th December, 1997 at the 3 rd Conference of the countries to the treaty when they met in Kyoto, and entered into force on 16 th February, 2005. As of November 2007, 175 countries have ratified the protocol. One hundred and thirty-seven (137) developing countries have ratified the protocol, including Brazil, China, India and Pakistan but have no obligation beyond monitoring and reporting emissions.
4.	Convention on Biological Diversity, 1994 Web Link: https://www.cbd.int/	Pakistan signed this treaty in 1992 and it was ratified by cabinet in 1994.	The Convention on the Biological Diversity has three main goals: Conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.
5.	UN Convention to Combat Desertification (UNCCD), 1994 Web Link: https://www.unccd.int/	Pakistan signed the Convention on 15th October 1994 and ratified it on 24 February, 1997	The UNCCD is a Convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements.
6.	Stockholm Convention on Persistent Organic Pollutants (POPs), 2004 Web Link: https://www.un.org/press/en/2004/unep204.doc.htm	The Stockholm Convention on Persistent Organic Pollutants was signed on 22 May 2001 and entered in to force on 17 May, 2004. Pakistan signed the convention on December 6, 2001	Convention seeks to protect human health and the environment from POPs as set out in Article-1, which are chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.
7.	Paris Agreement, 2015	The Paris Agreement's central goal is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below two degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even	The implementation of the proposed project will reduce the emission of greenhouse gases (GHG) due to the construction of the proposed project.



Sr. No	Agreement/Convention	Ratification	Description/Relevance
		further to one and half degrees Celsius. Additionally, the agreement aims to increase the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway.	
8.	Sustainable Development Goals (SDGs)	At the Sustainable Development Summit on 25th September 2015, UN Member States adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 SDGs to end poverty, fight inequality and injustice, and tackle climate change by 2030. Pakistan has displayed commendable commitment to the 2030 Agenda for Sustainable Development as it was one of the first countries to endorse it globally in 2015. On 16th February 2016, the Parliament unanimously approved the SDGs as the national development agenda.	The SDGs that will prevail for the proposed project are as follows: • Promote Gender Equality and Empower Women: The contractor during construction phase will be responsible to hire women for construction activities to elude gender discrimination and to promote women empowerment. • Combat HIV/AIDS Malaria and Other Diseases: Contractor will be responsible to conduct medical surveillance of the workers before hiring to combat HIV/AIDS Malaria and other diseases. • Ensure Environmental Sustainability: Contractor will be responsible to ensure environmental sustainability of the proposed Project Areas by ensuring implementation of EMP to mitigate adverse environmental impacts from construction activities during construction phase.

2.4 ADMINISTRATIVE FRAMEWORK

2.4.1 Punjab CBD Development Authority

Punjab CBD Development Authority is responsible for ensuring that the project complies with the laws and regulations and mitigations measures suggested in EIA of the proposed project for controlling the environmental and social concerns of during pre-construction, construction and operation phase, and all pre-construction requisites, such as permits and clearances are met.



2.4.2 Environmental Protection Agency, Punjab

Pakistan Environmental Protection Agency is meant for the enforcement of environmental laws in Pakistan. They have delegated powers to provincial environmental protection agencies for review, approval and monitoring of environmental examination/assessment projects. As the proposed Project also falls in Lahore District therefore Punjab-EPA will be responsible for reviewing the report, issuing environmental approval and overall/broad based monitoring of the proposed project activities.



3 DESCRIPTION OF THE PROJECT

3.1 GENERAL

This Chapter presents the detailed project description along with project cost, land acquisition, implementation schedule, workforce and water requirements, etc.

3.2 OBJECTIVES OF THE PROJECT

The main objectives of the proposed Project are:

- Reducing traffic congestion, time delays and transportation cost by diverting traffic load;
- Provide a safe, congestion free road facility to the commuters of the Project area;
- Increasing capacity of the Ada Nullah to minimize flood risks; and
- Installation of efficient drainage system to cater the future needs.

3.3 PROJECT DESCRIPTION

3.3.1 Project Administrative Jurisdiction

The proposed Project lies in the Lahore city, Punjab.

3.3.2 Project Implementation Schedule

The tentative implementation period for proposed Project is three (03) years.

3.3.3 Cost of the Project

Tentative cost of the proposed Project (Remodeling of Walton Road) is about PKRs. 16.825 Billion.

3.3.4 Salient Features of the Project

The proposed project lies in Walton area that is one of the most urbanized areas in Lahore. The project site is surrounded by residential areas on north and east of the site whereas a railway track is also passing through the above mentioned site. There are two main entrances to the site; one from Walton Road and other from Ferozepur Road.

The up-gradation of Walton road starts at Defense Chowk and ends at Ghora Chowk. A conduit system will also be installed for drainage purposes along with rehabilitation of ADA Nullah.



Existing Airport Development Authority (ADA) Nullah is carrying sewage as well as storm water from the project area, after up-gradation of ADA Nullah it only collects storm water and sewerage of project area will be collected through new conduit system.

Salient features of the proposed Project as provided below:

- Widening of existing Carriageway;
- Elevated U-Turn near Qainchi Chowk;
- Underpass at Defense Chowk;
- Construction of At-Grade Protected U-Turn (2 Nos.) near Kora Stop and near Taimur Aslam Chowk);
- Right Turning Flyover at Cheel Chowk;
- Right Turning Flyover at Ghora Chowk;
- Installation of Proposed Conduit for Drainage; and
- Up-gradation of Airport Development Authority (ADA) Nullah for Storm water Management.

Component Map of the proposed project is given as **Figure 3.1**.

3.3.5 Design Aspect

Following is the brief description of the design aspects of the proposed project. This information is based on the preliminary design data as the detailed design is under process. This information will be updated once the detailed design is completed and PC-1 is approved from the concerned authority.

3.3.6 Design Criteria

The geometric design will be carried out as per “A Policy on Geometric Design of Highways and Streets 2011” by AASHTO based on the following main parameters.

a. Right of Way (ROW)

- | | | |
|--------------------|---|-------|
| • Main Road | : | 80 ft |
| • Service Road | : | 52 ft |
| • At-Grade U-Turns | : | 25 ft |
| • Elevated U-Turns | : | 26 ft |

b. Road Cross Section:

- | | | |
|---------------|---|----------------------|
| • No of Lanes | : | 03 lane on each side |
|---------------|---|----------------------|

Cross-section of the proposed project is attached as **Figure 3.2**.

3.3.7 Codes and Standards



The following codes and standards have been considered and adopted for the design of the project road:

- Geometric Design: AASHTO
- Material & Testing: AASHTO – ASTM
- Pavement Design: AASHTO

Concept master plan of the proposed project is provided as **Figure 3.3**.

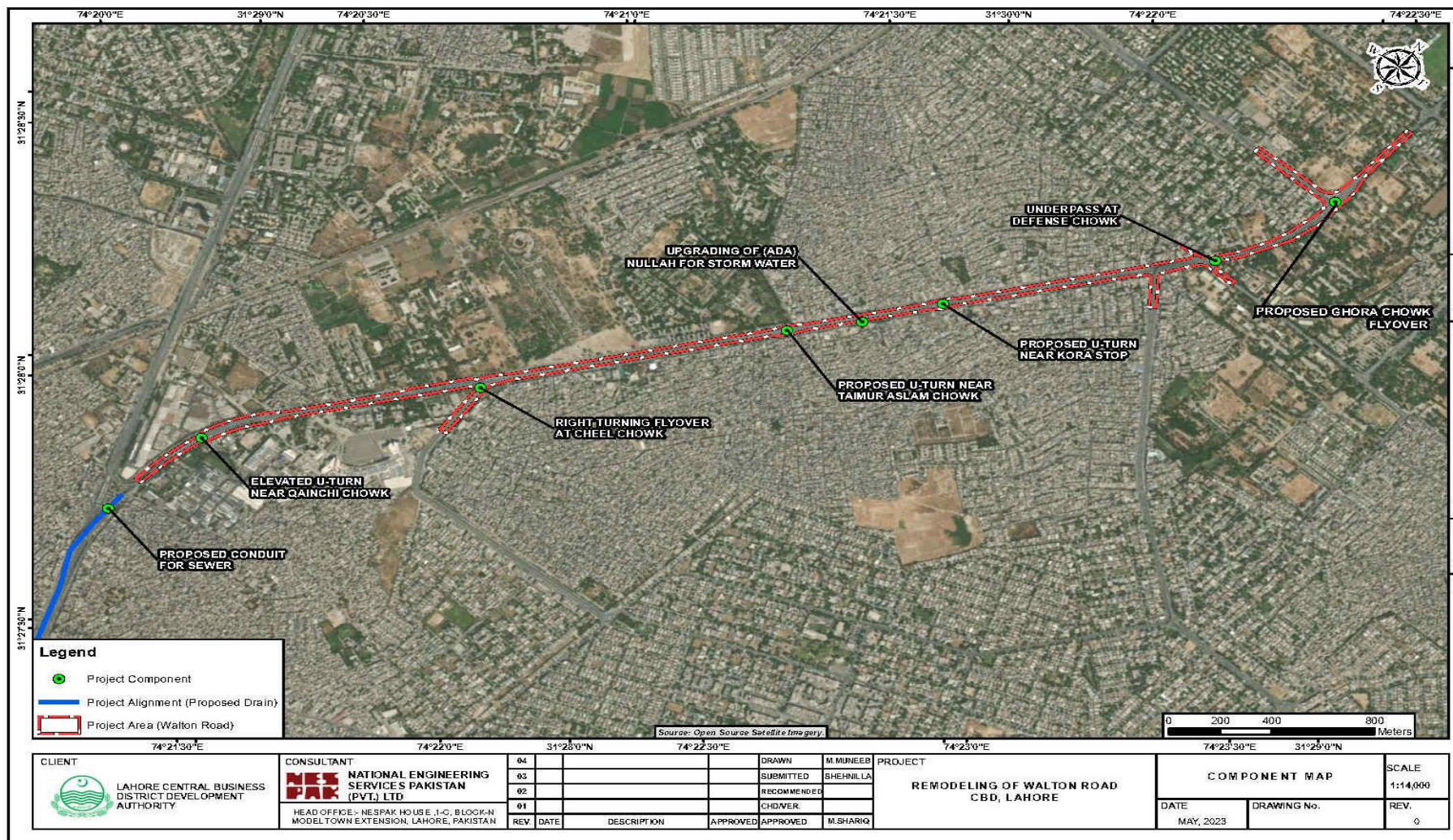


Figure 3.1: Component Map of the Proposed Project

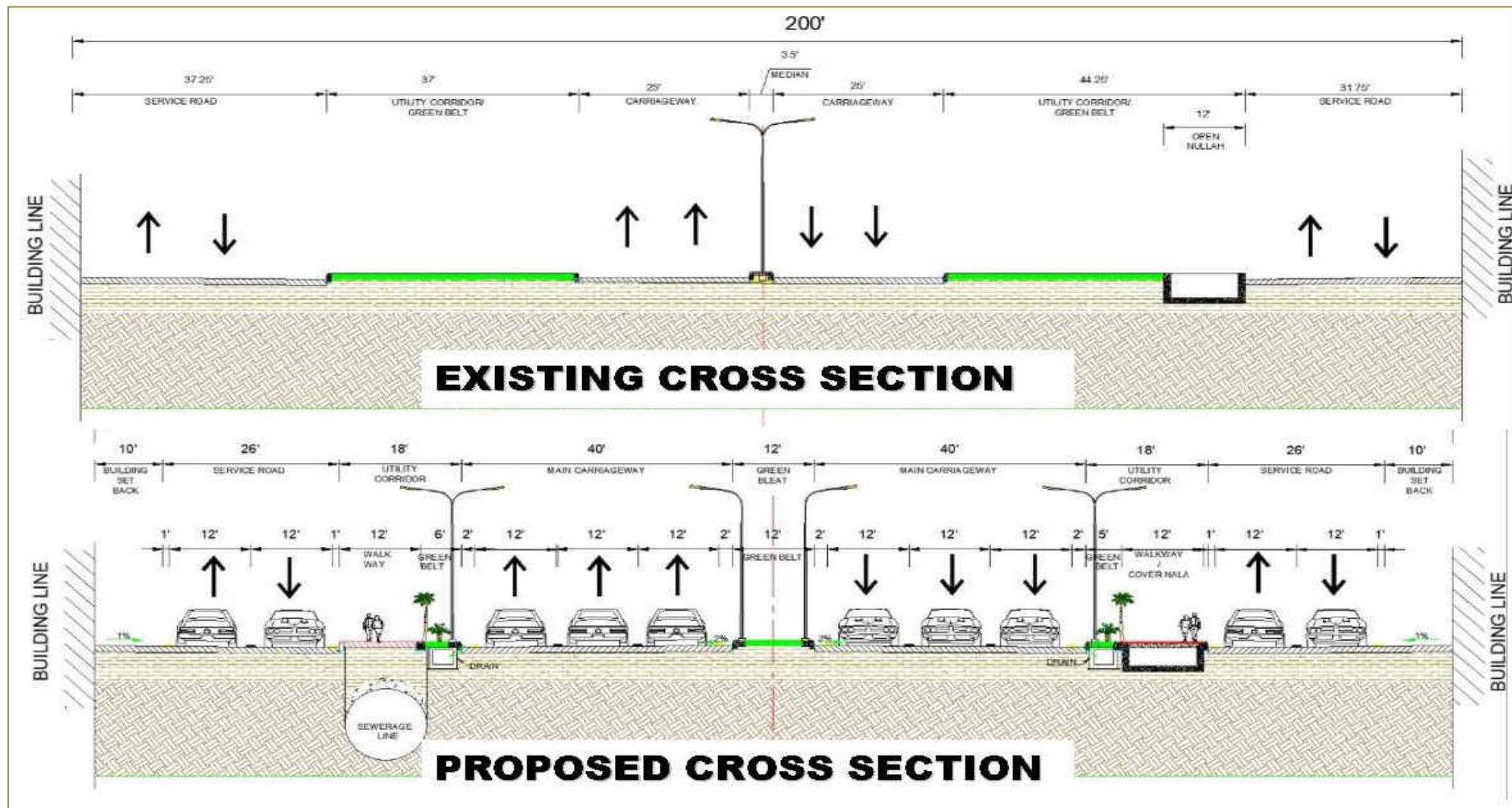


Figure 3.2 (a): Typical Cross Section of Up-gradation of Walton Road

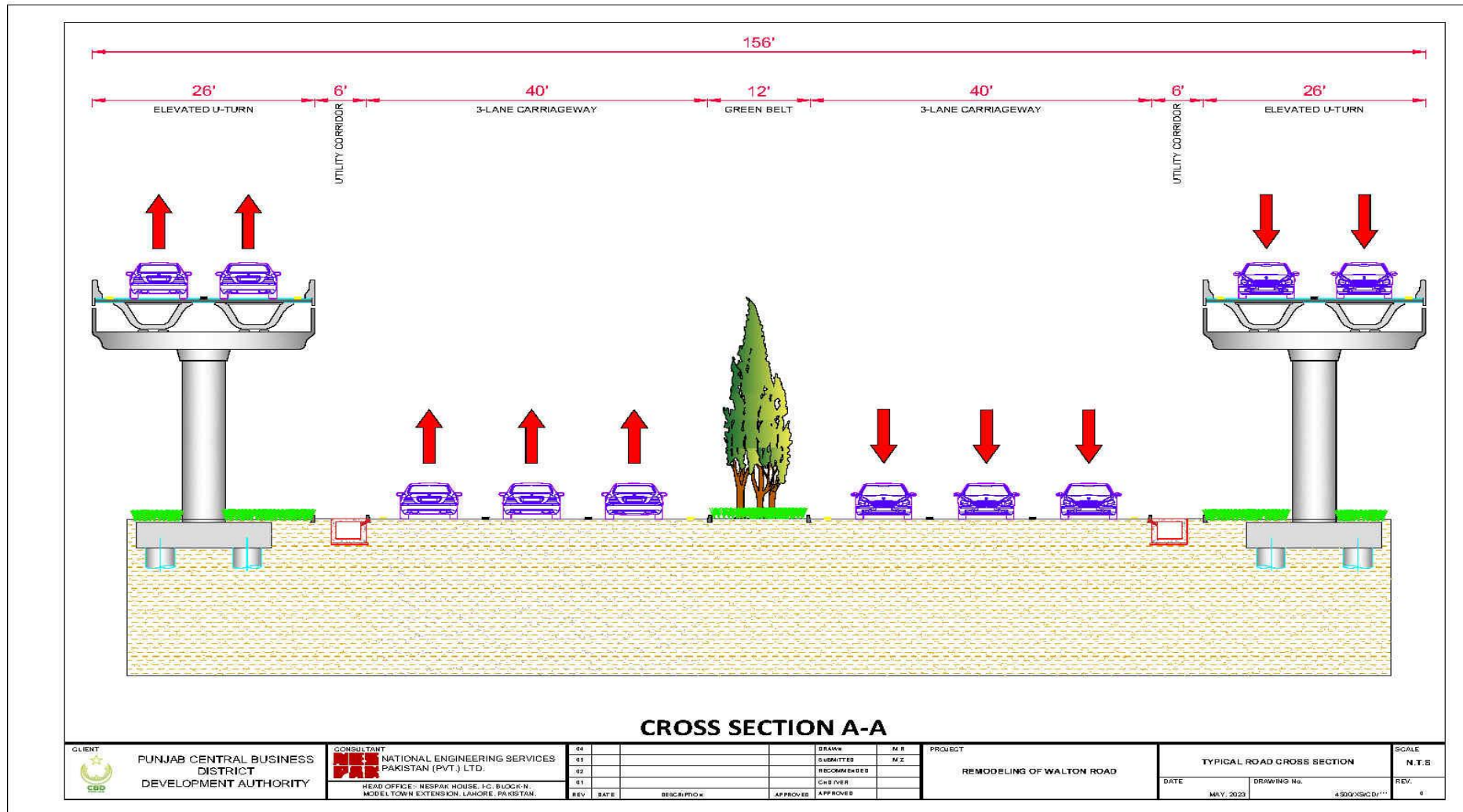


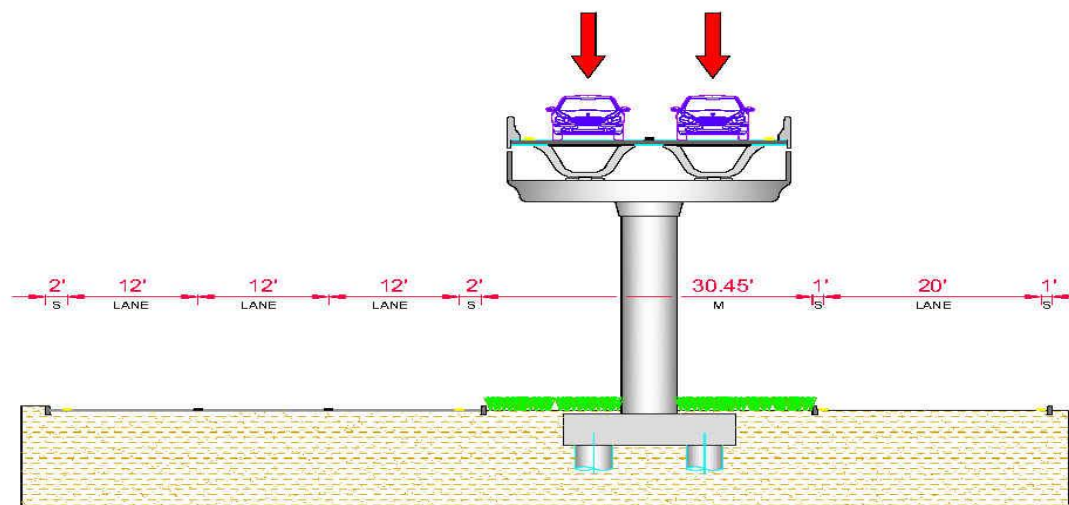
Figure 3.2 (b): Typical Cross Section of Up-gradation of Walton Road



CROSS SECTION B-B

 CLIENT PUNJAB CENTRAL BUSINESS DISTRICT DEVELOPMENT AUTHORITY	 CONSULTANT NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. HEAD OFFICE:- NESPAK HOUSE, I.C. BLOCK-N, MODEL TOWN EXTENSION, LAHORE, PAKISTAN.	04				DRAWN	M.R	PROJECT	TYPICAL ROAD CROSS SECTION		SCALE
		01				SUBMITTED	M.Z		N.T.S		
		02				RECOMMENDED					
		01				CHECKED					
		REV	DATE	DESCRIPTION	APPROVED	APPROVED					

Figure 3.2 (c): Typical Cross Section of Up-gradation of Walton Road



CROSS SECTION C-C

 CLIENT PUNJAB CENTRAL BUSINESS DISTRICT DEVELOPMENT AUTHORITY	 CONSULTANT NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. HEAD OFFICE: NESPAK HOUSE, 1-C, BLOCK N, MODEL TOWN EXTENSION, LAHORE, PAKISTAN	04				DRAWN	M R	PROJECT	REMODELING OF WALTON ROAD	TYPICAL ROAD CROSS SECTION	SCALE N.T.S.	
		01				SUBMITTED	M.Z					
		02				RECOMMENDED						
		01				CHECKED						
			REV	DATE	DESCRIPTION	APPROVED	APPROVED					
										DATE	DRAWING No.	REV.
										MAY, 2023	4500-XSC D1111	

Figure 3.2 (d): Typical Cross Section of Up-gradation of Walton Road



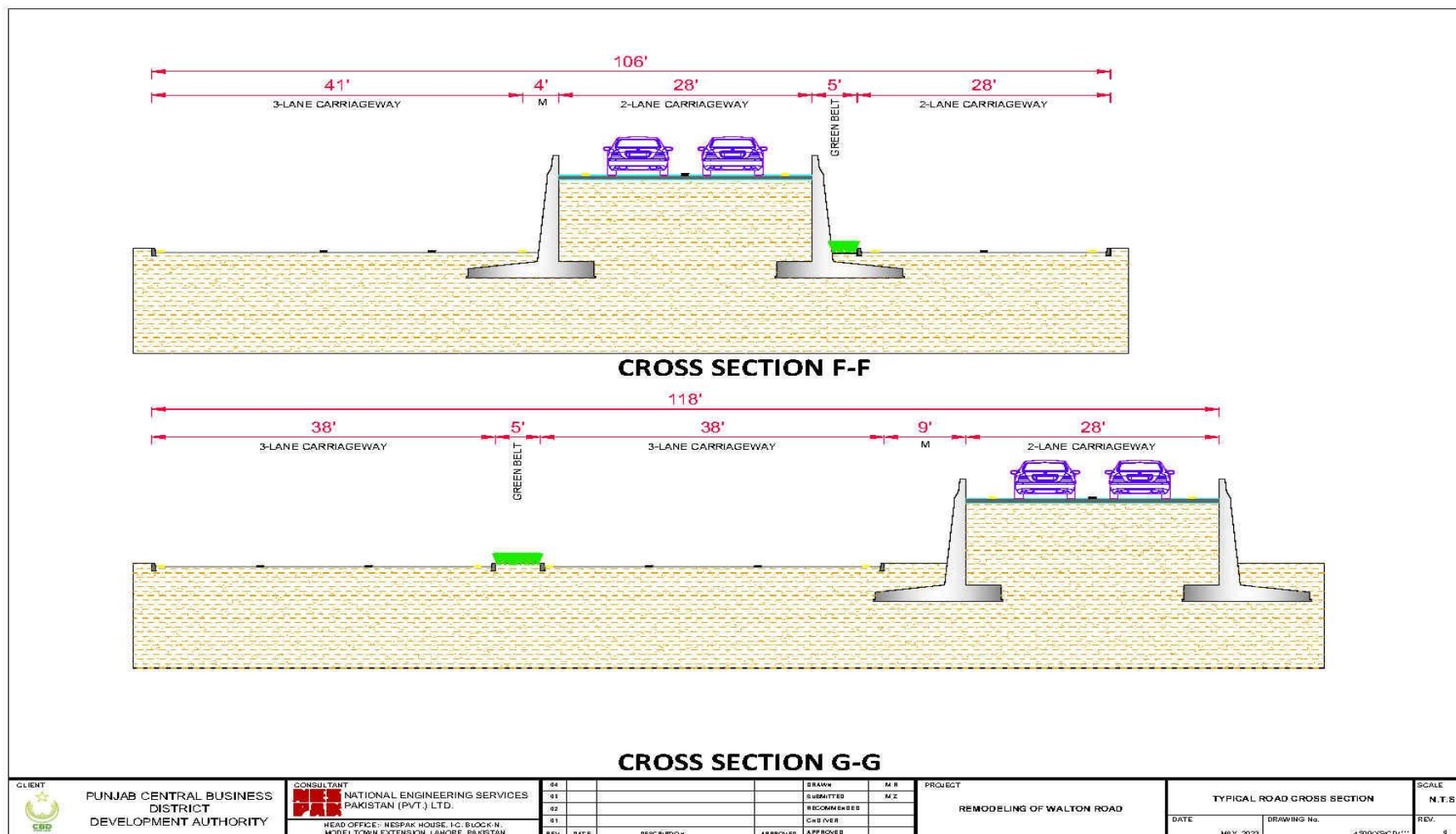


Figure 3.2 (f): Typical Cross Section of Up-gradation of Walton Road

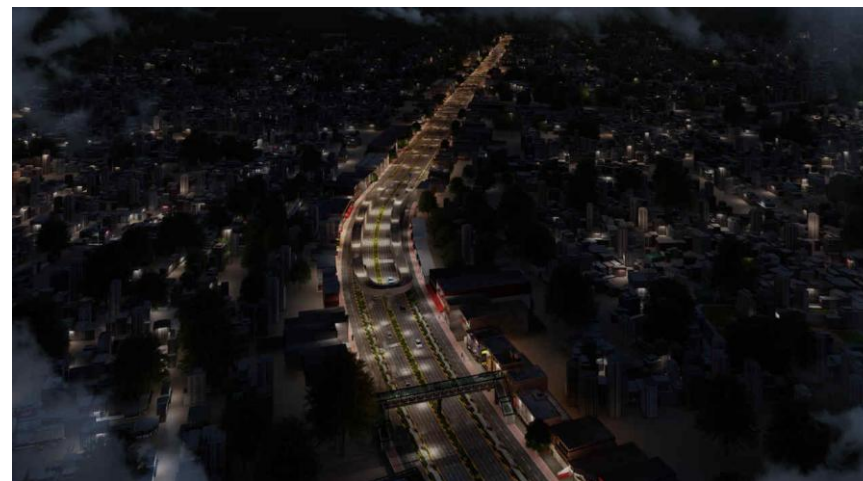


Figure 3.3: 3D View of Proposed Project



3.4 CONSTRUCTION MATERIAL

Construction materials are chosen in consideration of adaptability, feasibility and ease of maintenance. Construction material specifying the requirements of technical specifications will be used preferably which is as follows:

- Crush : Margalla
- Sand : Qibla Bandi/Lawrencepur
- Steel : Industrial Area Hattar
- Cement : Bestway, Askari, FECTO, Cherat, etc.

3.5 EXPECTED EQUIPMENT'S FOR CONSTRUCTION

The list of the machinery and the equipment expected to be used for the proposed Project are provided in **Table 3.1**.

Table 3.1: Machinery and Equipment Requirement for the Proposed Project

Sr. No.	Machinery Name	Sr. No.	Machinery Name
1	Dump Truck	12	Self-Propelled Pneumatic Roller
2	Front End Loader	13	Asphalt Distributor
3	Dozer	14	Batching Plant
4	Grader	15	Concrete Transit Truck
5	Vibratory Roller	16	Concrete Pump
6	Water Tankers	17	Excavator
7	Aggregate Spreader	18	Water Pumps
8	Three Wheel Rollers	19	Cranes
9	Tandem Roller	20	Vibrators
10	Asphalt Plant	21	Generators
11	Paver		

3.6 CONSTRUCTION CAMPS

Construction camps for the proposed Project components will be located within the premises of proposed Project.

However, if construction camp is to be located outside the project boundary, following criteria shall be adopted by the Contractor to identify and for the establishment of the construction camp sites before start of the construction:

- There should be no or minimum resettlement issues for the location of the camps;
- Camp site should be away from the residential areas and sensitive receptors;
- Selection of sites for construction camps shall be near the project area having proper access to the nearby main/link road;
- The camps must be located in a place where the drainage from and through the camps will not threaten any domestic or public water supply;
- Camp site must be adequate in size to prevent overcrowding of necessary structures;



- The camp site should consider avoiding any damage of property, vegetation, irrigation, and drinking water supply systems;
- The camp site must not be subject to periodic flooding; and
- There should not be any ecological sensitive areas e.g. wildlife sanctuaries, game reserves, national parks, forest areas, etc. near to the construction camp site.

3.7 WORKFORCE REQUIREMENTS

Manpower demand estimation is an essential component to facilitate deployment of manpower. Tentative workforce required for proposed Project during construction phase will be about 116 including workers/employees. Unskilled labor should be hired locally.

3.8 SOURCE OF WATER

Contractor will be responsible to arrange water for construction works. However, it is supposed that water tanks will be used by the contractor on the site for construction activities.

3.9 WATER REQUIREMENT

The water consumption for construction phase is estimated to be 4,640 liters/day for 116 workers during construction phase of the proposed Project.

3.10 WASTEWATER GENERATION AND TREATMENT MECHANISM

The wastewater generation is estimated to be 3,712 liters/day for 116 construction workers during construction phase of the proposed Project¹. Temporary toilets with cesspit will be adequately installed and treated periodically, and after the completion of work, the ground will be restored.

3.11 SOLID WASTE

The solid waste generation is estimated to be 52 kg/day for 116 construction workers during construction phase of the proposed Project².

3.12 POWER REQUIREMENT / POWER SOURCE

The main source of electricity/electric power during construction phase will be diesel generators for construction camps. The source of power for operation phase will be Water & Power Development Authority (WAPDA).

¹ Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain (Domestic sewage generation = 80% of water consumed/day)

² Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day.

4 DESCRIPTION OF ENVIRONMENT

4.1 GENERAL

For any development project, the prevailing environmental conditions need to be assessed prior to the stages of planning, designing and execution of the project. Identification of physical, ecological and social aspects of environment and collection of relevant data is essentially important for the evaluation of impacts as well as for the suggestion of adequate mitigation measures, which forms the basis for the implementation of the proposed Project in terms of prevailing environmental and social conditions in the study area.

The existing environmental conditions of the proposed Project have been considered within the AOI/COI (taken 25 m from Project boundary) as shown in **Figure 1.2** with respect to physical, biological and socio-economic aspects. The Study Area is selected on the basis of the Project's potential environmental and social impacts on the local resources. Information has been collected from variety of sources, including published literature, DCRs, field observations and surveys, conducted specifically for this Project have been analyzed for this study. Consultations were also held with the general public and stakeholders of the Project area in order to seek the public opinion on the implementation of the proposed Project. Survey tool used for public consultation for baseline data collection during field visit is attached as **Annex-I**.

4.2 PHYSICAL RESOURCES

The following section provides an overview of the information on physical environment of the proposed Project study area collected from primary as well as secondary sources. The major parameters covered include Physiographic and Topography, Geology, Soil, Seismicity, Climate and Meteorology, Ambient Air & Noise, Water Resources, Solid Waste, and Land Use.

4.2.1 Topography

Lahore is generally flat and slopes towards south and south-west at an average gradient of 1:3000. The general height varies from 150 to 200 meters above the mean sea level (MSL). It is divided into two parts i.e. the low-lying area along River Ravi and the comparatively upland area in the east, away from Ravi. The low lands are generally inundated by the river water during intense rainfall events.

The Project site is located within an alluvial plain, naturally flat and level having no hills and valleys. **Figure 4.1** represents the topography of the study area of the proposed Project.

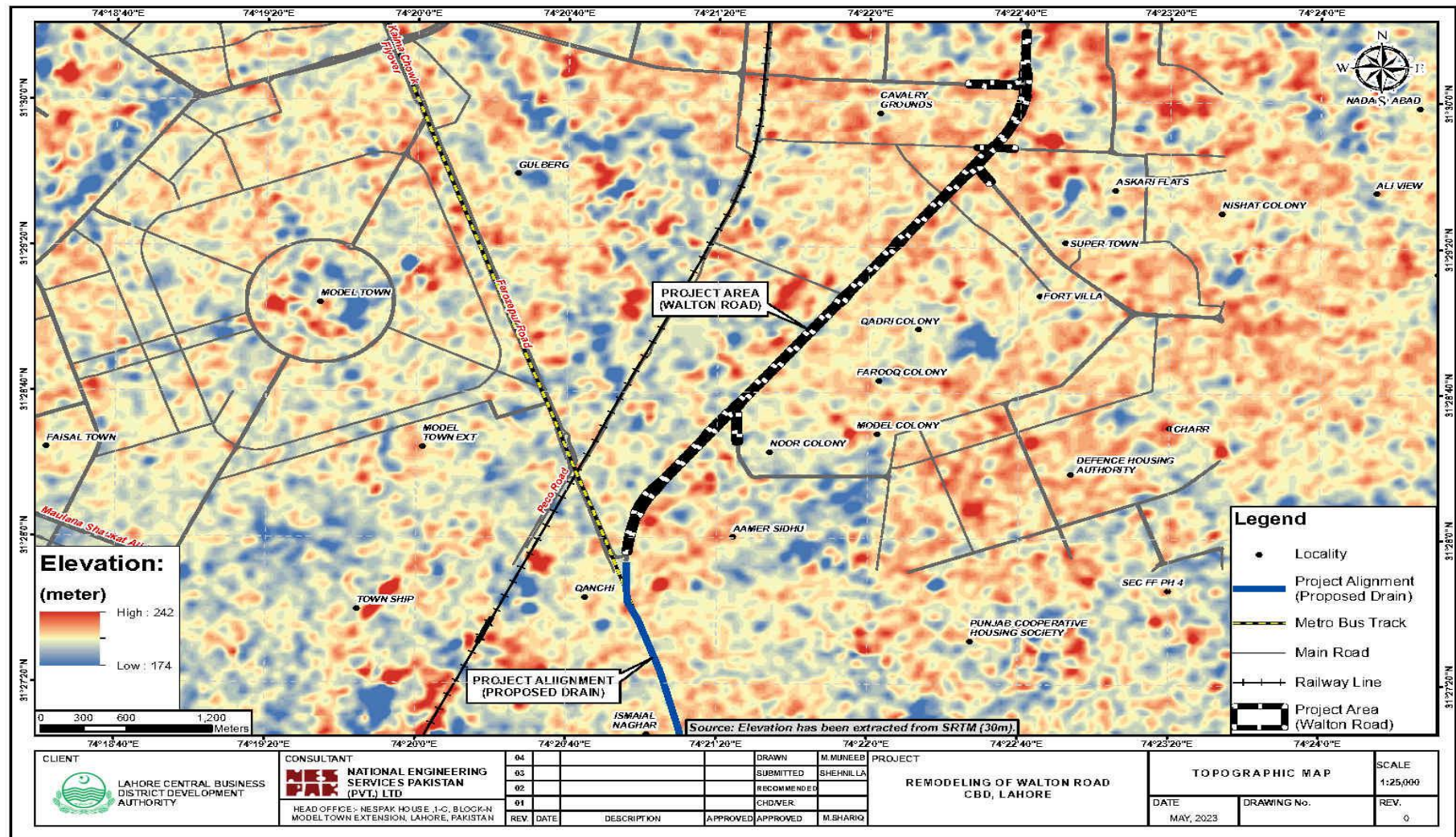


Figure 4.1: Topography Map of the Study Area

4.2.2 Geology

Lahore city lies on the alluvial plain called Bari Doab³. Doab is a local word for area between rivers. Bari Doab is a part of the Indo-Gangatic alluvial plain formed by the Indus River and its tributaries. It is bounded by Ravi and Chenab rivers in the northwest and west, and Sutlej River in the Southeast. A northeastern boundary of Doab lies near the foothills of the Himalayan Ranges.

The Bari Doab is covered by quaternary alluvium, which overlies semi-consolidated tertiary rocks or metamorphic and igneous rocks of Precambrian age. Except for a small area in the northeastern part of Doab where basement rock was encountered no information is available at present regarding the distribution of tertiary and Precambrian rocks in the Doab.

The thickness of alluvial deposits in Lahore reported to be more than 300 meter. These alluvial deposits are underlain by the basement rocks of the Indian shield. The alluvial deposits mainly consist of sands, with intercalation of silt and clay layers of varying thickness. Project site is located in meander belt deposits.

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

The only minerals worth to value are kallar and kankar⁴ in the district Lahore. Kallar is the grey powdery substance collected and taken out from the old village sites and other deserted abodes in the district. It is used for the manufacture of crude saltpeter and also as manure for the top dressing of young cotton and tobacco plants (no longer in the line of extensive cultivation). With the passage of time the demand for Kallar diminished and its use as a trading commodity is on the decline. Kankar is used for metaling Roads and its smaller particulars are burnt for lime. It is a kind of limestone gravel and is found, after being dug out at a depth varying from one to eight feet, in many parts of the district particularly the uplands. However, the Project area does not have any valuable minerals. **Figure 4.2** shows the regional geological map of the study area.

4.2.3 Soil

The soil in the Project area is cohesion less and is of alluvial type deposited by Ravi River. The types of soil layers that are present below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt and lean clay. The soil map of the study area is shown in **Figure 4.3**.

³ Kadwai, S.U. and Siraj, A. (1964), "*The Geology of Bari Doab, West Pakistan*", WAPDA Water and Soil Investigation Division (Bulletin No. 8)

⁴ Malik, A. (2015). Geotechnical statistical evaluation of Lahore Site Data and Deep Excavation Design

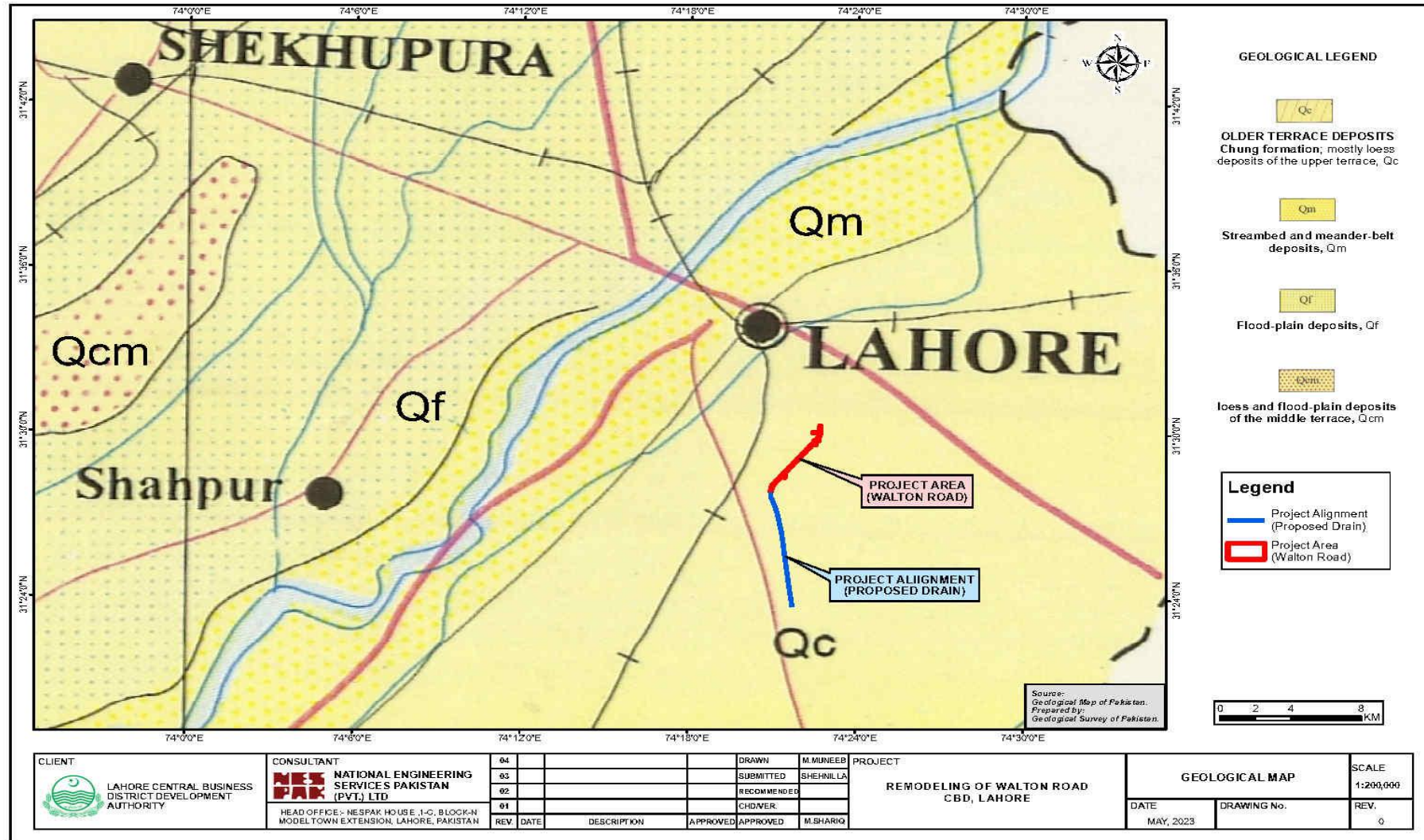




Figure 4.2: Regional Geological Map of the Study Area

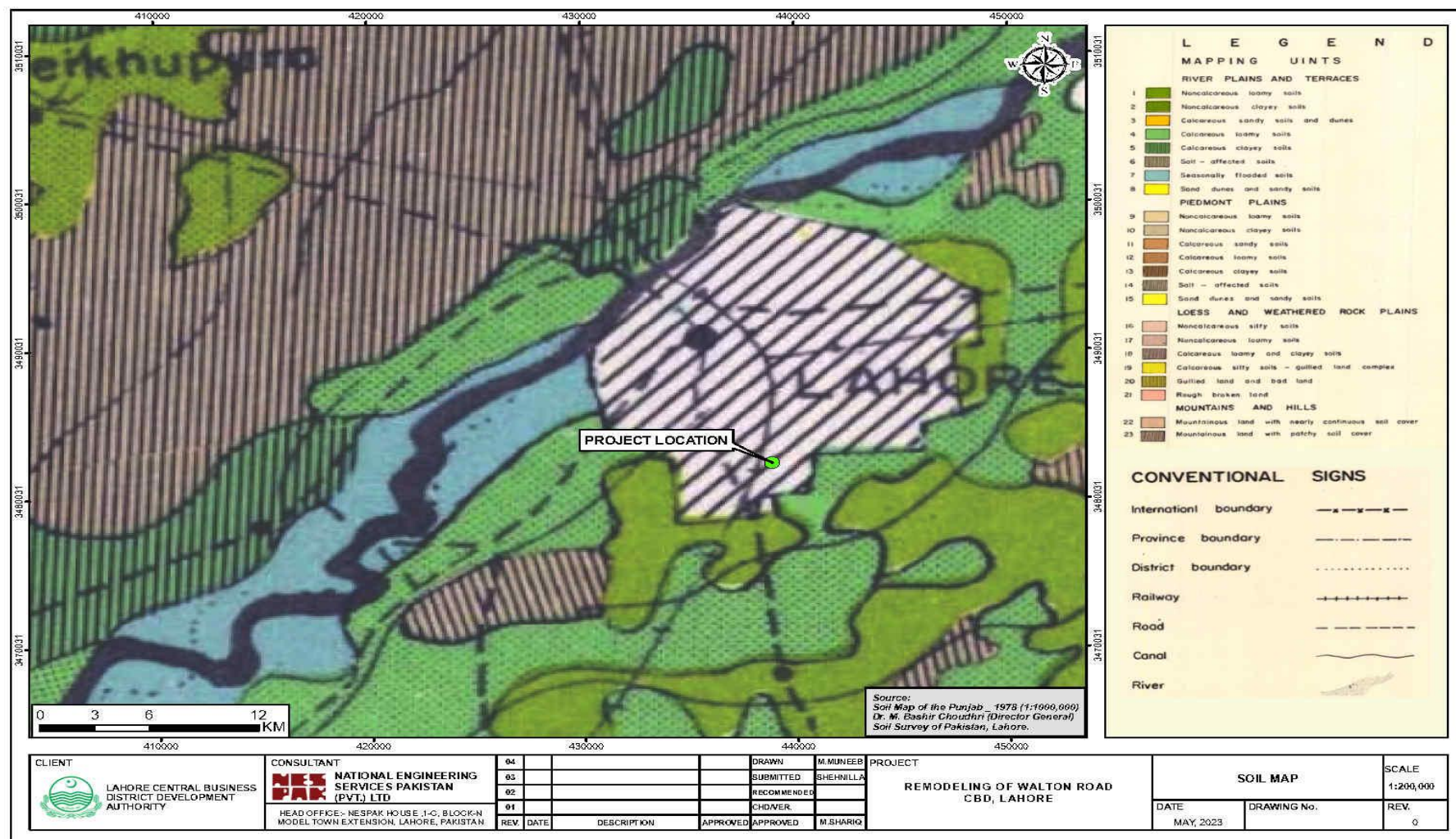


Figure 4.3: Soil Map of the Study Area

4.2.4 Seismology

The Project site falls in the Punjab plain, which has low to moderate level of seismicity. The Project region has been subjected to severe shaking in the past due to earthquakes in the Himalayas. The known main active fault of the Himalayas is the Main Boundary Thrust (MBT). The epicenters of low to moderate magnitude earthquakes, recorded in the Punjab plain are associated with the subsurface fractures in the basement rocks, which are concealed by thick alluvial deposits.

According to Building code of Pakistan 2007, the Project area falls in Seismic Zone 2A of Pakistan (low to moderate damage) with peak ground acceleration (PGA) from 0.08 to 0.16 g. **Figure 4.4** shows the seismic zoning map of the study area.

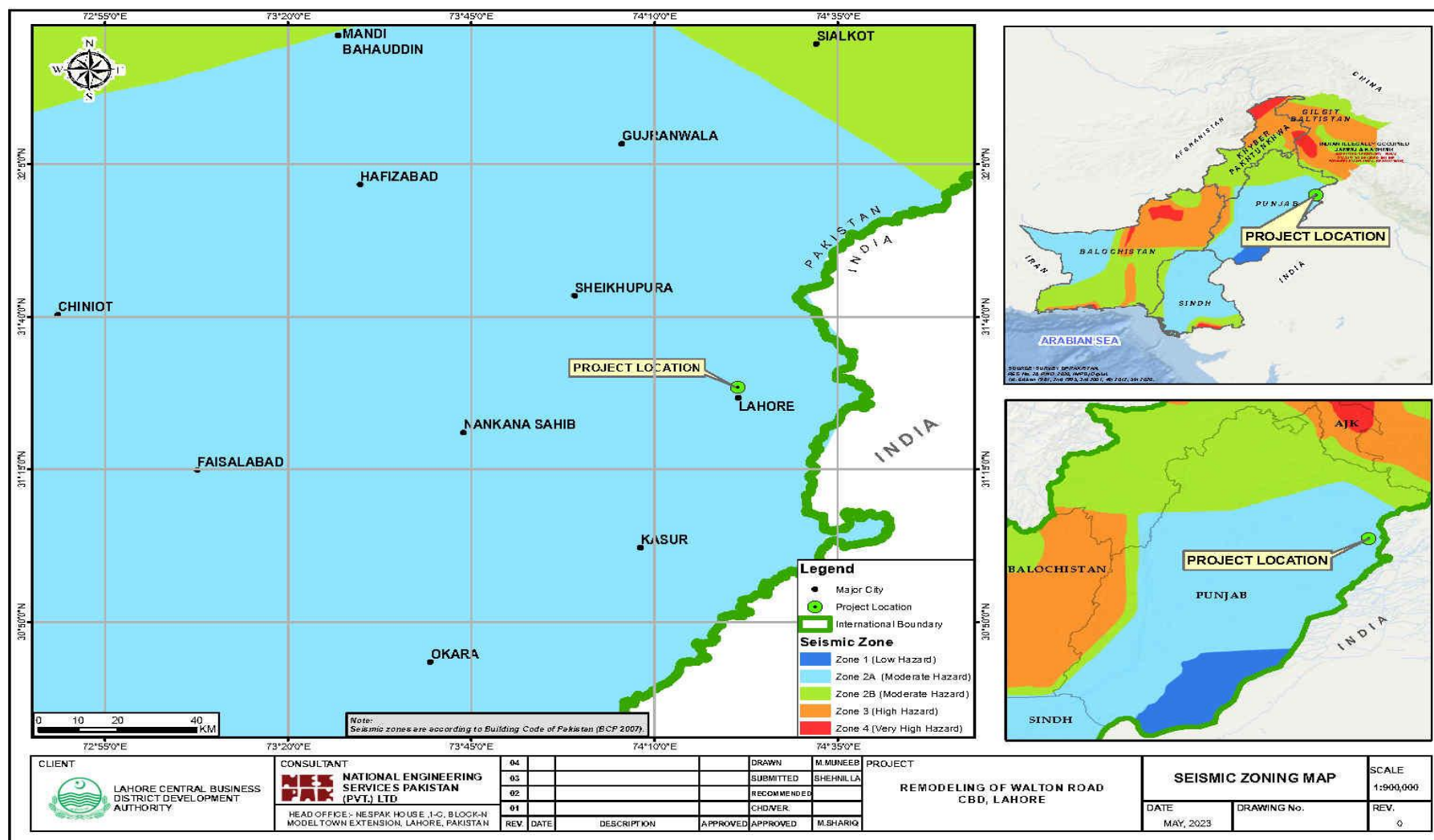


Figure 4.4: Seismic Zoning Map of the Study Area

4.2.5 Climate and Meteorology

The seasonal climatic conditions must be considered for the design and execution of the developmental projects. The climate including air, temperature, precipitation, humidity and evaporation are an influencing factor, affecting the construction of engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered.

The Project area has moderate to extreme climate conditions, with hot summers and cold winters. The summer starts from April and lasts till September, with mean minimum and maximum temperature ranges from 27°C to 47°C. The winter seasons lasts from November to March, with mean minimum and mean maximum temperature ranges from 2°C to 18°C.⁵

The Project area receives rains in all the seasons but monsoon rain is pronounced and constitutes a definite rainy season between the month of July and September. The average rainfall is about 1,172 mm per year.

Based on climatic elements, following five seasons are recognized in the Project area i.e.:

Pre-monsoon Season: Pre-monsoon refers to the period from April to June prior to the setting in of the monsoon. This is the hottest and the driest season, with persistent dry and hot winds. Day time temperature rises to 47°C. The flows in the rivers begin to rise simultaneously due to snow-melt water in the high mountains. The water table falls to the maximum depth.

Monsoon Season: Monsoon is the main rainy period, which starts at the beginning of July, reaches its climax in August and gradually, subsides in September. The intense rainfall events cause soil erosion, which is a function of erosivity and erodibility. The cool monsoon winds followed by heavy showers lower the temperature to great extent. The part of rain percolates into the soil and is conserved in the subsoil, and adds to the groundwater. The conserved moisture in the soils is generally sufficient to rejuvenate the vegetation. All plants grow rapidly and mature towards the end of the season. With the start of monsoon season, the rivers flow at their peak level. The groundwater level is improved toward the end of the season in September and October.

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

Winter Season: Winter refers to the period from December to January. The lowest temperature is less than 2°C, and cold winds characterize this season. The plants become dormant and most of them dry out. Most of the trees shed their leaves and few remain green or partly green.

⁵Meteorological Data for Lahore (1981-2010), Pakistan Meteorological Department.

Sometimes this season becomes severe due to cold Siberian winds. Groundwater level declines in this season due to low flows in the rivers, and no or little rains, which usually fall in light showers causing little soil erosion.

Spring Season: Spring refers to the period from February to March. Temperatures become pleasant. The mean maximum temperature is 24.5°C. Some light showers of rain may also fall without generating run off. The vegetation sprouts again because of conserved moisture from winter and spring rains (if any), and the water table starts falling.

Temperature, precipitation, relative humidity, evaporation, wind speed and wind direction of the study area (District Lahore) is discussed below.

4.2.5.1 Temperature

Table 4.1 and **4.2** shows mean minimal and maximal temperatures observed for each month between year 2010 to 2020 in the study area. The highest temperature measured is 47°C in June, 2014, and the lowest temperature was observed in December, 2020 i.e. 7°C.

Table 4.1: Mean Maximum Temperatures (°C) between 2010 and 2020⁶

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2010	24	25	36	42	45	46	42	28	37	36	31	25
2011	22	23	31	37	44	44	40	36	35	34	30	25
2012	19	20	29	35	42	46	45	38	37	36	30	24
2013	22	22	31	37	44	46	43	38	40	36	29	25
2014	22	23	28	36	41	47	44	42	36	35	29	22
2015	22	26	28	6	43	42	39	39	38	36	30	24
2016	24	28	31	37	43	45	41	40	40	39	32	28
2017	21	27	31	40	44	43	41	41	41	39	30	26
2018	25	27	33	38	43	44	40	40	39	36	30	24
2019	20	22	27	38	41	45	41	39	39	36	28	22
2020	18	25	27	36	41	45	44	40	41	38	28	23

Table 4.2: Mean Minimal Temperatures (°C) between 2010 and 2020⁷

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2010	9	11	18	24	28	30	30	28	25	23	17	11
2011	8	10	15	20	29	32	31	27	26	23	19	13
2012	7	8	14	22	28	33	33	29	26	23	18	13
2013	9	11	15	22	30	34	33	28	27	25	17	13
2014	9	9	14	22	28	34	32	3	26	23	17	10

⁶ Meteorological Data for Lahore (2010-2020)

⁷ Meteorological Data for Lahore (2010-2020) - <https://www.worldweatheronline.com/gujrat-weather-averages/punjab/pk.aspx>

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2015	9	12	15	23	30	33	31	30	26	25	18	13
2016	10	12	16	23	31	34	32	30	28	24	18	14
2017	9	11	15	24	30	32	32	31	29	26	20	16
2018	13	14	19	25	31	35	32	31	28	25	20	14
2019	11	12	16	26	30	34	31	29	27	24	19	13
2020	10	13	16	24	30	35	34	31	30	26	18	14

Figure 4.5 shows the graphical presentation of mean temperatures in the Study Area for the year 2010-2020.

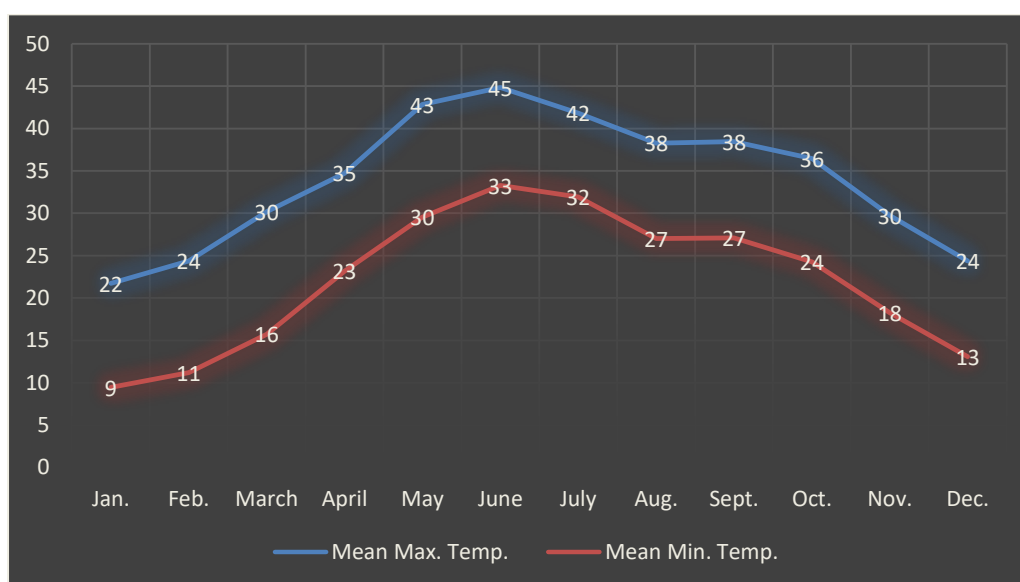


Figure 4.5: Mean Maximum and Minimum Temperature in the Study Area (2010-2020))

4.2.5.2 Precipitation (Rainfall)

Table 4.3 shows mean monthly precipitation observed in the study area from 2010 to 2020 with an annual average rainfall of 409.2 mm. **Figure 4.6** shows the mean monthly precipitation in the study area for the year 2010-2020.

Table 4.3: Mean Monthly Precipitation (2010-2020)⁸

Month	Precipitation (mm)
January	19.7
February	31.2
March	28.3
April	18.5

⁸ Meteorological Data for Lahore (2010-2020)

Month	Precipitation (mm)
May	21.6
June	42.7
July	70.2
August	83.2
September	77.9
October	3.8
November	5.2
December	6.9
Annual	409.2

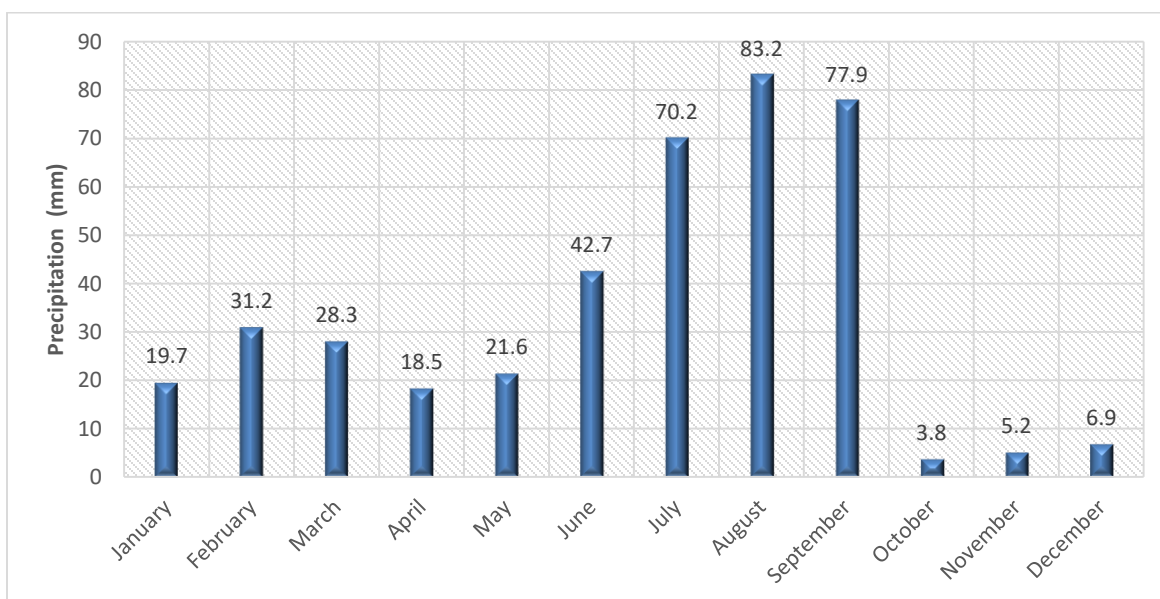


Figure 4.6: Average Precipitation in the Study Area (2010-2020)

4.2.5.3 Relative Humidity

A mean daily data of humidity on a monthly basis from 2010 to 2020 is shown in **Table 4.4** and **Figure 4.7**.

Table 4.4: Mean Relative Humidity (%) in the Study Area (2010-2020)⁹

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2010	49	53	40	20	18	20	44	63	61	44	28	32
2011	50	64	49	34	25	34	47	68	68	41	36	32
2012	59	59	51	39	20	17	35	58	54	32	27	40
2013	47	68	52	26	16	25	38	59	45	39	27	36
2014	51	61	52	31	24	20	34	40	58	38	27	33

⁹ Meteorological Data for Lahore (2010-2020)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2015	48	47	53	33	16	24	44	49	39	30	26	29
2016	43	37	42	23	21	25	42	44	35	21	19	27
2017	53	45	36	21	20	29	40	39	30	18	24	27
2018	32	38	30	25	17	28	43	47	45	25	25	27
2019	45	63	51	27	19	20	46	54	51	34	41	39
2020	59	47	57	33	24	22	34	53	38	16	24	35

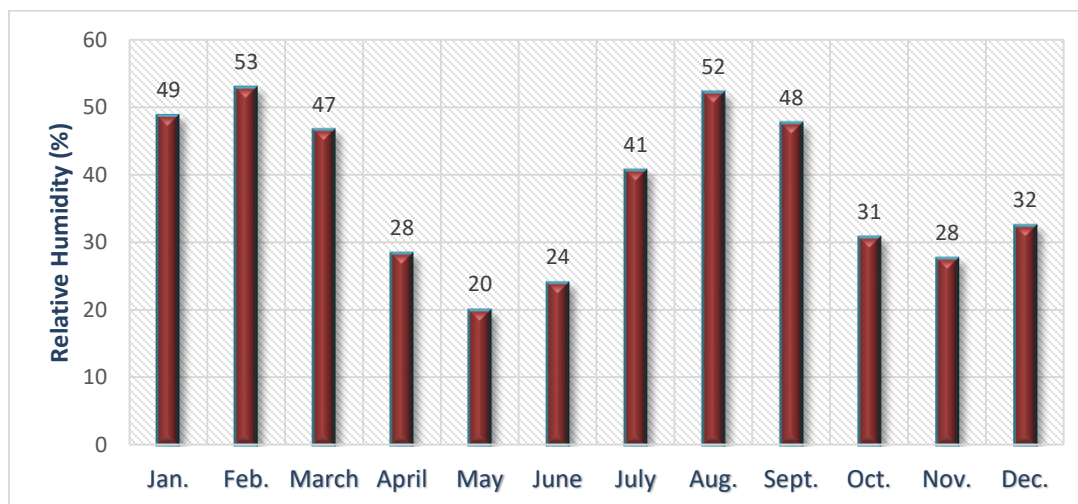


Figure 4.7: Mean Relative Humidity in the Study Area (2010-2020)

4.2.5.4 Wind Speed and Wind Gust

Table 4.5 and Figure 4.8 depicts average wind speed on a monthly basis in the study area from year 2010 to 2020.

Table 4.5: Mean Wind Speed (Km/h) in the Study Area (2010-2020)¹⁰

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2010	7	8.5	7.5	8.4	8.7	7	8	6.4	5.7	5.3	6.6	6.7
2011	7.2	8.3	8.2	8.3	8.2	8.4	6.8	6.9	5.1	5.6	6.1	6.3
2012	7.3	9.5	8.9	8	8.6	7.2	6.8	6.4	5.4	5.5	7	8.4
2013	7.4	9.2	8	8.4	8.6	7	7.3	6.6	5.4	5.1	7.4	7.4
2014	7.4	7.3	8.8	8.9	7.8	7.5	6.6	5.8	5.6	5.8	7.6	7
2015	7.3	9.5	8.7	9.7	9.2	8.9	9.8	8.2	7.3	6.7	7.6	7.4
2016	6.5	8.2	9.9	10.9	10.3	9.4	7.7	6.8	7	5.6	6.9	6.3
2017	7.4	8.1	8.1	10.3	8.6	8.7	7.9	7.4	5.3	5	4.7	6.2
2018	5.9	6.9	7.9	9.2	10	9.4	8.3	8.5	7.5	5.8	6.9	5.2
2019	6.6	7.2	8.1	9.3	9.2	10.3	11.9	9.9	11.4	7.5	6.9	4.9

¹⁰ Meteorological Data for Lahore (2010-2020)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2020	6.7	7.7	9.8	9.8	11.8	10.6	9.9	10.3	7.4	6.1	7	7.1

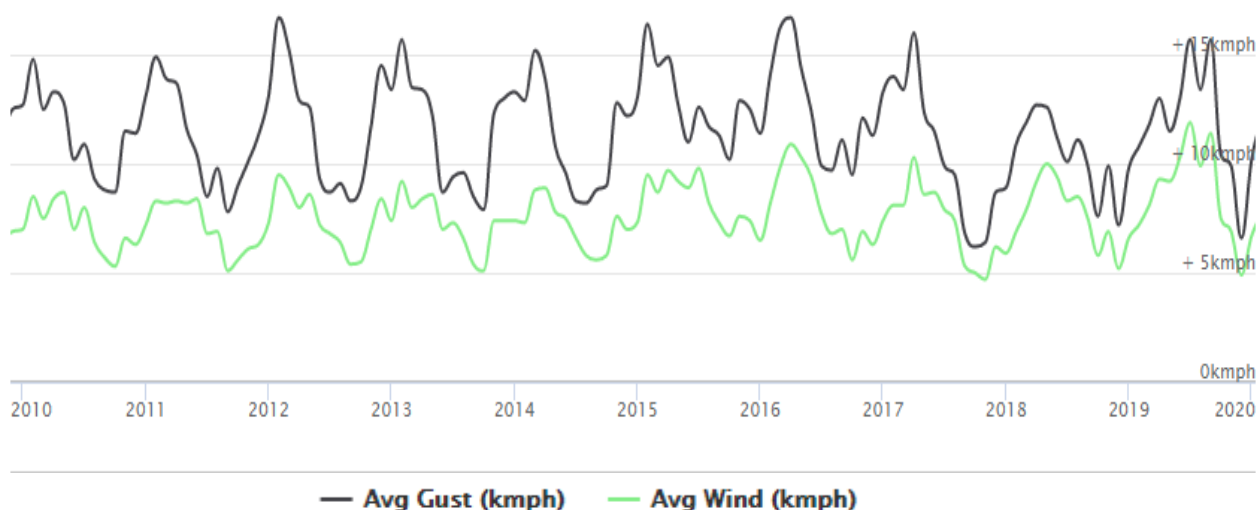


Figure 4.8: Average Wind Speed and Gust in the Study Area from 2010 to 2020

4.2.6 Ground Water

Presently main clean water source in Lahore is ground water that meets all the requirements including domestic, industrial and commercial, which is being extracted through tube wells installed in the city at about 600 ft. depth.

In the study area, Walton Cantonment Board maintains a wide network of about 489,600 rft pipelines of water supply providing water for the residents of Walton Cantonment. WCB have maintained 91 Tube wells in Walton Cantt area and 51 water filtration plants has been installed for provision of pure and hygienic water to the residents of Cantt area. All filtration plants are functional and well maintained. Average daily water supply to Walton Cantonment is about 36.41 MGD in contrast of 34.14 MGD of total daily demand.¹¹

4.2.7 Surface Water Hydrology

The main surface water resources in the Lahore city are Ravi River, Lahore Branch Canal, Khaira Distributary and the Bambawali Ravi Bedian Depalpur (BRBD) canal.

¹¹ <http://wcb.gov.pk/en//water>

4.2.7.1 Ravi River

The Ravi River is a trans-boundary river crossing north western India and eastern Pakistan. It is one of six rivers of the Indus system in Punjab region. The Ravi River having a total length of about 720 kilometers flows across the city of Lahore. However, besides monsoon season the river is mostly dry due to the fact that water is diverted in India for irrigation and domestic purposes. In the past, River Ravi was the main source for recharge of groundwater aquifer, but due to increasing water demand and diversion of its water in India, it can no longer meet the required aquifer recharge of Lahore city. The quality of water of Ravi River has a direct impact on quality of water present in the adjacent aquifer.

4.2.7.2 BRBD Canal

BRBD canal flows in the east of Lahore, from North to South. It crosses Grand Trunk Road, at a distance of about 6 kilometers, from Lahore Ring Road. The Canal takes off from Upper Chenab Canal (UCC) at Bambanwala, itself off takes from Marala Barrage with full discharge. The BRBD is about 175-kilometers long. It is an earthen channel except a short lined central segment. Although design capacity at head is 7,260 cusecs, the maximum discharge is around 4,600 cusecs. Among others, one of the reasons of limiting discharge to 4,600 cusecs is the limited design capacity of Syphon for crossing of River Ravi. The Canal is brick lined from RD 260 to RD 373 and crosses the River Ravi and GT road at RDs 281 and 325¹² respectively.

4.2.7.3 Lahore Branch Canal

The other surface water source is the Lahore Branch Canal (LBC), which takes off from BRBD canal at about RD 230. It is an open channel with lining at both sides. Due to its limited discharge of about 400 cusecs, this canal cannot be considered as surface water source for Lahore, even to draw 100 cusec discharge.

4.2.7.4 Khaira Distributary

This water source lies in the south of Lahore and it also takes off from BRBD canal, and flows from east to west, its flow is even less than the Lahore Branch Canal.

Figure 4.9 shows the Surface Water Resources Map of the study area.

4.2.8 Drainage

There are total eight (08) major drains in the Lahore city i.e. Sattu Kattla drain, Lakshami Drain, Suk Nehar Drain, Upper Chota Ravi Drain, Lower Chota Ravi Drain, Siddique Pura Drain, Cantonment Drain and Shahdara Drain along with 76 minor drains which finally fall into

¹² Final Feasibility Study Report on Lahore Water and Wastewater Management Project-February, 2019

aforementioned major drains. At present, all these drains collect wastewater from different areas of Lahore and finally fall into River Ravi and greatly deteriorated the quality of river water.

The nearest drain close to the Project area is the Sattu Kattla and Ferozepur drains in which minor drains of the Project area falls. **Figure 4.9** shows the major drains in the study area.

4.2.9 Solid Waste

The Project area lies in administrative jurisdiction of Cantonment Board and Walton Cantonment Board (WCB) and responsible to ensure efficient collection, transportation, recovery, treatment and disposal of waste generated in the study area. The Cantonment Board renders following Sanitation services throughout the Cantonment Area:

- Manual sweeping of road and streets;
- Provision of collection points/receptacles/bin;
- Transfer of collection/swept wastes to rubbish points;
- Loading transportation of solid waste;
- Cleaning of main nallahs/drains;
- Final disposal of solid waste; and
- Dog shooting.

The total waste generated in conservancy area of WCB is about 659 tons/day approx. (including green waste building material, debris and animal waste), out of which, 554 tons/day collected through conservancy Contractor and 105 tons/day was collected through Cantt. Board Vehicles. There are total 317 waste collection points in the study area that are being operated under Cantonment Board¹³.

¹³ <http://wcb.gov.pk/en//garbage>

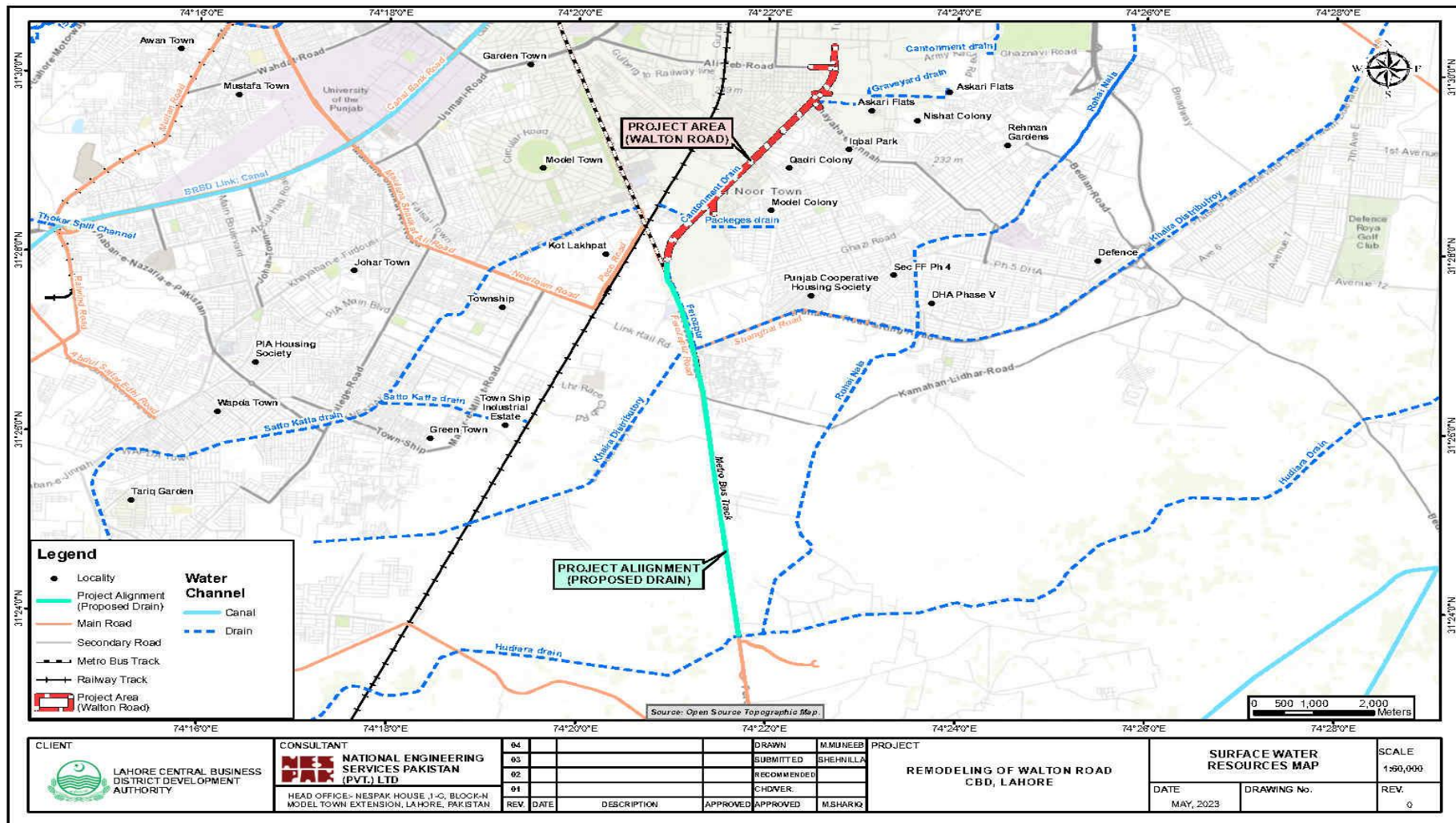


Figure 4.9: Surface Water Resources Map of the Study Area

4.3 ENVIRONMENTAL MONITORING

The environmental monitoring of parameters like ambient air quality, noise level, surface water and groundwater help us to analyze the prevailing environment conditions in and around the study area, and to protect it from any adverse activities due to the proposed Project implementation.

The environmental parameters for ambient air, noise level, surface water and groundwater were monitored/sampled at different locations of the proposed Project site in May, 2023 for establishing the baseline profile of the Study Area.

The sampling locations of the above mentioned parameters are shown in **Figure 4.10**. Environmental monitoring reports are attached as **Annex-II**.

4.4 LAND USE PATTERN

The land use of the study area is mainly a barren land and built-up area. The built-up area primarily includes shops, mosques, shrines, graveyards, offices, health, and educational institutes. A considerable area is covered with trees and shrubs. **Table 4.6** depicts land use cover of the Project area. The land use map of the proposed Project site is shown in **Figure 4.11**. Pictorial views of current land use provided in **Plate 4.1**.

Table 4.6: Land Use Type

Land Use Type	Area (Acres)
Up-gradation of Walton Road	
Built Up	22.33
Foot Path	0.30
Green Belt	13.68
Nullah	3.67
Park	0.77
Road	67.53
Barren Land	19.57
Proposed Conduit	
Flyover	0.12
Green Belt	0.31
Metro Station	0.30
Metro Track	15.16
Road	22.50
Barren Land	0.21



Plate 4.1: Current Land Use of the Project Area

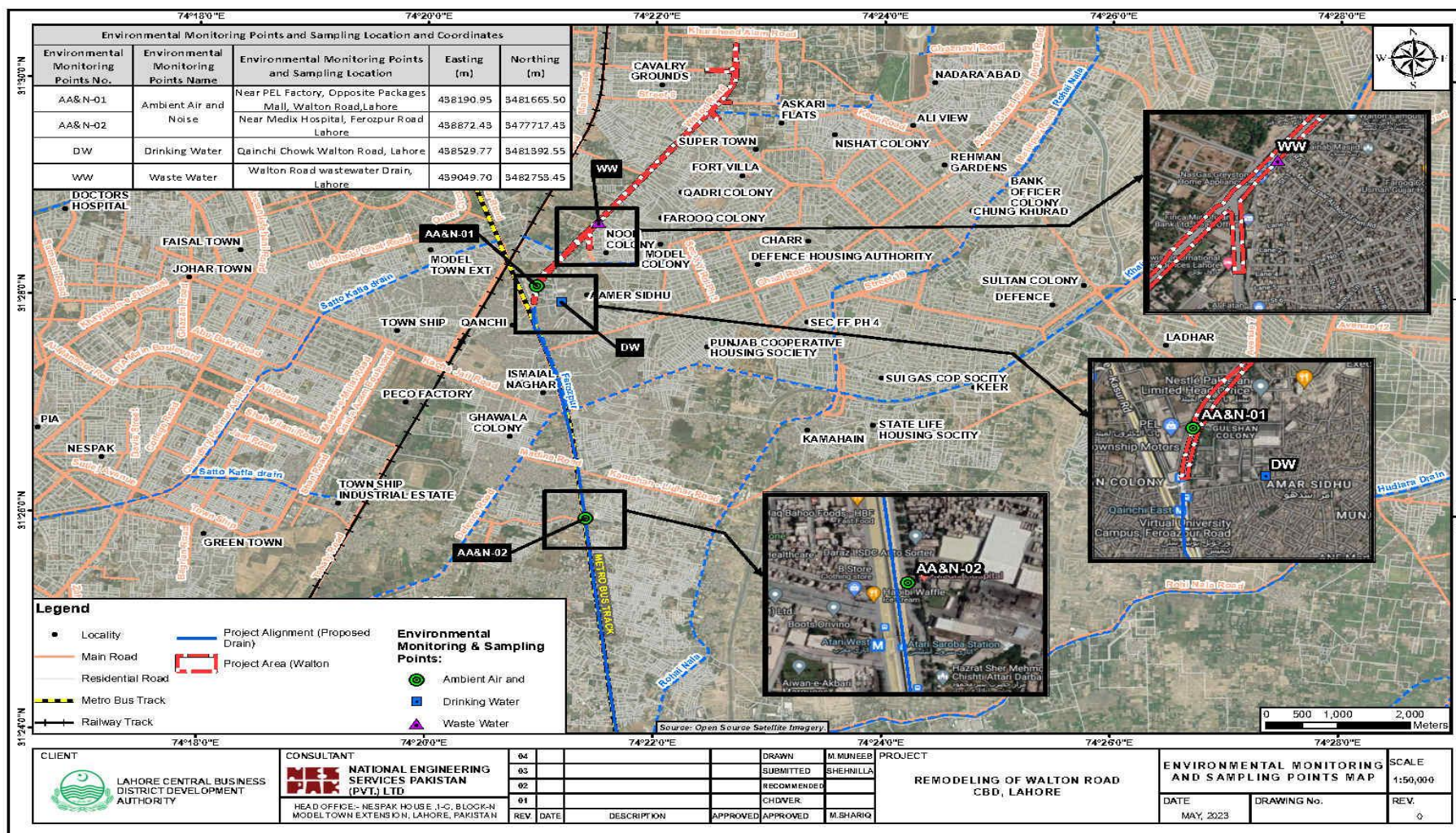


Figure 4.10: Environmental Monitoring Map of the Study Area

4.5 ENVIRONMENTAL SENSITIVE RECEPTORS

Sensitive receptors are mainly people or other organisms that may have a significantly increased sensitivity and exposure to the pollutants and social disturbance, due to the developmental projects. Thus, sensitive receptors are necessary to be identified, to evaluate the potential impacts of the proposed Project on public health and the surrounding environment.

The sensitive receptors identified for the proposed project within AOI/COI are: health and educational institutions, Bab-e-Pakistan Foundation Stone and religious places (mosques, shrines and graveyard) as shown in **Figure 4.12**. They are prone to sensitivity during construction phase, due to emission of air pollutants, noise and vibration, temporary edifice of construction camps and mobilization issues.

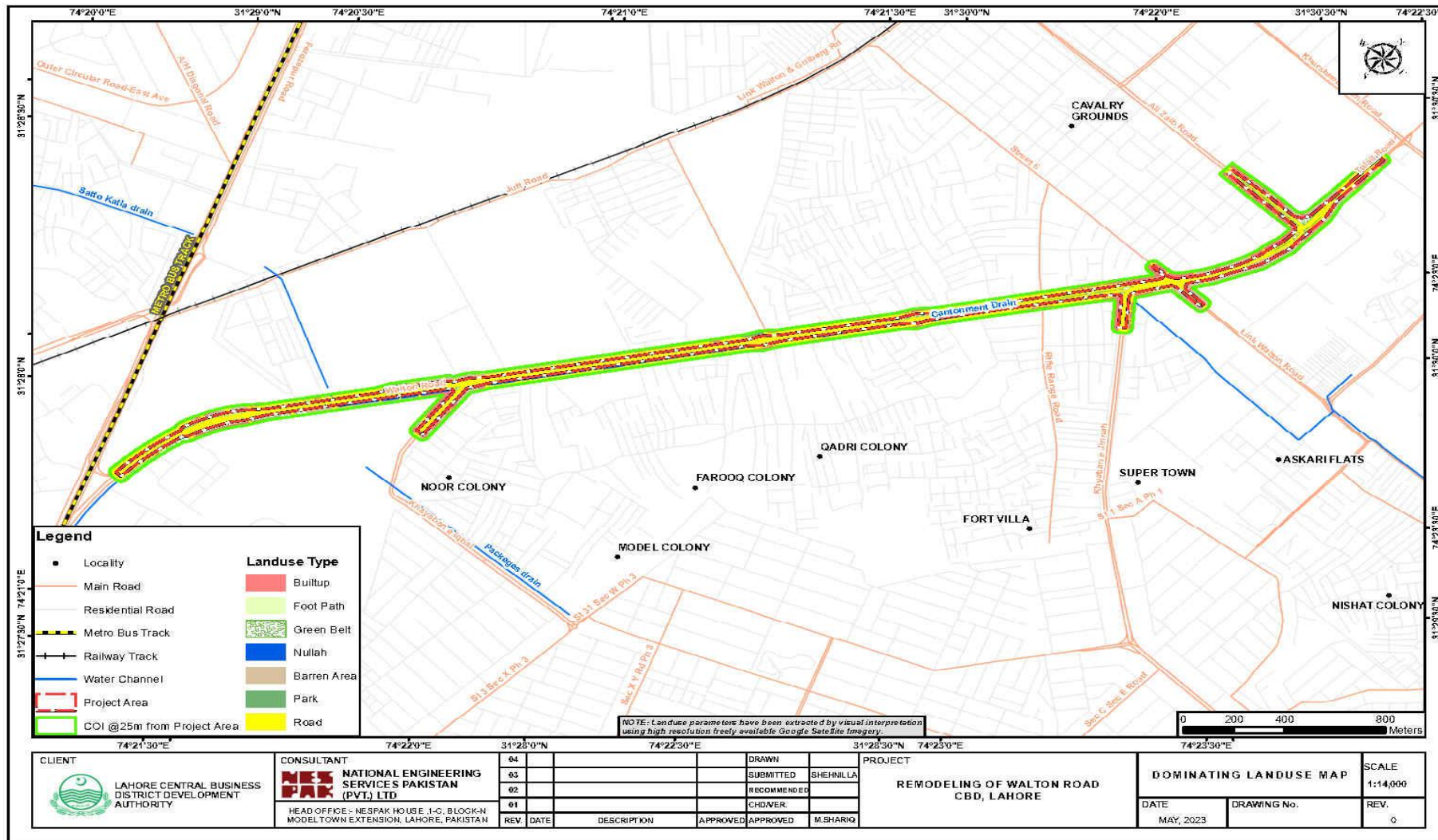


Figure 4.11 (A): Land Use Map of the Walton Road

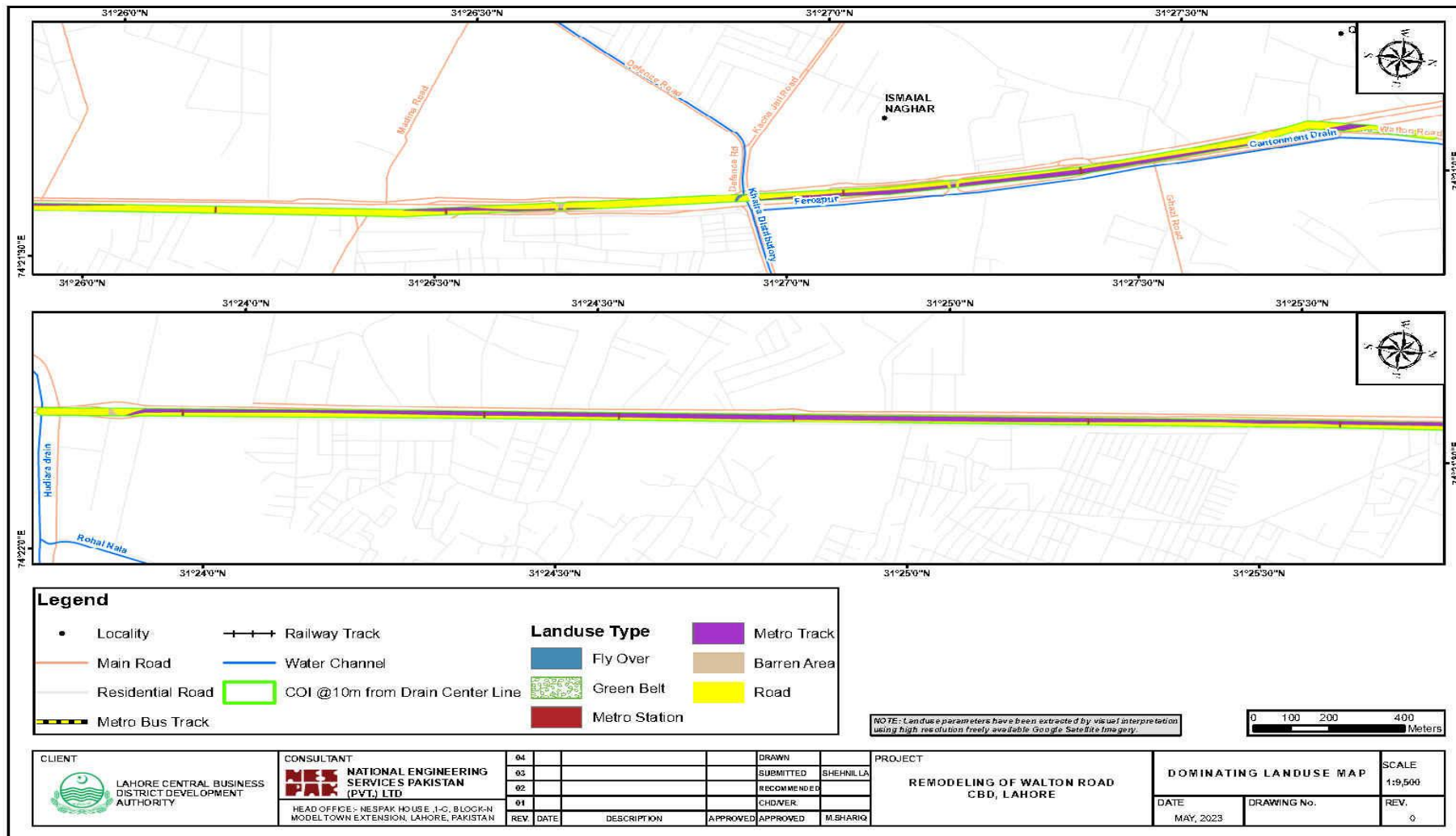


Figure 4.11 (B): Land Use Map of the Proposed Conduit

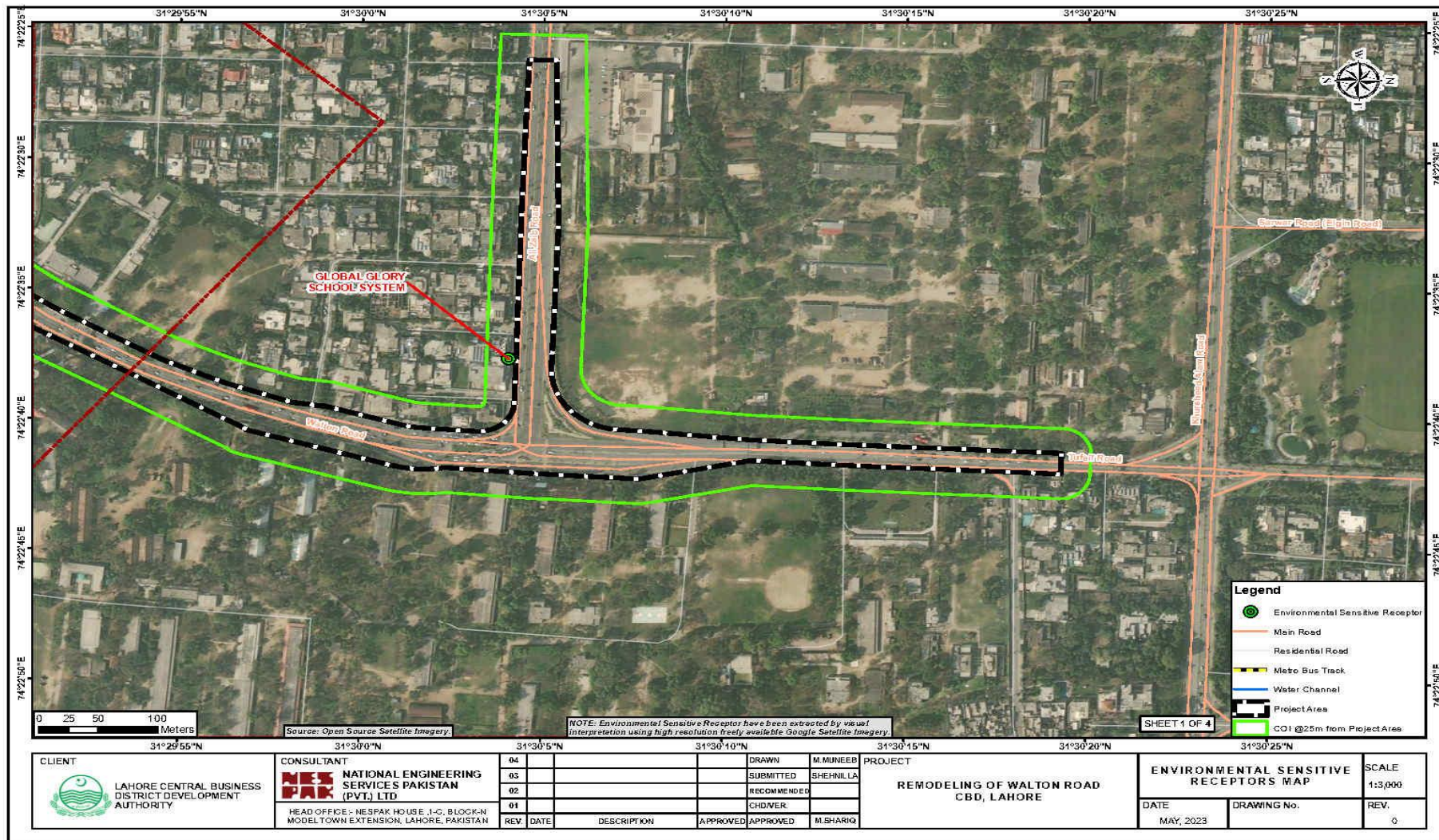


Figure 4.12(A): Sensitive Receptor Map of the Study Area

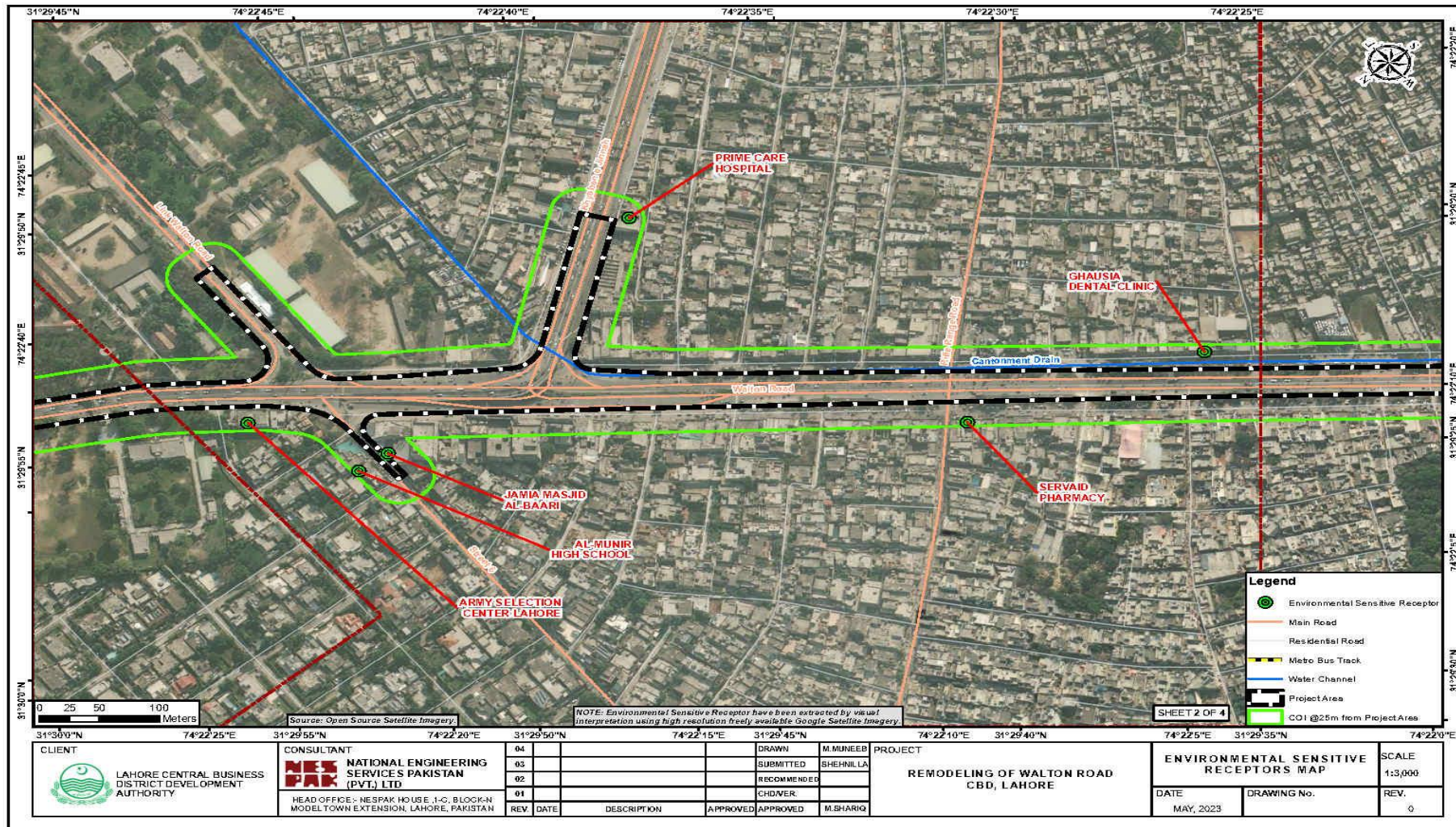


Figure 4.12(B): Sensitive Receptor Map of the Study Area

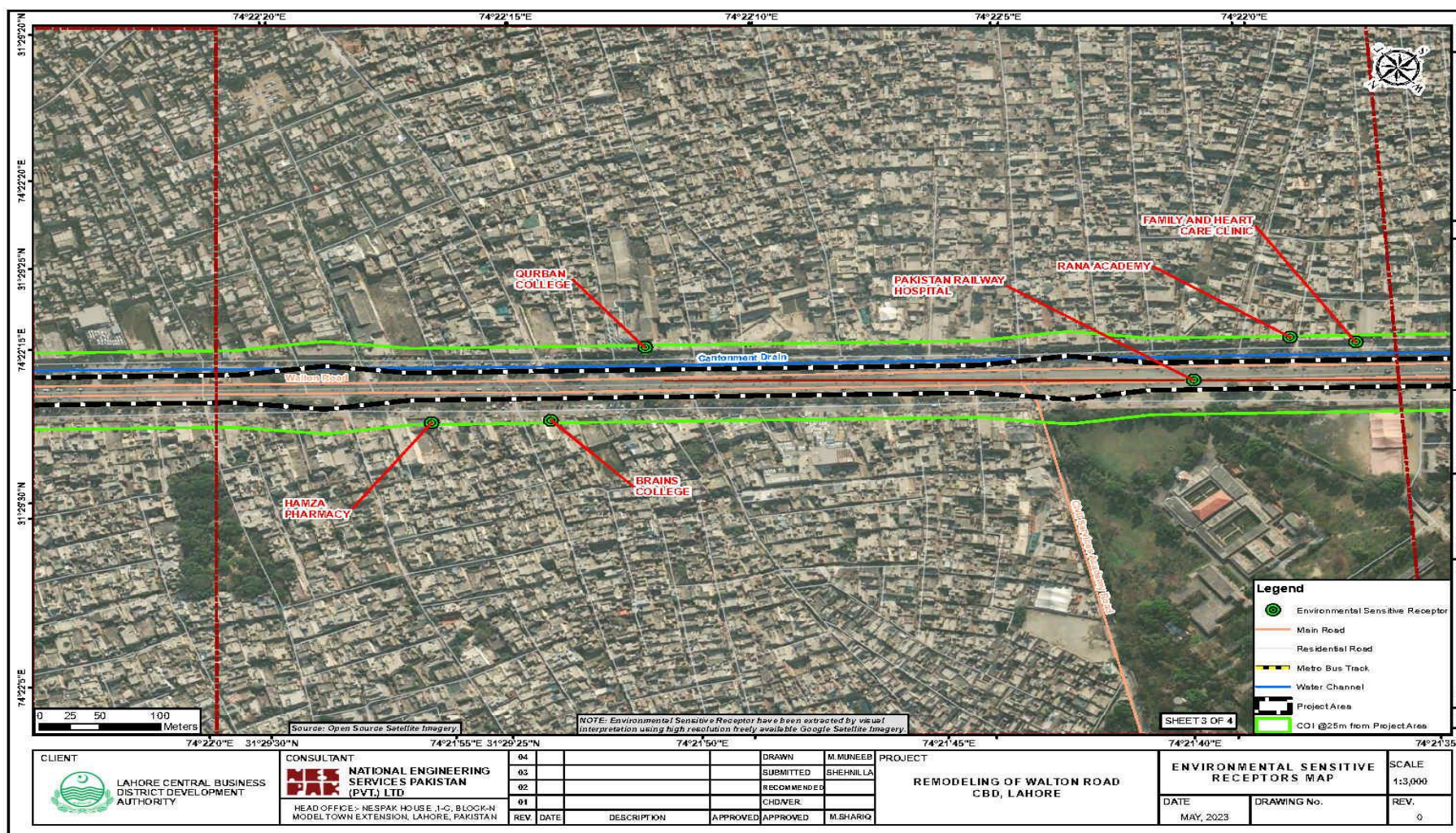


Figure 4.12(C): Sensitive Receptor Map of the Study Area

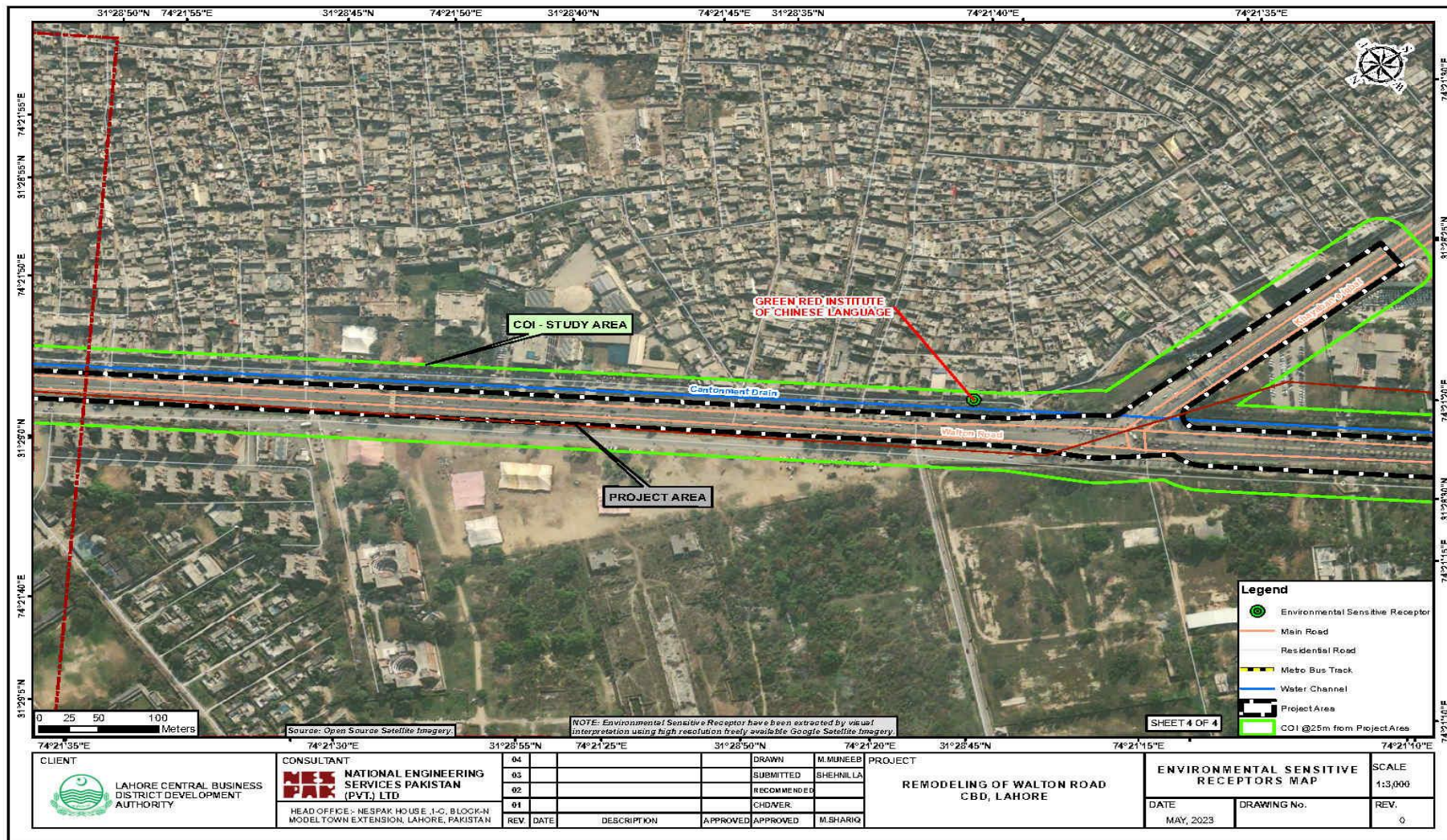


Figure 4.12(D): Sensitive Receptor Map of the Study Area



4.6 ECOLOGICAL RESOURCES

Ecological study of the area has been conducted using standard ecological assessment technique based on primary and secondary information and inclusion of additional information collected during site visit, discussion and meetings with groups of communities/public living in and around Project area coupled with expert visual observations. Following is the description of the baseline ecological environment of the area.

The climate of the area tends to have hot and sometimes extremely hot summers and mild warm winters. The soils are very fertile therefore, climate supports variety of agricultural crops and vegetables, with scare growth of indigenous flora and grasses. The proposed Project is situated in semi-arid region. The region is characterized by dry climate both in summer and winter season. The water precipitation is in the form of occasional seasonal rains, during rainy season (July – September).

As climate of Lahore is semi-arid and subtropical, the vegetation of the area falls under scrub, dry, tropical thorn forest type as per phyto-geographical classification of the area. Due to rapid increase in the population of the city and to cater for its public utility buildings, housing and commercial requirements, these agricultural lands were converted into public buildings, business centers, educational institutions and housing colonies.

4.6.1 Flora

The Project area is under intense pressure of anthropogenic factors which is damaging the local area ecosystem with pace from last many decades. This particular area has been accessible to humans for a long time resulting in low diversity and wildlife abundance. Some of the broad leaved trees exist in the area and these species still survive the on-slaught of urbanization. Some may be found in remote barren areas or in graveyards only. There is probably little natural vegetation left in tract. Natural vegetation of the Lahore region is falling under tropical thorn forest type, but no such designated forest is reported in the Project area and has long ago been replaced completely by weeds and trees.

The study area has a variety of trees. Some of the principal trees, shrubs (plants) and herbs (ground covering plants) of the Project area are given below in **Table 4.7**, which illustrates their nomenclature including local names, English names and Botanical names.

Table 4.7: Inventory of Trees Present in Lahore District

Sr. No.	Common Name	Scientific Name
1	Shisham	<i>Dalbergia sissoo</i>
2	Eucalyptus	<i>Eucalyptus camaldulensis</i>
3	Bakain	<i>Melia azedarach</i>
4	Neem	<i>Azadirachta indica</i>
5	Sirris	<i>Albizia lebbe</i>
6	Jaman	<i>Syzygium cumini</i>
7	Pipal (Sacred Fig)	<i>Ficus religiosa</i>
8	Ber	<i>Ziziphus mauritiana</i>
9	Banyan	<i>Ficus bengalensis</i>
10	Alstonia	<i>Alstonia scholaris</i>

Sr. No.	Common Name	Scientific Name
11	Toot (Mulbery)	<i>Morus alba</i>
12	Kikar	<i>Acacia modesta</i>
13	Bottle Brush	<i>Callistemon lanceolatus</i>

Source: Site Survey & Topographical survey, 2023

These trees are mostly of medium size and some mature with a girth between 4' to 6'.

4.6.1.1 Natural Shrubs and Herbs

Shrubs and herbs existing in the open and non-developed areas include Calatropis (calatropisprocera), Bhang (cannabis sativa) and Bathu (Chenopodium species).

4.6.1.2 Grasses

The Project site is at present partially covered with Khabbal grass, while Kana grass (Saccharummunja) also exists, along the depressions, where water accumulation occurs.

Some of the pictorial views of flora of the project area are provided in **Plate 4.2**.



Plate 4.2: Pictorial Views of Flora in the Project Area



4.6.2 Fauna

4.6.2.1 Mammals

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

4.6.2.2 Reptiles

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

4.6.2.3 Amphibians

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

4.6.2.4 Birds

House sparrow (*Passer domesticus*), House crow (*Corvussplendens*) and Mynah (*Acredotherestrictis*) are the most common in the area. In addition, following birds have also been observed in the area.

- Nightingale (*Pycnontuscafer*)
- Parrot (*Psittaculakrameri*)
- Pigeon (*Columba livia*)
- Hoopoe (*Upupa epops*)

There are no endangered species of flora and fauna in the study area.

4.6.2.5 Wildlife Sanctuaries and Game Reserves

No wildlife sanctuary or game reserve is located in the vicinity of the study area.

4.6.2.6 Critical Habitats

No critical habitat exists near the Project area or the study area and therefore it can be stated that this Project does not affect any critical habitat.

4.7 SOCIO-ECONOMIC ENVIRONMENT

This section deals with the social conditions of the Project Area. During the desk/ office study, available reports/ documents were comprehensively studied. During the field visit different stakeholders were consulted i.e. residents, shopkeepers, communities and



relevant departments. Observations were taken after giving due consideration to the desk/office study results.

4.7.1 Data/Information Source

For the socioeconomic baseline information, both primary and secondary sources of data were used.

4.7.2 Secondary Data

Secondary data collected by exploring the relevant documents. Common sources of secondary data for the study include censuses, information collected by government departments, organizational records and data that was originally collected for other research purposes. In this EIA Report, secondary data was derived from District Census Report Lahore, 1998 and Pakistan Bureau of Statistics (Census 2017) for socioeconomic baseline survey.

4.7.3 Primary Data

In addition, to the review of secondary data, field visits of the proposed Project were conducted to assess the impact assessment and local communities were also consulted to obtain their views and concerns about the Project.

4.7.4 Location of Lahore City and the Project area

Location of Lahore City is bounded on the North and West by Sheikhpura District, on the east by India and on the south Kasur District. River Ravi flows on the northern side of Lahore. Total land area of the city is 404 sq. Km. Altitude of the city lies between 31-15 and 31-45 North latitudes and 74-01 and 74-39 East longitude. The Project lies in the Walton area and the nearby settlement is Ghausia Colony.

4.7.5 Political and Administrative Setup

The Project area falls in the administrative jurisdiction of District Lahore. In district Lahore, Commissioner is the highest ranked administrator of the district. For the collection of revenue and administration, the district is subdivided into Tehsils. Local governments also administer the area through Union Councils and Tehsils. The total area of the District Lahore is 1,772 square kilometers.

4.8 DEMOGRAPHIC CHARACTERISTICS OF PROJECT AREA

The total population of Lahore District was 6,340,114 as enumerated in March 1998 with an intercensal percentage increase of 78.3 since March 1981 when it was 3,544,942 souls. The average annual growth rate of population in the district during intercensal period 1998-2017 was 3 percent. The total area of the district is 1,772 square kilometers which gives population density of 3,566 persons per square kilometer as against 2,000 persons observed



in 1981 indicating a fast growth rate of the district. Afterwards, massive efforts are made by Government of Pakistan to count the latest population. Census Bureau carried out latest census and released the latest statistics of 2017. The annual growth rate is 3.0% and the population of District Lahore is estimated as 11,126,285 persons out of which 5,824,131 were male and 5,300,931 were female. Sex ratio is measured as 109.87 percent. **Table 4.8** gives Households, Population Increase, Sex Ratio and Growth Rates of Lahore District, for the year of 2017.

Table 4.8: Households, Population Increase, Sex Ratio and Growth Rates in Lahore

Households	Population-2017				Population 1998	Sex Ratio 2017	1998-2017 Average Annual Growth Rate
	Male	Female	Transgender	All Sexes			
1,757,691	5,824,131	5,300,931	1,223	11,126,285	6,340,114	109.87	3.00

Source: Pakistan Bureau of Statistics (Census 2017)

The sex ratio is an important demographic indicator, which is defined as the “number of males per hundred females”. According to census 2017, Sex ratio is measured as 109.87 percent. Lahore is a young city with over 40% of its inhabitants below the age of 15. The average life expectancy stands at less than 60 years of age.

4.8.1 Rural and Urban Distributions

According to Census of 2017, the district Lahore falls 100% in the urban area with **1,757,691** number of households.

4.8.2 Migration

The total number of life time in-migrants in Lahore district was 1,034,848 or 16.4 percent of the population of the district. Out of total, 71.7 percent district migrants came from other districts of the Punjab, 10.1 percent were from Sindh, KPK and Baluchistan, 1.3 percent from Azad Kashmir and Northern Areas while remaining 16.9 percent were Pakistanis who repatriated from other countries. **Table 4.9** shows life time in-migrants with their decomposition by place of origin, and place of settlement in rural and urban areas of the district.

Table 4.9 : Life Time Migrants in the District by Rural/ Urban Areas, 1998

Description	Migrants by Residence		
	All Areas	Rural	Urban
Total in-migrants	100	100	100
Migrants from the same province	71.7	79.4	70.5
Migrants from other provinces	10.1	6.1	10.7
Migrants from AK/ NA	1.3	0.8	1.4
Migrants from other countries	16.9	13.7	17.4
Migrants from places not reported	**	0	*

Source: DCR of Lahore District, 1998



4.8.3 Religion

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

4.8.4 Mother Tongue

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

4.8.5 Ethnic Structure

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

4.9 ECONOMIC CONDITIONS

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

4.9.1 Unemployment

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



4.9.2 Employed Population by Occupations

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

4.9.3 Industry, Trade and Trade Centers

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

The Lahore Expo Centre is one of the biggest projects in the history of the city and was inaugurated on May 22, 2010 and there are various business centers and hub of commercial activities, i.e. Emporium Mall, Packages Mall, Mall of Lahore and other markets where customers from all over the country visit.

4.9.4 Educational Facilities

Lahore is an old first class seat of learning in Pakistan. The world famous and the oldest university of Pakistan i.e. University of the Punjab is located in this city. The pioneer University of Engineering and Technology is also in Lahore. There has been a significant development in the educational sector of this district. University of the Punjab has been extended and its new campuses are constructed along the Lahore branch of Upper Bari Doab canal. This provides an ideal environment for teachers and taught in the green lush area surrounded by New Muslim Town, Wahdat Colony, PCSIR Colony, Faisal Town and Garden Town.

In the Project area, private and government educational institutions are present, which include: Virtual University, Allied School, Concept School and College, Government Rabia Nasri College for Women, Beacon House School System, Iqra School, Qurban College etc.



Moreover, private educational institutions up to middle and high level are also working in neighboring localities.

4.9.5 Health Facilities

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

The overall health condition of the residents is good in the Project area and the common diseases were pointed out by the local people and medical practitioners, i.e. allergy, flu and fever, sugar and blood pressure. The health institutions that are working near the proposed Project area are Lahore Care Hospital, Gyani Hospital, Shahid Khalida Hospital, Farkhanda and Jamil Memorial Hospital and Others.

Private medical clinics are also available in the surrounding of the Project area. The people of the local communities get their treatment from both government as well as private hospitals.

4.9.6 Transportation

Lahore is the provincial capital of Punjab and has higher and better transportation facilities as compared to other area of Punjab. Lahore's main public transportation system is operated by the Lahore Transport Company (LTC) and Punjab Mass Transit Authority (PMTA). The backbone of its public transport network is the PMTA's Lahore Metro Bus and Orange Line Train of the Lahore Metro. LTC and PMTA also operate an extensive network of buses, providing bus service to many parts of the city and acting as a feeder system for the Metro bus.

4.9.7 Railways

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



4.9.8 Rickshaw and Cabs

Auto rickshaws and Cabs play an important role of public transport in Lahore. There are auto rickshaws, often simply called autos, in the city. Motorcycle rickshaws, usually called "chingchi", are also a very common means of domestic travel.

Radio cab services like Uber and Careem have been recently introduced by some private companies, which are now-a-days, is used as common mean of transportation by local population. In the Project area, there are many access roads which are linked to residential as well as commercial places. The common mean of transportation in Project area is private and local buses, cabs and rickshaws, private cars and motor bikes.

4.9.9 Archeological and Cultural Property/ Places of Interest

Lahore's modern city space consists of the historic walled city of Lahore in the northern part of the city, which contains several world and national heritage sites. The most common places of interest in Lahore city, i.e. Royal Fort Lahore, Minar-e-Pakistan, Badshahi Mosque, Wazir Khan Mosque, Grand Jamia Mosque Bahria Town, Shrine of Data Ganj Bakhsh, Shrine of Madhu Lal Hussain; Lahore Museum, Shalimar Garden, Jallo Park, Lahore Zoo, Tomb of Allama Iqbal, Tomb of Anarkali, Tomb of Nur Jahan and Jahangir's Tomb and Wagah Border.



5 STAKEHOLDER CONSULTATIONS

5.1 GENERAL

Timely and broad-based stakeholder involvement is an essential element for an effective environmental assessment, as it is linked with project planning, appraisal and development in general. Public involvement during EIA study has a tendency to improve project design environmental soundness and social acceptability.

This section describes the outcome of the public consultation sessions held with different stakeholders in the Project Area that may be directly or indirectly affected by the proposed project. Public Consultation is mandatory for development projects. The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national / international safeguard policies.

5.2 OBJECTIVES

The objectives of stakeholder consultation were to contribute to the openness, transparency and dialogue. Special efforts were made to ensure that the communication with the public should be efficient and well balanced. The concerned stakeholder groups were identified to participate in the assessment process.

The consultation process was carried out in accordance with the requirements of Pakistan Environmental Procedures. The objectives of this process were to:

- Inform the public about the proposed project;
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts on the physical, biological and socio-economic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts (positive & negative) of construction and operation related activities;
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the consultation session for valuable suggestions related to project design; and
- Reduce the chances of conflict through an early identification of controversial issues, and consult them to find acceptable solutions.

5.3 CONSULTATION AND PARTICIPATION PROCESS

For ascertaining the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them. These meetings were



carried out in the vicinity areas of proposed project. The meetings with stakeholders were carried out in February 2023.

5.4 METHODS OF PUBLIC CONSULTATION

Public Consultation was carried out in order to establish stakeholder's opinion regarding project implementation. The following methods were used for public consultation with project stakeholders:

- Scoping Sessions
- Formal Meetings
- Informal Meetings
- Individual Interview

5.5 IDENTIFICATION OF STAKEHOLDERS

Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field survey were the local residents, shopkeepers, students, teachers, laborers, private business owners, government department employees, private job holders and retired officials etc. All the stakeholders had different type of stakes according to their professions which are listed down along with their apprehensions and suggestions. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

5.6 CATEGORIES OF STAKEHOLDERS CONTACTED

Different categories of stakeholders contacted during consultation are given in **Table 5.1**.

Table 5.1: Stakeholders Contacted in the Project Area

Sr. No.	Stakeholder Category
1	Local residents
2	Private business owners/Shopkeepers
3	Wider Community
4	Relevant Department/ Organizations

5.7 STAKEHOLDERS AND THEIR APPREHENSIONS

Among all stakeholders, some major stakeholders were identified in the proposed project area. **Figure 5.1** shows the pictorial view of interviews and consultation meetings held with the stakeholders. **Table 5.2** contains the list of major stakeholders and their apprehensions.

Table 5.2: Major Stakeholders and their Apprehensions in the Project Area



Sr. No.	Stakeholders	Apprehensions
1	Local Residents/ Communities	- During the monsoon season, the adjoining nala adda overflows and the road condition becomes miserable, therefore the proposed project is essential in these circumstances. - Due to construction and operation of widened road in the residential areas, social problems will arise along with the environmental issues. Privacy of the local residents would be another social issue which will arise due to the construction activities of the proposed project. The local residents also considered negative impacts on health and safety. The noise and dust pollution generated during the construction phase and noise generated during the operation phase can cause unpleasant living conditions. - During the construction period, local residents will face difficulties while walking to nearby places existing in the vicinity of the proposed project area. Movement problem for local residents, dust and noise problem, privacy / safety issues, disturbance of public utilities, traffic jam and environmental pollution are the major concerns. - Due to increase large number of commercial activates in the area the pressure on the public utilities will also increase and the local residents will face inconvenience.
2	Wider Community	During the construction period, local residents will face difficulties while walking to nearby places existing in the vicinity of the proposed project area. Movement problem for local residents, dust and noise problem, privacy / safety issues, disturbance of public utilities, traffic jam and environmental pollution are the major concerns. Due to increase large number of commercial activates in the area the pressure on the public utilities will also increase and the local residents will face inconvenience.
3	Private Business Owners/ Shopkeepers	During the construction phase, they may face the issue of dust and movement, disturbance to customers, loss of business and reduction in number of customers.
4	Relevant Department/ Organizations	Sensitive receptors such as educational and health institutes, religious places and commercial setups will be affected due to construction. Dust, noise and vibration, disruption to travelers during construction and tree cutting.

5.8 CONSULTATION MEETINGS AND FORMAL & INFORMAL GROUP DISCUSSIONS

Consultation meetings regarding project impacts, their magnitude and mitigation measures were held with different types of stakeholders as mentioned above, to know their concerns. Scoping sessions were conducted with these stakeholders at various locations of the proposed project area.

Generally, it was found that mostly people were already aware of the proposed project. After the meetings, respondents, including local residents and other stakeholders, multiple responses received from participants about the proposed Project. Some showed concerns and anticipated the negative social and environmental impacts on the local residents due to



construction activities and disturbance of business. The other showed support for the proposed project as it will be beneficial in terms of good infrastructure development, not only for the local residents but also good for the economic development of the area. Due to construction of business hub, business and employment opportunities will increase.

5.9 CONCERNS / SUGGESTIONS OF THE STAKEHOLDERS

The most commonly raised concerns during the meetings are listed below:

- Impact on educational and health institutes should be avoided through change in design.
- Exposure of noise and dust pollution will cause disturbance and health & safety issues to the local residents and other stakeholders throughout the construction stage due to the movement of construction machinery and transportation of construction materials. The effects of noise and dust pollution on the local residents should be minimized by making necessary arrangements. Dust pollution should be controlled by water sprinkling on regular basis;
- Due to the movement of loaded trucks during the construction period of proposed project, congestion on the access road will increase. Proper diversion route rather than access road should be clearly defined to avoid traffic blockage during the entire construction period;
- Impact on religious places in the project area should be avoided;
- Construction of proposed project should be completed in time without any delay;
- During construction period, local residents, road users and students will face difficulties while moving to places in the vicinity of proposed project area. Appropriate diversion plan should be developed to avoid the disruption due to use of heavy machinery in daytime and should avoid disturbance to the local residents living in the project vicinity;
- Locals should be given priority for jobs during the construction phase;
- Due to the construction of the proposed project, public utilities will be disturbed. Arrangements should be made to minimize the disruption of public utilities or they may be rehabilitated on priority basis to reduce the impacts;
- Increase in traffic and safety hazards will create problems to the local population and surrounding communities. Accordingly, a detailed health and safety plan must be developed to mitigate the construction and operation risks of the proposed project on the local residents and surrounding communities;
- Solid waste produced during construction should be disposed of timely and properly;
- Construction material and site camp of labor should be located outside the residential area;
- The labor camps and batching plant should be located away from the populated area; and
- Good quality construction machinery may be used to reduce noise and air pollution issues.



5.10 MITIGATION MEASURES PROPOSED FOR ADDRESSING THE STAKEHOLDER'S CONCERNS

The contractors and design consultants may include the following environmental, social and occupational health and safety provisions in the project design in order to protect the surrounding communities from the anticipated impacts of pre-construction, construction and post construction activities:

- Significant efforts including change in design should be adopted to minimize the physical, disturbance of the local residents and to minimize the impacts of religious structures;
- Construction machinery should be placed at adequate locations away from the sensitive areas to minimize the impacts related to the noise;
- Project construction facilities should be located outside the existing residential areas. In order to avoid restricting the daily movement of the local stakeholders, construction vehicles should remain confined within their designated areas of movement;
- The utilities to be shifted due to the implementation of the proposed project should be rehabilitated on priority basis to minimize the impacts on the stakeholders;
- Solid waste generated during construction at site should be disposed of safely at the waste disposal sites approved by the client; and
- All necessary measures should be taken to ensure the safety of traffic during construction, including barricades (including signs boards, pavement markings, flags, and lights). All such barricades need to be set up to facilitate the local traffic.

5.11 DETAILS OF MEETINGS WITH THE STAKEHOLDERS

The detailed schedule of meetings at site with the secondary and primary stakeholders and the issues raised by the respondents are given in **Table 5.3**.

Table 5.3: Stakeholder Consultation Meeting with Locals

Sr. No.	Venue	Stakeholder Category	No. of Participants	Questions & Comments Raised	Response to Comments
1	Madina Colony	Residents, Shopkeepers; Business operators; Transporters; Govt. and private Employees; Students laborer	12	• Residential and commercial structures of the colony will be affected and people will lose their livelihood? • Different Types of the public utilities will be affected in the city areas during construction activities and local residents will face inconvenience.	• No residential and commercial structure outside the project area will be affected and demolished; • Before start of construction activities, all departments will be taken onboard to shift utilities and provide alternative facilities to the residents and after completion
2	Yasrab Colony	local Residents, Shopkeepers, Business Operators	08		



Sr. No.	Venue	Stakeholder Category	No. of Participants	Questions & Comments Raised	Response to Comments
3	Peer Colony	local Residents, Shopkeepers, Business Operators	06	• From where the labour force will be hired during implementation of the Project? • There will a dust problem during the construction of the road and will lead to the respiratory diseases. • There will be traffic congestion during the construction period. • The project will generate job opportunities. • There should be grievance mechanism for the community related complaints. • Trees should be planted at appropriate places.	of the construction of the road required utilities will be restored.
4	Farooq Colony	local Residents, Shopkeepers, Business Operators	04		• The contractor should hire maximum unskilled labor force from the local areas.
5	Alnoor Town	local Residents, Shopkeepers, Business Operators	05		• Issues mentioned by the local communities will be discussed with the Project authorized persons and the Design Engineers and mitigation measures will be suggested in the environment implementation plan.
6	LDA Quarters	local Residents, Shopkeepers, Business Operators	07		• Water sprinkling during construction phase should be ensured to minimize the dust pollution. • GRM has been proposed for the project construction phase. • A tree plantation plan has been developed and plantation will be carried out accordingly in the project area.

Generally, people were found to be aware of the construction of the Business Development District, and showed their concerns on the proposed project regarding adverse impacts on the local communities. **Figure 5.1** shows the pictorial presentation of public involvement (PI) process.



5.12 DEPARTMENTAL CONSULTATIONS

The Environment and Social team has conducted the Stakeholder's Consultation with relevant departments/organizations during the field visits in February, 2023. The consultation was done to get their views/concerns for the proposed Project. **Table 5.4** below presents the details of consultations, including stakeholder's designations/department and their views/concerns regarding the proposed Project.

Table 5.4: Summary of Consultation Meeting at Department Level

Sr. No.	Department/ Organization	City/ District	Name and Designation / Contact Details	Stakeholder Views/Concerns and Discussions
1	LDA	Lahore	Mr. Muhammad Riaz (Member of Lahore CBD Development Authority) 0321-6649914	Discussed about the status of the land of the proposed project. Requirement of the documents from LDA was discussed in detail and the field visit plan was also shared with the representative.
2	Environmental Protection Department (EIA Section)	Lahore	Azhar Iqbal - Deputy Director (EIA)- +92 3004108392 & Anmol Tabassum – Inspector	- Projects which have cost less than 100 million, their EIA reports will be approved by the deputy commissioners of the districts according to the new amendment in section 12 of Pakistan Environmental Protection Act, 1997 (amended 2012&2017); - Priority should be given to clear all the public grievances of local community and ecological, physical issues and (social issues due to this project) during EIA (public consultations); and - Trees and plants which are removed from the project site should be compensated with 1:10 ratio.
4	Government High School for Boys, Walton	Lahore	Mr. Amir Shehbaaz Vice Principal 0300-8007470	- Impact on Government High Schools for boys should be avoided through change in design. - RO plant is not functional so there is dire need of water filtration plant for students. - Playground is not available for the students of the school. - Movement of the students should not be disturbed during the construction period. - Water sprinkling arrangements should be made on daily basis to reduce impact of dust. - Solid waste generated during construction at site should be disposed of safely at the waste disposal sites approved by the client.

Sr. No.	Department/ Organization	City/ District	Name and Designation / Contact Details	Stakeholder Views/Concerns and Discussions
5	Government High School for Girls, Walton	Lahore	Nasir Rafique Principal 042-35940759	- Impact on Government High Schools for girls should be avoided through change in design. - No playground is available for the students of the school. - Movement of the students should not be disturbed during the construction period. - Water sprinkling arrangements should be made on daily basis to reduce impact of dust. - Solid waste generated during construction at site should be disposed of safely at the waste disposal sites approved by the client. - School building needs extension as the existing class rooms are not fulfilling the requirements.

Mixed responses received during the consultations. A majority of consulted persons considered the proposed Project will lead to adverse social and environmental issues, i.e., population, waste management, consumption of energy, issues of privacy of local residents, traffic management issues and health and safety issues. On the other hand, some consulted people favored the Project and mentioned that it will contribute to the economic and social development in the area.



Meeting with Officials of Punjab-EPA



Consultation with Vice Principal, Govt. High School Walton



A View of Consultation meeting with official from Walton Cantonment Board



A View of Consultation meeting with local Business Owners



Consultation with Local Business Owner



Consultation with Locals



Consultation with Local Residents



Consultation with Local Residents

Figure 5.1: Pictorial View of Stakeholders' Consultation Meetings



6 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 GENERAL

This chapter identifies the beneficial as well as the potentially significant adverse environmental and social impacts during design/pre-construction, construction and operation phases of the proposed Project on the physical, ecological and socio-economic domains of the environment. The appropriate mitigation and remedial measures are proposed in this chapter. A project impact evaluation matrix has been developed to evaluate the potential impacts of the proposed Project. A brief qualitative description of each aspect and the affected environment in Study Area / AOI is presented below.

6.2 NOTION OF SIGNIFICANCE

The term “**Environmental Impact**” or simply “**Impact**” covers the negative, adverse or harmful as well as positive, desirable or beneficial impacts of the project on environmental settings. Prediction of impacts of the proposed activity is based on factual data; however, the significance of these impacts involves a value judgment technique. The nature of the impacts may be categorised in terms of:

Direction	-	Positive or Negative
Duration	-	Long or Short Term
Effect	-	Direct or Indirect
Extent	-	Wide or Local

Impact significance depends on both the nature of the impact and on the sensitivity of the receptor. The more sensitive the receptor the greater will be the significance of impact from that proposed activity. For this EIA, activities and nature of impact are combined with the sensitivity of the receptor to evaluate the significance of the impact. The significance of impact is characterized as very low, low, moderate, high and very high. Environmental issues having “moderate”, “high” and “very high” significance is provided with mitigation measures.

Following the assessment of magnitude, the quality and sensitivity of the receiving environment or potential receptor has been determined and the significance of each potential impact established using the impact significance criteria matrix as shown below. Most of the potential impacts can be mitigated by implementation of various types of mitigation measures; however, some residual environmental impacts may remain after mitigation.



Magnitude of Impact	Sensitivity of Receptors			
	High (4)	Medium (3)	Low (2)	Negligible (1)
Major (4)	16	12	8	4
Moderate (3)	12	9	6	3
Minor (2)	8	6	4	2
Negligible (1)	4	3	2	1

Score	Impact Significance
1	Negligible
2 – 4	Low
5 – 8	Medium
9 – 12	High
> 12	Very High

6.3 METHODOLOGY FOR IMPACT EVALUATION

The methodology adopted for the evaluation of the impacts included the following assessment tools, (i) project impact evaluation matrix and (ii) overlays. These tools were used to identify the significance and magnitude of the impact as well as the nature, reversibility, extent etc.

6.3.1 Project Impact Evaluation Matrix

The Impact Evaluation Matrix was developed by placing project activities along one axis (i.e. Y-axis), and on the other axis (i.e. X-axis) the different environmental parameters likely to be affected by the proposed Project actions grouped into categories i.e. physical, ecological and socio-economic environment. For the impact assessment, project impact evaluation matrix was used by dividing the project action into different phases (design/pre-construction, construction and operational phases). A Project Impact Evaluation Matrix is given as **Table 6.1**.

6.3.2 Overlays

In order to identify spatial based impacts, overlays were used. An overlay is based on a set of transparent maps, each of which represents the spatial distribution of an environmental characteristic (for example, land acquisition). Information for an array of variables such as land use, infrastructure, vegetation etc. was collected for the standard geographical units within the project's AOI, recorded on a series of maps, typically one for each variable. These maps were overlaid to produce a composite map. The resulting composite maps characterize the Project area's land use, physical, social, ecological and other relevant parameters related to proposed intervention. The overlays maps used in this EIA for the quantification of the landuse categories referred in Chapter 4: Description of Environment.

Table 6.1: Project Impact Evaluation Matrix

Project Impact Matrix																																
Environmental Component → Project Component	Physical Environment					Ecological Environment							Socio Economic Environment																			
	Soil Erosion / Stability / Contamination	Air Quality	Noise Level	Surface & Ground Water Quality	Solid Waste Generation	Aquatic Ecosystem	Terrestrial Ecosystem	Endangered Species	Migratory Birds	Beneficial Plants	Loss of Trees	Loss of Crops/Orchards	Conflict over Resources	Mobility of Locals	Public Infrastructure	Accessibility	Housing Infrastructure	Cultural Properties (Mosque, Shrine, Graveyard)	Community Stability	Tourism And Recreation	Grazing Area	Gender Issues	Cultural & Social Issues	Health& Safety	Aesthetic	Security Situation	Living Standards	Employment Opportunities	Restoration of Livelihood	Other Socio-Economic Indicators		
A. Planning & Design Phase	1	2	3	4	5	8	8	9	10	11	12	13	14	15	16	17	18	18	20	21	22	23	24	25	26	27	28	29	30	31	32	
Topographic Survey of Project	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Geotechnical Investigation	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
Temporary Acquisition of Land	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	
Permanent Acquisition of Land	0	0	0	0	0	0	0	0	0	4	8	0	12	0	12	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	
B. Construction Phase																																
Site Clearance	9	9	9	2	8	0	12	0	0	9	12	0	6	6	12	3	0	0	0	10	0	0	2	9	4	2	0	6	0	0	0	
Earthwork in Filling and Excavation	9	9	9	2	8	0	12	0	0	9	8	0	6	6	2	3	0	0	2	0	0	0	2	9	4	2	0	6	0	0	0	
Establishment of Construction Camps & Workshop	2	2	4	0	0	0	4	0	0	0	0	0	8	0	0	0	0	0	4	0	0	4	4	8	4	0	0	6	6	0	0	
Transportation & Storage of Construction Materials	4	6	6	2	4	0	2	0	0	0	0	0	0	4	0	0	0	0	4	0	0	0	4	6	4	0	0	4	0	0	0	
Use of Construction Material and Heavy Machinery	3	8	9	0	4	0	4	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	2	8	0	4	0	4	0	0	0	
Installation and operation of Batching and Asphalt Plants	4	8	8	2	4	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	6	4	0	4	4	0	0	0	0	
Spoil Disposal	3	3	0	2	6	0	6	0	0	0	4	0	0	0	0	0	0	0	2	0	0	0	4	4	6	0	0	0	0	0	0	
Structural & Civil Work	8	8	8	2	7	0	6	0	0	0	0	0	2	0	2	0	0	0	2	0	0	4	4	9	4	3	0	8	0	0	0	
Drainage Work	6	6	6	2	6	0	6	0	0	0	0	0	2	0	2	0	0	0	2	0	0	4	4	9	4	4	0	8	0	0	0	
Miscellaneous Work (Road Ancillaries, Traffic Signs and Signals etc.)	0	4	6	4	4	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	6	0	0	0	6	0	0	0	0	
Pavement Work	2	4	6	2	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	8	0	0	0	6	0	0	0	
Finishing and Comissioning	0	2	4	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	
C. Operational Phase																																
Operation of Project	0	2	2	0	0	0	2	0	0	0	6	0	0	6	4	0	0	0	4	4	0	0	6	6	8	3	8	6	6	0	0	
Inspection & Monitoring	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	3	0	4	0	0	0	0	
Maintenance of Miscellaneous Work	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	



6.4 DELINEATION OF STUDY AREA / AOI

For an EIA Study, a clear delineation of the Study Area / AOI is required. Study Area / AOI is the area within which the potentially significant impacts of the proposed Project activities (direct or indirect) are envisaged. In this report, the Study Area / AOI is the area where the Project impacts on the environment due to the proposed Project activities are assessed. Based on the available Google Earth Imagery and ARC GIS software, Project footprints were overlaid on the existing Project Area Imagery. Utilizing the information collected through the detailed site visit, consultations with the locals and concerned departments and foreseen impacts of the proposed Project, a tentative AOI was delineated. Map of the Study Area / AOI is shown as **Figure 1.2**.

6.5 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

There are some potential significant adverse environmental impacts on the local environment. The proposed Project is divided into three (03) phases i.e. Pre-construction / Planning and Design Phase, Construction Phase and Operation and Maintenance (O&M) Phase. The Pre-Construction Phase includes all stages before the Construction Phase (i.e. site investigation work i.e. topographical, seismic studies etc.); Construction Phase includes all stages from mobilization of Contractor to the completion of Project; and Operation Phase starts after the Construction Phase which includes the inspection and repair works.

Adverse impacts envisaged at these three (03) phases of the proposed Project along with their proposed remedial or mitigation measures are detailed below:

6.5.1 Potential Environmental Impacts during Pre-Construction / Design Phase

Following is the brief description of impacts envisaged and the recommended mitigation measures during Pre-construction / Design phase.

6.5.1.1 Land Acquisition

The land associated with the proposed project is owned by the Government of Punjab. No private land acquisition is involved in the project as the construction activities will be carried out within the available land. Since, no private land acquisition is involved in the project, therefore, no impact is envisaged with respect to land acquisition at the design phase.

6.5.1.2 Technical Design and Layout Planning

Potential Impacts

Incompatible layout plan and engineering design of the project's structures i.e. flyovers, u-turns and conduit system can undermine the overall aesthetic beauty and ambience of the project area. Also low utilization of the available spaces and designing the structures without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality. This impact is permanent and moderate adverse in nature.



Mitigation Measures

- The technical design of the proposed project must consider all the above-mentioned factors for the final design and should meet all the local and international standards;
- All the objectives of proposed Project mentioned in the Chapter-3 (Project Description) must also be fulfilled; and
- The proponent must review and validate all the design considering the possible impacts (as mentioned) before the start of construction of proposed Project.

6.5.1.3 Topography

Potential Impacts

The project area is a plain terrain and the proposed project is going to be constructed on existing road, so, there is no significant change in the topography of the project area is expected. This impact is minor negative and permanent in nature.

Mitigation Measures

- The project design would consider aesthetic concerns such as the Tree Plantation which is already recommended in the EIA Report;
- Best engineering design measures should be adopted keeping in view the aesthetics of the project area; and
- Ground disturbances should be limited to only the areas necessary for project related construction activities.

6.5.1.4 Storm Water Drainage / Urban Flooding

Potential Impact

The construction of proposed Project may be subjected to urban flooding as the project area has high frequency of rainfall during monsoon season. Improper design of storm water drainage of the proposed Project may result in stagnant water on the road due to which following impacts are expected to arise:

- Deterioration of road surface and reduction of its bearing capacity;
- Inconvenience for commuters/pedestrians;
- Stagnant water may provide the breeding ground for disease vector; and
- Foul odour may be generated.

This impact is temporary and minor negative in nature.

Mitigation Measures

Mitigation measures will include provision of appropriate drainage structures with appropriate design capacity to avoid urban flooding especially during the rains. Proper slopes shall be incorporated in design to avoid the stagnant water on at-grade road surface.



6.5.1.5 Seismic Hazard

Potential Impact

As per Building Code of Pakistan, Seismic Provisions, 2007, the project area is located in Seismic Zone 2A (low to moderate hazard), where 2A represents peak horizontal ground acceleration from 0.08g to 0.16g. In this Zone, designing of various types of structures should be done on the basis of PGA. A high intensity earthquake impacting the project site can adversely impact the development. This factor requires special consideration of the designers keeping in view of the recent earthquake of October 08, 2005. This will be a local and high adverse impact.

Mitigation Measures

- The proposed structures should be designed and constructed to withstand high intensity earthquakes. For seismic hazard analysis, updated structural, geotechnical and seismic studies should be conducted; and
- To mitigate the seismic hazard, Seismic Building Code of Pakistan 2007 (SBC-07) should be adopted. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural, geotechnical and earthquake engineering.

6.5.1.6 Resource Conservation

Potential Impact

Resources involved in the construction of proposed Project would include construction materials, water and fuel. Construction material to be used for construction activities includes coarse aggregates, fine aggregates, asphalt, cementitious materials, reinforced and structural steel etc. Almost all the materials to be used in the construction of proposed Project components are non-renewable and therefore their sustainable use is necessary for the future use. Excessive water consumption for drinking and washing purposes by the construction staff may pressurize water resources in the project area. Fuel (diesel, petrol) will be used to operate construction machinery, asphalt and batching plants. Sustainable use of energy resources is very important not only to continue future use but also to reduce air emissions. The overall impact is considered to be local, high negative and long term.

Mitigation Measures

- Use potable water bowsers for construction works and mineral water bottles/ filtered or treated ground water for drinking purpose;
- Plan for the provision/purchase of adequate insulation to reduce heat loss through batching plants;
- Reduction of wastage of water through training of workers involved in water use;
- Reuse of construction waste materials may be adopted wherever possible;
- Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment;



- Efficient and well maintained equipment and machinery should be used;
- The equipment and machinery should be turned off when not in use;
- Ensure adequate insulation to reduce heat loss through batching plants;
- Regularly monitor CO and CO₂ content of the flue gases to verify that combustion systems are using practical excess air volumes;
- Use of solar panels at construction camps may be considered and plan for use of solar panels at operational phase may also be considered; and
- A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.
- Resource Conservation Plan is attached as **Annex-III**

6.5.1.7 Public Utilities

Potential Impact

Due to the proposed project, public utilities i.e. Electricity Polls, Power/Telephone Lines, etc. will be affected creating disruption of public services and inconvenience to the local residents. This impact is temporary and may be considered as moderately negative in nature.

Mitigation Measures

Mitigation measures will include:

- The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; and
- All public utilities (e.g. electric lines, water pipes, power/ telephone lines, etc.) likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction works.

6.5.1.8 Flora

Potential Impact

During the pre-construction phase, activities such as installation of construction camps, construction of temporary roads & mobility of construction staff may damage the local vegetation/trees. As the heavy machinery and camps will be moved and installed, which require significant space due to which available vegetation is expected to be removed. This impact is Site-specific, Permanent, Medium Significant and needs to be encountered prior to the start of construction stage.

Mitigation Measures

- The camps, mobility of machinery and construction of temporary road should be proper planned and well designed to avoid any loss to local green cover;



- It is recommended to establish the construction camps where minimum or no vegetation exists.
- Similarly, the alternate routes for roads and points for camps are recommended where no loss of vegetation is expected; and
- The location of construction camp should be selected so, as to have limited environmental impact during construction phase and to reduce the cost and land requirement.

6.5.1.9 Fauna

Potential Impact

As movement and installations of machinery and vehicles will take place so noise and habitat loss is expected. The routes of the available wildlife and other habitats may be affected due to camps set-up and machinery movements and installations. Temporary road may also affect the habitat of locally available fauna. This impact is Site-specific, Temporary and Low Significant.

Mitigation Measures

- The standard measures must be adopted to minimize noise due to machinery movements and installations;
- Wildlife movements and routes must be considered during activities and should be avoided to their maximum level;
- The alternate routes and points are recommended to avoid any damage to locally available fauna;
- The camps shall be properly fenced and gated to check the entry of animals in search of eatable goods; and
- Similarly, wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them.

6.5.2 Potential Environmental Impacts during Construction Phase

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

6.5.2.1 Soil Erosion and Contamination

Potential Impact

The clearing of vegetation can also loosen the soil and make it more susceptible to erosion due to wind and rain. There is also a possibility of silt runoff during rainy season causing soil erosion. During the rain, the eroded soil mix with stagnant water to transform into slush, which can affect movement of vehicles and machinery and construction work as well as limit the movements of local people. Soil may be affected by erosion, compaction and contamination. Soil erosion may occur at active construction sites and at contractors' camps, as a result of uncontrolled run-off from equipment washing yards, excavation of earth/cutting operations and clearing of vegetation. Soil may also be impacted due to unauthorized use of



borrow areas and quarries, resulting in degradation of landscape. Whereas, contamination of soil may be caused by solid waste generated at campsites and by oil and chemical spills at asphalt plant sites, workshop areas and equipment washing yards. This impact is high adverse negative in nature.

Mitigation Measure

- Soil contamination by asphalt will be minimized by placing all containers in a bunded area away from water courses/drains;
- Provision of impervious platform with oil and grease trap for collection of spillage during equipment and vehicle maintenance;
- All spoils shall be disposed of safely and the site shall be restored back to its original conditions;
- Non-bituminous wastes from construction activities shall be dumped in approved sites, in line with the legal prescriptions for dumpsites;
- Solid waste generated at the camp sites will be properly treated and safely disposed only in the demarcated waste disposal sites/areas;
- If any contaminated soils are found, they shall be removed and deposited in a sealed pit in an area agreed with the concerned authorities;
- Use of modern, well-maintained machinery and vehicles by the contractor to avoid leakages; and
- Soils removed during construction would be stockpiled for reuse where possible.

6.5.2.2 Water Quality

Potential Impact

There is no surface water body within immediate vicinity of the Project Area. Therefore, no impact is envisaged regarding surface water contamination. Groundwater may also get contaminated from the wastewater generation from the construction camps, leachate from improper dumping of solid waste. The impact is medium adverse in nature.

Mitigation Measures

As a mandatory step, all the effluents will be disposed as per the requirements of PEQS. Moreover, to reduce the risk of surface and groundwater contamination, good management practices will be adopted to ensure that fuels, chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner. These measures are described below:

- Construction camp will be established in area with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that PEQS are met;
- The proponent will ensure that the construction work is confined within the project boundary and water bodies are prevented from pollution during construction;
- The solid waste will be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Regular water quality monitoring according to determined sampling schedule;
- Water required for construction shall be obtained in such a way that the water availability and supply to nearby communities remain unaffected;



- The contractor will ensure that construction debris do not find their way into the drainage which may get clogged;
- To maintain the surface water flow/drainage, proper mitigation measures will be taken for the proposed project, like drainage structures;
- Wastes will be collected, stored and taken to approved disposal site;
- Wastewater effluent from the Contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging into the natural streams. According to the PEQS, the BOD concentration in sewage must be brought down to less or equal to 80 mg/l before being discharged into a natural stream having capacity to dilute the effluent. For wastewater apart from BOD, COD of 150 mg/l will also be checked; and
- Similarly, if the sewage after treatment is to be discharged into the land it will meet the requirements of the PEQS for disposal of wastewater.

6.5.2.3 Landscape Changes

Potential Impact

Visual intrusion from large piles of excavated and construction material is one of the possible adverse impacts during the construction phase of the project. The impact is considered to be medium negative, local and short term.

Mitigation Measures

- Material stockpiles should be removed as soon as work is completed and the area re-landscaped; and
- The contractor should ensure minimal footprint of construction activities.

6.5.2.4 Traffic Issues

Potential Impact

Due to the proposed project construction activities and movement of heavy project vehicles for construction material supply, traffic problems may arise for the commuters and transporters travelling especially through Walton Road and Ferozepur Road. The problems will include traffic jams and inconvenience to the public passing through the Project Area. It will also increase traffic load on the existing road network or access roads ultimately deteriorating the existing condition of the roads. The movement of vehicles along the haulage routes will cause soil erosion, debris flow, dust emissions, vibrational impacts, etc. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

To minimize traffic problems in the proposed Project Area, following measures will be considered:



- Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime to reduce traffic load and inconvenience to the local population;
- Construction vehicles, machinery and equipment will be parked at designated areas (at construction camps site) to avoid un-necessary congestions along the major roads;
- Damages of roads due to construction vehicles will be instantly repaired and/or compensated after the completion of work;
- Proper sign boards will be provided for smooth flow of traffic;
- Period of construction and area / location of construction site shall be informed to public in general and specifically to local residents;
- Any closure of the roads (especially main roads) and deviations / diversions proposed should be informed to the riders through standard signs and displays; and
- Traffic Management Plan (refer **Annex-IV**) will be prepared by the contractor and implemented to avoid traffic accidents, jams/public inconvenience.

6.5.2.5 Deterioration of Ambient Air Quality

Potential Impact

Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. Besides, multifarious construction activities and increased vehicular traffic (construction vehicles) would also contribute to the localized airborne dust. The larger sized particles, under influence of gravity, tend to settle down in the immediate vicinity of the source. The Suspended Particulate Matter (SPM) of the size smaller than 10 micrometre (PM_{10}) tends to remain suspended in the environment for much longer and persistent time and is an environmental hazard. The objectionable impacts of settling of the suspended dust would be its dry deposition on vegetation, motor vehicles, structures, and other exposed surfaces. Exhausts from fossil fuel burning in the construction machinery will also deteriorate local air quality. Similarly, exhausts from generators can also have impacts on air quality in the vicinity. The deteriorated ambient air quality may cause health hazards to the residents of nearby residential colonies including sensitive receptors e.g. Schools, Mosques, etc.

The overall impact on the quality of air during the construction phase will be high adverse, however, it will be temporary and limited to the project's implementation phase only.

Mitigation Measures

The construction phase impacts of the proposed Project could be effectively mitigated by the implementation of simple procedures by the Contractor including but not limited to the following:

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;



- Open burning of solid waste from the Contractor's camps and at construction site should be strictly banned;
- Preventive measures against dust should be adopted for on-site mixing and unloading operations;
- Construction materials (sand, gravel, and rocks) and spoil materials will be transported through trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS for carbon emissions and noise;
- Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s);
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions;
- Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers. Diesel operated equipment should be equipped with well-maintained fuel filter and may be replaced timely (if required). In addition to that, regular maintenance activities comprising changing of lubricating oil, changing the air and fuel filter, cleaning the fuel system, draining the water separators and proper tuning may also help in reducing the emissions from diesel generators;
- Construction equipment is generally left idling while the operators are on break or waiting for the completion of another task. Emissions from idling equipment tend to be high. Existing idling control technologies, which automatically shut the engine off after a preset time can reduce emissions, without intervention of the operators;
- PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works;
- Service roads (used for earthmoving equipment and general transport) should be regularly sprayed with water during dry weather;
- All excavation work should be sprinkled with water;
- Construction workers should be provided with masks for protection against the inhalation of dust;
- Vehicles used for construction should be tuned properly and regularly to control emission of exhaust gases;
- Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards; and
- Regular monitoring of air quality in accordance with the formulated environmental monitoring plan (given in EMP).

6.5.2.6 Noise and Vibration

Potential Impact

The noise and vibration will be produced due to the operation of construction machinery equipment. Sources of noise and vibration during construction are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment's. Noise and vibration are perceived as one of the most undesirable consequences of construction activity. The above machinery is expected to generate noise levels that would be severe in the Project Area. The noise and vibration may



cause health hazards to the residents of nearby residential colonies and sensitive receptors e.g. Mosques and educational institutes etc.

The likely impacts due to noise are:

- Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels;
- Noisy settings and higher background levels can cause temporary threshold shift and the consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed;
- Potential impact from vibration during the construction period consists of damage to buildings from heavy earthmoving equipment; and
- Moreover, vibrations from machinery and equipment such as hand held compactors and concrete vibrators can produce easy fatigability and generalized aches in the persons operating these machines.

This impact is negative, local, medium and short term.

Mitigation Measures

There are a variety of ways by which construction equipment and worksite noise can be controlled. The following is a list of ways to control noise level at the worksite of the proposed Project:

Quieter Equipment: A cost-effective way to reduce noise at a construction worksite is to buy quiet equipment. In addition, equipment in use should be the most suitable for the job. Avoid using equipment that is over-powered and, conversely, avoid using under powered equipment. Whenever possible the quietest equipment alternative should be used. In general, electronic powered equipment is quieter than diesel powered equipment and hydraulically powered equipment is quieter than pneumatic power.

Modifying Existing Old Equipment: The most common way to reduce the noise levels of common construction equipment is through worksite modifications. Some common worksite modifications consist of retro-fitting existing equipment with damping materials and mufflers.

Barrier Protection: An effective way of reducing noise is to locate noisy equipment behind purpose-built barriers. The barriers can be constructed on the work site from common construction building material (plywood, block, stacks or spoils) or the barriers can be constructed from commercial panels which are lined with sound absorbing material to achieve the maximum shielding effect possible. To be effective, the length of the barrier should be greater than its height. The noise source should not be visible and barrier should be located as close as possible to either the noise source or the receiver.

Work Activity Scheduling: Work activity scheduling are administrative means to control noise exposure. Planning how noise sources are sited and organized on a work site can reduce noise hazards. Jobs can be rotated so that exposure time is limited. Transferring workers from a high exposure task to a lower exposure task could make the employee's



daily noise exposure acceptable. Administrative controls include activity planning, for example, scheduling pavement breaking operations so as to reduce the number of work site workers exposed. In addition, noisy equipment should not be run for periods longer than necessary and should be switched off when not in use.

Maintenance: Increased attention to maintenance of tools and equipment will reduce worksite noise levels. Maintaining plant and equipment in good order not only increases its life, but makes it safer to use and quieter. Loose and worn parts should be fixed as soon as possible. Ideally, the worksite should have a system in place for checking and servicing the various machines and power tools.

Noise Perimeter Zones (NPZs): The NPZs are another administrative control to limit exposure to noisy processes or equipment to as few workers as possible. NPZs are areas where noise levels of 90 dB (A) or more are roped off and marked to keep out all workers who don't have to be there. NPZs can be set up using a sound level meter to find the safe distance from the source (90 dB (A)) and the NPZs can be set up at that distance. Noise does not radiate from the source at the same level in all directions. Noise from machinery can be higher in one direction than another because the noise can also be either absorbed or reflected from surfaces it contacts, such as the ground or a wall. Therefore, measurements should be taken at several points in an area where people might be working. Once noise levels that are 90 dB (A) or more are determined, rope off this area as the Noise Perimeter Zone. Exclude all workers who do not need to be in that zone. All workers who need to work within the zone must wear hearing protection.

6.5.2.7 Borrow Areas/ Open Pits

Potential Impact

Borrow / open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments.

Borrow/ open pits may also result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the Project Area. This impact is permanent and high adverse in nature.

Mitigation Measures

- Necessary permits will be obtained for any borrow pits from the competent authorities;
- In borrow pits, the depth of the pit shall be restricted upto 5' and the sides of the excavation will have a slope not steeper than 1:4;
- Soil erosion along the borrow pit shall be regularly checked to prevent/mitigate impacts on adjacent lands; and
- In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.



The Guideline Quarry Management Plan is attached as **Annex-V**.

6.5.2.8 Construction Camps / Camp Sites

Potential Impact

Improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which include health and safety, traffic problems, soil degradation, loss of vegetation and assets on the selected land, solid waste and water pollution in the vicinity settlements. Furthermore, cultural differences, behavior of construction workers, potential disregard for local cultural norms can lead to increased tension between local communities and workers residing in the construction camps. This impact is temporary and moderate negative in nature.

Mitigation Measures

- The project will seek to avoid sitting camps where their presence might contribute to any conflicts with locals;
- Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values;
- Camps will be designed to be self-contained to reduce demand on infrastructure and services of nearby communities;
- A comprehensive safety and security plan for the camp will be prepared which will comprise of a training manual, use of safety equipment and emergency preparedness;
- Training will be provided to all staff on camp management rules and overall discipline and cultural awareness;
- Waste Management Plan (refer **Annex-VI**) will be implemented to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste;
- Site for construction camp will be selected to minimize the removal of existing macro-plants at camp sites;
- Photographical and botanical inventory of vegetation before clearing the site;
- Compensatory plantation to be done when construction work near ends; and
- The contractor(s) shall ensure removal and rehabilitation of site upon completion.

6.5.2.9 Wastewater Generation at Construction Camps

Potential Impact

Wastewater will be generated at the construction camps by the workers. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels etc. apart from soil contamination. The wastewater generation is estimated to be 3,712 liters/day¹⁴ for 116 construction workers during construction phase of the proposed Project. This impact can be categorized as moderate negative, site-specific, temporary and reversible.

¹⁴ Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain (Domestic sewage generation = 80% of water consumed/day)

Mitigation Measures

To dispose the liquid waste generated from the construction activities, the following steps will be taken by the Contractor:

- Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks (as shown in **Figure 6.1**);
- Proper monitoring to check the compliance of PEQS will be carried out;
- Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit; and
- The Contractor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal.

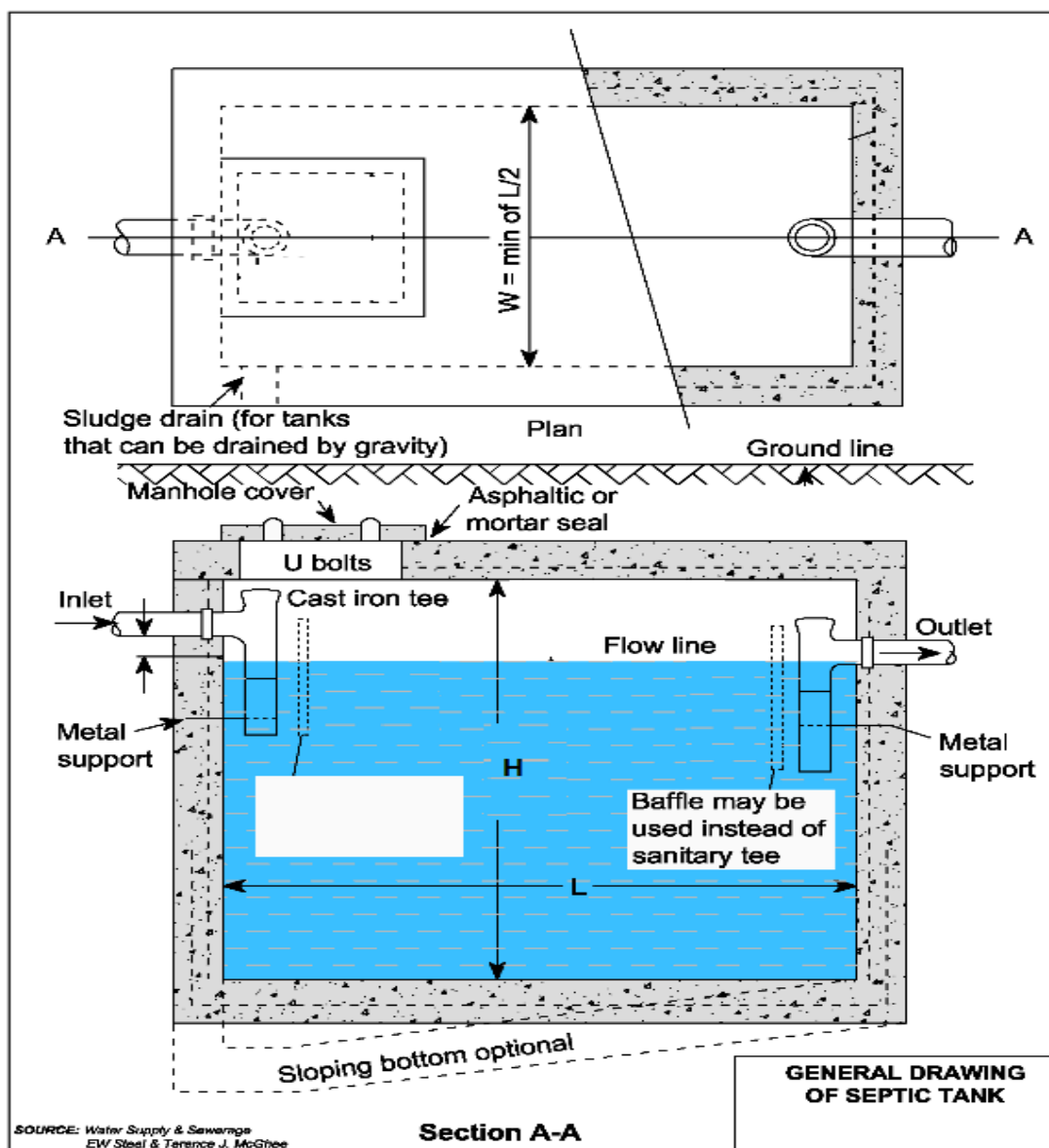


Figure 6.1: General Drawing of Septic Tank



6.5.2.10 Solid Waste Generation at Construction Camps

Potential Impact

The solid waste generation is estimated to be 52 kg/day¹⁵ for 116 construction workers during construction phase of the proposed Project. Different type of waste is likely to be generated during the construction phase of the proposed Project. The municipal waste will be in the form of food, cans, paper and wastewater from construction camps toilets and washing yards. Construction waste will include excavated soil, sand, gravel, rocks, asphalt, pieces of concrete, bricks, wood, metal pieces and electrical wires. Whereas, hazardous waste can be comprised of paints and construction chemicals. All these, if left unattended, can become a source of nuisance and environmental pollution in the Project Area.

Insecure and unhygienic disposal of the solid wastes particularly garbage and trash may cause degradation of soil and land. Insecurely disposed off heaps of wastes containing kitchen garbage and food waste can serve as breeding grounds for the disease spreading vectors and rodents. Throwing away of solid wastes into water channels and the wastewater network can result into choking of the latter. These impacts are temporary and minor negative in nature.

Mitigation Measures

- Solid Waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;
- Training of work force in the storage and handling of hazardous materials and chemicals Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste; proper labeling of containers, including the identification and quantity of the contents, hazard contact information, etc;
- Waste disposal plan must be reviewed during the entire construction phase in the light of changing weather conditions;
- Emergency response plan shall be prepared to address the accidental spillage of fuels and hazardous goods;
- Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate technologies;
- Reusing bitumen spillage; and disposing non-usable bitumen spills in a deep trench providing clay linings at bottom and filled with soil at the top (for at-least 0.5 m);
- Used oil shall be collected in separate containers stored on impervious platform with restricted access and shall be sold to licensed contractor and the burning of waste oil shall be strictly restricted;
- Segregating and stockpiling scarified/ milled bituminous material and reusing this material in sub grade/shoulders;
- Construction waste such as waste wood can be recovered and recycled into wood for new building projects, and cement, bricks, and plaster can be crushed and reused in other construction and building projects; and

¹⁵ Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day.



- The contractor should ensure implementation of proposed Construction Waste Management Plan (attached as **Annex-VI**) and it must be reviewed during the entire construction phase in the light of changing weather conditions.

6.5.2.11 Green House Gas Abatement

Potential Impact

The main sources of greenhouse gases (CO₂, CH₄, NO_x etc.) during the construction activities of the proposed Project will include both mobile and stationary sources. The mobile sources will be the construction and transportation vehicles while the stationary source will be the batching and asphalt plants. Emission of greenhouse gases cause global warming and other climatic changes on regional and global scale. The climate change due to global warming, may result in following impacts over a period of time:

- Extended summer season and absence of snow falls;
- Higher temperatures may result in more precipitation falling as rain rather than snow, hence earlier and greater runoffs, increased runoff may pose greater challenges for water management
- Increased natural hazards such as landslides and debris flows, extreme/unpredictable rainfall events, wind storms, droughts and wildfire.
- Due to shift in temperatures and precipitation patterns runoff, stream/lake temperatures, suitable habitats may move upland, thereby declining in size, ecosystems become fragmented, number and composition of species will change with particular threats to sensitive species; and
- Increased damages to transportation infrastructure from extreme events, causing difficulties for access and emergency evacuation, and involves higher maintenance costs.

Mitigation Measures

- Regular motioning of the vehicles for engine efficiency;
- Avoid idling of construction vehicles;
- Alternative energy resources shall be considered where possible; and
- PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery shall be enforced during construction works.

6.5.2.12 Natural and Man-Made Disasters

Potential Impact

Natural disasters (earthquakes) and accidents such as fire, falls, slips and trips may result in injuries, financial losses and may even lead to deaths. The workers shall be trained and facilitated to cope with such disasters.

Mitigation Measures

Mitigation measures include the following:



- An Emergency Response Plan (ERP) for earthquakes and manmade disasters should be developed by contractor in coordination with SC and Lahore CBD Development Authority should be implemented in close consultation with the RESCUE Services and other concerned departments;
- Training of the Contractor and Lahore CBD Development Authority staff and employees regarding the emergency procedures and plans should be regularly conducted;
- Emergency numbers should be clearly posted at active construction sites; and
- Minor incidents and near misses should be reported, and preventive measures should be formulated accordingly by the Lahore CBD Development Authority management.

6.5.2.13 Occupational Health and Safety

Potential Impact

Occupational Health and Safety (OHS) related impacts will arise during construction phase activities including clearing of earth, levelling, compaction, carpeting, pavement finishing and testing & commissioning. Eye injury can be caused by stone or metal particles. Hazard of being hit by falling objects, major hand-arm and whole body vibration hazards, skin and respiratory tract irritation from exposure to cement dust, overexertion and awkward postures etc. will be another impact. Welding hazards include electric shock, fumes and gases, fire and explosions, falls from height, eye and head injuries etc.

Other impacts will be fall from height, contact with heavy electrical and mechanical equipment, equipment failure, uncontrolled movement, unguarded moving mechanical equipment parts, fatigue, unbalanced load, falling objects, hand injury, slip and trip hazards, wind / storm activity, injury from releasing load too soon etc. Operating mechanical and electrical equipment will trigger the OHS related issues e.g. struck by moving vehicles or other equipment, slips or trips, struck by flying objects, such as dirt or splashed fluids, caught in pinch points, shear points, crush points, falling from machine etc. The proposed project area is also sensitive from the law and order point of view and the security as well as the safety of the Contractor and Consultant staff will be a major issue. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

Following mitigation is given to avoid the accidental risks:

- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- Complying with the safety precautions for the construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the Project Contract;
- Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves and protective masks, goggles, shields and monitoring their proper and sustained usage;



- Contractor will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site;
- Work areas will be cordoned off where necessary;
- Contractors will instruct their staff to use Personnel Protective Equipment (PPE) (e.g., wire containment, displaying warning signs along the work site, communicating advance warnings to mats) to enhance the safety; and
- Safety lookouts will be built to prevent people and vehicles from passing at the time of hot or cold work; and
- An emergency management plan must be devised by the contractor in close coordination with the provincial emergency services.

The Occupational Health and Safety Plan is attached as **Annex-VII**.

6.5.2.14 Community Health and Safety

Potential Impact

The construction activities and vehicular movement at construction sites may result in roadside accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. Quality of groundwater and surface water resources available in the nearby local communities may be affected due to the construction activities, oil spillage and leakage, roadside accidents, etc. The proposed Project will also have potential of air (dust pollution), noise and vibrational impacts on nearby community. The labour works with different transmittable diseases may cause spread out of those diseases in the local residents. The construction areas located near the residential, settlements, may cause accident for the people moving near to those areas. Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Tensions may also arise between different groups within the labor force, and pre-existing conflicts in the local community may be exacerbated. Ethnic and regional conflicts may also be aggravated if workers from one group are moving into the territory of the other. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- There will be proper control on construction activities and oil spillage leakage of vehicles;
- The labourers with different transmittable diseases will be restricted within the construction site;
- Ensure that the site is restricted for the entry of irrelevant people particularly children;
- Efforts will be made to create awareness about road safety among the drivers operating construction vehicles;
- Timely public notification on planned construction works;



- Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links;
- Seeking cooperation with local educational facilities (school teachers) at each village along the route for road safety campaigns;
- Provision of proper safety and diversion signage at sensitive/accident-prone spots;
- Setting up speed limits in close consultation with the local stakeholders;
- The mitigation measures provided in the following sub-sections for air and noise shall be adopted to reduce the air pollution, noise pollution and vibrational impacts on nearby community;
- The communicable disease of most concern during construction phase, like Sexually-Transmitted Disease (STDs) such as HIV/AIDS, will be prevented by successful initiative typically involving health awareness; education initiatives; training health workers in disease treatment; immunization program and providing health service;
- Reducing the impacts of vector borne diseases will be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which include prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water;
- The Contractor will prepare the construction camp management plan which, in addition to other components, will include the labor influx management plan; and
- Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions.

6.5.2.15 Communicable Diseases

Potential Impact

The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of communicable diseases like COVID-19 and HIV/AIDS. Majority of the people living in the surrounding of the Project, and potential labor are not aware of the source, mode of communication or consequences of HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of COVID-19 and HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the labor camps and the field offices of the Project to prevent the communicable diseases.

There is a chance of spreading of an epidemic of Coronavirus disease (COVID-19) due to close interaction of the labor force during construction not only among the workers but also in the area. This impact can be categorized as direct, medium, site-specific, short term, temporary, medium to high probability and reversible.

Mitigation Measures

The Contractor shall:



- Arrange to run an active campaign, in the labor camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;
- SOPs related to the construction industry advised by National Action Plan for COVID-19 Pakistan to control spreading of COVID-19, shall be implemented by the contractor and should be strictly monitored;
- Strengthen the existing local health and medical services for the benefit of labor as well as the surrounding villages;
- Ensure cleanliness and hygienic conditions at the labor camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department;
- Locating a labor camp at least away from the villages (local settlement), and
- Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.

6.5.2.16 Flora

Potential Impact

The project will not involve any destruction of vegetation cover on construction areas. However, exhaust of noxious gases from movement of heavy machinery and dust will pollute air which will adversely affect health and vigor of plants. During construction activities, the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements). This impact is Site-specific, Temporary, and moderate Significant.

Mitigation Measures

- Cutting and / or disturbance of trees shall be avoided, as far as possible;
- A tree plantation program shall be implemented with the recommendations and technical support of PHA;
- NOC for tree cutting from PHA is mandatory;
- As a principle, ten trees shall be planted in place/lieu of felling of one tree in consideration of mortality. Total 7000 trees shall be planted in compensation/lieu of 700 trees;
- It is pertinent to mention that trees should be relocated/transplanted/replanted (where possible) instead of cutting and may be replanted within the 500 meters' radius of its original location;
- The compensatory plantation shall be carried out in the project area (in the available space) or in the vicinity of project area like associated roads and nearby parks / green areas, etc. to reduce the negative impacts of the tree cutting in the immediate project area and overall;
- The proponent shall implement the program with the help of PHA and with the consultation of concerned consultant ecologist;
- Open fires should be banned in the area to avoid hazards of fire in the area;
- Clearing of vegetation cannot be avoided at the areas specified for project structures, but damage to the natural vegetation may be minimized by establishing camp sites, workshops and batching plants on waste/barren land rather than on forested or green land.
- However, if such type of land is not available, it shall be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth;



- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement;
- The Contractor's staff and labor shall be strictly directed not to damage any vegetation such as trees or bushes; and
- Contractor shall provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall be strictly prohibited.

6.5.2.17 Fauna

Potential Impact

During construction phase the existing population of birds, mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. The existing fauna will leave the directly affected areas due to construction activities and human intervention. Some animals particularly reptiles may get killed during the earthworks operations. Moreover, the movements of the mammals and reptiles will be restricted during the construction phase.

Birds as well, will tend to move away from the construction areas and find shelter and food elsewhere due to the activities mentioned above for fear of being hunted / trapped.

Noise generated from machinery particularly during the night hours will even scare the wildlife residing in habitats located at some distance from the construction areas. Food and refuse at the Contractor's camps may attract animals that might in turn be hunted by the workers. This impact is Indirect, Site-specific, Temporary, Reversible, Possible and Medium Significant.

Mitigation Measures

- Care shall be taken during construction activities for avoiding purposely or chance killing of animals;
- If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed;
- Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard;
- The Contractor must be held responsible for instructing his work force accordingly and for enforcing this restriction. In addition, this shall have to be controlled by the Wildlife Department.
- Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding;
- Noise generating activities shall not be carried out during the night by the work force;
- Wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them; and
- Noise produced due to construction activities may be kept to acceptable level.



6.5.2.18 Discovery of Heritage Sites/ Structures during Excavation

During excavation, there is a chance of finding artifacts. In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate General (DG) of Archeology, Government of Punjab to take further suitable action to preserve those antiques or sensitive remains. Chance finds procedure (**Annex-VIII**) shall be adopted in case of any accidental discovery of cultural heritage.

6.5.2.19 Social/ Cultural Conflicts

Potential Impact

During the construction phase of the project, conflicts may arise between labor force and local communities exists near the Project Area. Use of local resources (existing infrastructure and utilities) by the construction workers can generate stress on the local residents. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact is temporary and moderate adverse in nature.

Mitigation Measures

- Local labor should be preferably employed for the construction works;
- Careful planning and training of work force to minimize disturbance to the local people; and
- Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals.

6.5.2.20 Traffic, Noise, Privacy Issues and Disturbance/Nuisance to People

Approach/ hindrance problems for the local residents in the surrounding areas, business owners and movement of the daily commuters will be disturbed due to construction activities. The movement of construction material carrying vehicles will cause traffic congestions at the entrance/exits of abovementioned housing societies. Moreover, the construction activities will produce dust and noise pollution that will cause nuisance to the residents of the surrounding housing schemes. There will be issues of privacy for the local residents due to construction of high-rise buildings. This impact is temporary and minor adverse in nature.

Mitigation Measures

- Assurance of timely completion of the construction works according to the agreed schedule by LDA;
- Provision of alternate routes for the project site where the construction is being carried out;
- Effective traffic management the Lahore Traffic Police during the peak hours to avoid traffic congestions and provide ease of traffic;
- Continuous water sprinkling at the active sites to suppress the dust;
- Restricting the construction activities to only daytime; and
- Contractor should prepare and strictly implement SOPs for the workers to protect the privacy of the residents.



6.5.2.21 Economic Activity

Due to the construction of the proposed project, economic activity will be generated in the Project Area as the laborers and semi-skilled staff will have an opportunity to work for the construction of the proposed project. This will help in developing their skills and capacities. Local construction companies will be engaged and therefore will bring more business and experience to their work. Moreover, purchase of goods and material from the local markets will also be economically beneficial for the area. This is a moderate positive impact.

6.5.3 Potential Environmental Impacts During Operational Phase

The anticipated environmental impacts related to the proposed Project have been studied for the operational phase of the project as discussed hereunder.

6.5.3.1 Landscape

Potential Impact

After the completion of the proposed Project, the overall environmental conditions of the Project Area will greatly improve due to elimination of stagnant wastewater, plantation of trees and ornamental plants and rehabilitation of Walton Road. This will be a major positive impact of the proposed Project.

Mitigation Measures

Proper implementation of the tree plantation plan will improve landscape of the Project Area.

6.5.3.2 Ambient Air Quality

Potential Impact

Increased traffic levels in the project area may lead to higher values of air emissions that will affect the ambient air quality of the Project Area. The impact is permanent and minor negative in nature.

Mitigation Measures

Following mitigating measures are needed to be suggested:

- Client with the help of PEPA may set up system to monitor air quality along project area at important intersections/sensitive receptors in accordance with PEQS for a specific period to record the quality of air during the operation phase. This may help in comparing the baseline conditions with the operation phase of the project;
- Setting up system to monitor air quality along the project area in accordance with acceptable International Standards; Monitoring emissions of vehicle as per PEQS;



- Helping the owners and occupants of the affected premises/settlements to identify and implement special measure such as hedges and vegetation to reduce air pollution; and
- Increasing vegetation in the form of greenbelt is one of the preferred methods to mitigate air pollution. Plants generate oxygen, serve as a sink for pollutants, reduce the flow of dust and reduce the noise pollution too alongside the proposed project.



6.5.3.3 Noise and Vibration

Potential Impact

The movement of vehicles and usage of horns will create noise which will be a hazard for the nearby residents/built-up areas. Impact of noise generated from the vehicles moving on the proposed road will be permanent and moderate adverse in nature.

Mitigation Measures

- Provision of adequate noise barriers such as hedges and indigenous tree species will reduce the noise. Further Improvement can be made by enforcing the laws and getting the vehicles tested, regularly after a specific time period, by some reputable vehicle testing laboratory and obtaining a certificate. Noise measurements should be carried out at locations with respect to the schedule specified in the Environmental Monitoring Plan (EMMP) to ensure the effectiveness of mitigation measures;
- Use of horn should be strictly prohibited in the close proximity of the built-up areas;
- Proper signboards should be installed to ensure reduce noise levels in the project area;
- Enforcement and penalties against traffic rules violators; and
- Noise barriers may be installed/constructed near the built-up areas.

6.5.3.4 Operational Sustainability

Potential Impact

The most pressing need is the sustainability of Sewage & storm water collection system and its disposal, and it can be assessed on many factors including capacity issues of government departments dealing with municipal services, efficiency of the system and its performance, life cycle analysis (aging and deterioration), natural hazards (earthquakes, floods and fire outbreaks), escalation in population growth and energy requirements.

The three major drivers considered worldwide for ensuring sustainability are: (i) economic considerations, (ii) social considerations and (iii) environmental protection. Therefore, the municipal services provider i.e. WASA, must consider these aspects in achieving appropriate and optimize use of sewer and drainage system.

Mitigation Measures

- The operational sustainability can be achieved by adopting following measures: Establishment of Monitoring and Maintenance System for wastewater treatment before its final disposal into surface water bodies;
- Regular operation and maintenance of the scheme;
- Capacity building and training of workers;
- Periodic environmental monitoring;



- Sewage & storm water Conduit system should be designed in a such ways that withstand existing climate change issues e.g.: intense rainfall events and increase and decrease in temperature; and
- Cost for the operation and maintenance in the annual budget of WASA should be considered.

6.5.3.5 Maintenance Works

During the operation phase related road and conduit maintenance works will be conducted time to time which may lead to social and environmental issues like traffic management, inconvenience to local residents, public safety, vehicular emissions, dust and increase in noise. This is a temporary and moderate negative impact.

Mitigation Measures

- Best Management Practices should be used for all the maintenance works;
- Timely completion of all the maintenance works according to the agreed schedule;
- Traffic management plan should be devised and implemented; and
- HSE protocols should be strictly followed and implemented to avoid any incident/accident.

6.5.3.6 Drainage

During the operational phase, poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travellers and public due to flooding in the existing drainage line. In case of chocking of road drainage, the increased surface runoff due to heavy rains will accumulate at the surface and can cause traffic jams. The impact may consider to be moderate adverse in nature.

Mitigation Measures

- The impact can be controlled/reduced by timely and continuous maintenance/cleaning of the drainage system; and
- Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain along the road alignment.

6.5.3.7 Flora

Potential Impact

During operational stage of the Project, there will be minimal effect on flora or release of any significant pressure detrimental to flora. Low level impact is expected at operational phase on Flora due to the operation and maintenance activities. This impact is Site-specific, Temporary, Short-term, Irreversible, Unlikely and Low Significant.



Mitigation Measures

- The implementation of plantation plan recommends compensation for cutting of trees and work should be started during operational phase to ensure the ecological balance and to avoid any impact on local environment;
- Large scale planting with suitable indigenous trees, shrubs and ornamental plants in the form of tree groves, and linear plantation will be carried out in accordance with the Tree Plantation Plan to improve aesthetic value and offset the effect of removal of vegetation;
- Proper check and balance for above activities is highly recommended. Plantations so raised must be maintained according to the Silvicultural practices which includes proper irrigation, cleaning, pruning, thinning at prescribed intensity, silt clearance and trench-opening, etc.;
- Maintenance and security of the plantation should be done for at-least four years (in consultation with the PHA and forest department). Measures such as fencing, watch guards and fire protection should be considered; and
- All activities must be done under the technical supervision of PHA and forest department.

6.5.3.8 Fauna

Potential Impact

There is no protected area, game reserve, game sanctuary or national park in the project area so no major impact on wildlife and livestock in the area is expected through noise, vibration and any type of normal activity in the project area. This impact is Insignificant.

Mitigation Measures

- Strict control must be exercised for stoppage of killing/poaching of available wildlife species (if any) by enhancing protection practices; and
- The precautionary measures described for future shall also be applicable during operation phase as relevant for the conservation of wildlife species in the Study Area.



7 ENVIRONMENTAL MANAGEMENT PLAN

7.1 GENERAL

This section provides brief description of environmental issues, mitigation measures to eliminate or reduce environmental and social impacts to an acceptable level, institutional framework for the implementation of the mitigation measures and environmental monitoring plan for air quality, water quality, and noise pollution parameters during construction and operational phase. A budgetary plan is also developed, indicating estimated costs to be incurred to mitigate potential adverse impacts of the proposed Project.

7.2 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The main objectives of the Environmental Management Plan (EMP) are to:

- Provide the details of the Project impacts along with the proposed mitigation measures, and the corresponding implementation activities;
- To ensure that all necessary corrective actions are carried out and monitored in time to counter any adverse environmental impact under a systematic monitoring approach;
- Provide a procedure for timely action in the face of unanticipated environmental situation;
- Define the role and responsibilities of the Project Proponent (Punjab CBD Development Authority), Contractor(s), Supervisory Consultant(s) and other key players in order to effectively communicate environmental and social issues among them;
- Define a monitoring mechanism, reporting frequency and identify monitoring parameters to ensure that all the mitigation measures are completely and effectively implemented;
- Design the training and capacity building plan for enhancing the capacities of the Project Proponent (Punjab CBD Development Authority), Contractor(s), Supervisory Consultant(s) on environmental and social management;
- Identify the resources required to implement the EMP and outline the corresponding financing arrangements; and
- Define the requirements necessary for documenting compliance with EMP and communicating it to all the concerned regulatory agencies.

7.3 INSTITUTIONAL REQUIREMENTS

The institutional requirements for the Construction and Operation & Maintenance (O&M) phases of the proposed Project are provided in below sections.

7.3.1 Institutional Setup for Implementation and Management of EMP

The key players involved during construction phase of the proposed Project are the Punjab CBD Development Authority as employer/proponent, Punjab-EPA, the Supervisory



Consultant (SC) and the Contractor. The roles and responsibilities of these organizations are outlined below.

The following staff will be involved in the implementation of EMP:

- Punjab CBD Development Authority /Proponent / Employer;
- SC's; and
- Contractor's Environmental Manager.

The employer/ proponent (Punjab CBD Development Authority) will make Contractor bond through contract documents to implement the EIA including EMP and other terms and conditions of the Environmental Permit. The whole EMP will be included as a clause of the contract documents. Construction camps will be established after necessary approvals and submission of Site-Specific EMPs to be developed in the light of the relevant agencies requirements, before commencement of construction works. The organizational setup for implementation of EMP during construction phase is provided in **Figure 7.1**.

7.3.2 Overall Oversight Arrangements

A Project Steering Committee comprising of Chairman Punjab CBD Development Authority, Project Director (Punjab CBD Development Authority) and Deputy Director, Punjab CBD Development Authority will provide overall guidance and oversight and will be responsible for ensuring effective implementation of the project.

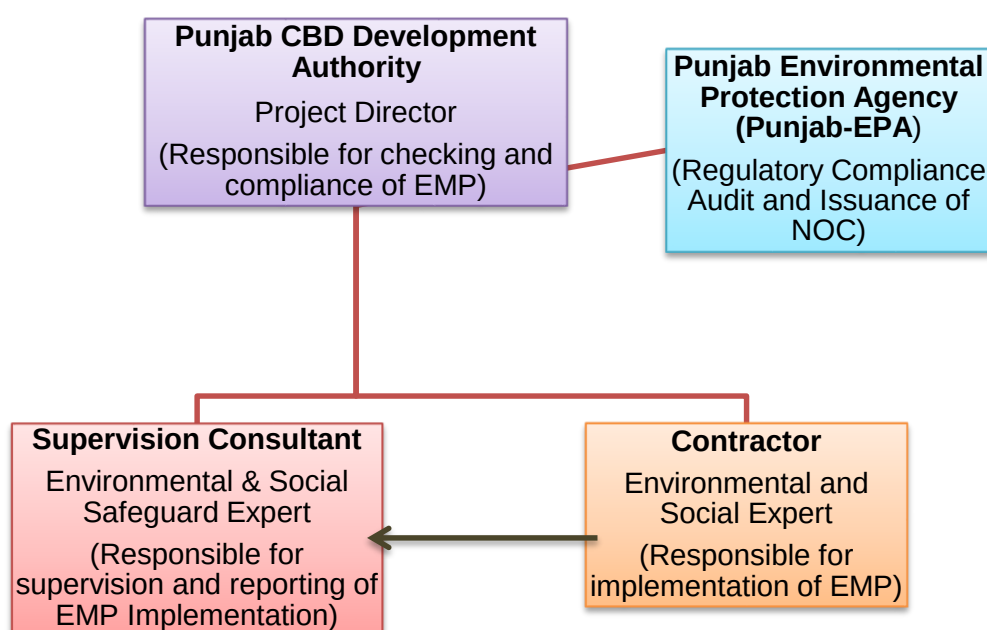


Figure 7.1: Organizational Setup for the Implementation of EMP (Construction Phase)



7.3.3 Roles and Responsibilities for EMP Implementation during Construction Phase

a. Punjab CBD Development Authority / Employer Concerned Staff

The specific responsibilities are as follows:

- Setting up systems for environmental management;
- Ensuring that the Contractor develop and carry out environmental implementation plans that are consistent with the EMP;
- Liaising between the project staff and the Supervisory Consultant's staff to monitor environmental and social compliance during construction phase;
- Ensuring that the required environmental and social training is provided to the concerned staff;
- Responsible for carrying out random site visits to the construction sites to review the environmental performance of the Contractors;
- Monitoring the progress of environment and social related activities;
- Make sure that the Contractor is implementing the additional measures, suggested by the Supervisory Consultant in monthly environmental monitoring reports;
- To support Construction Contractor for obtaining necessary approvals from the concerned departments;
- To develop operational guidelines and implementation schedule;
- Receiving complaints from nearby community and assisting the local authority including liaison with Punjab EPA;
- Ensuring availability of committed human resources and sufficient budget for successful implementation of EMP;
- To ensure that the proposed project is implemented in an environment friendly manner,
- Maintaining interface with the other lined departments/stakeholders; and
- Reporting through Contractor to the Punjab EPA on status of EMP implementation.

b. Supervision Consultant (SC)

Environmental and Social Experts (ESEs) of SC will oversee the performance of contractor to make sure that the contractor is carrying out the work in accordance with EMP as mentioned in the contract documents. He will provide guidance to the contractor's ESE for implementing each of the activity as given in EMP. ESEs will be responsible for record keeping, providing instruction through the Resident Engineer (RE) for corrective actions and will ensure the compliance of various statutory and legislative requirements.

However, overall responsibilities of ESEs are as follows:

- To oversee the performance of the Contractor to make sure that the Contractor is complying with EMP;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Discussing various environmental and social issues and environmental mitigation, enhancement and monitoring actions with all concerned personnel's;



- Inspect, supervise and monitor all the construction and allied activities related to the EMP for the project and oversee the performance of the Contractor to make sure that the Contractor is complying with EMP;
- Visiting construction sites including incomplete construction work sites, where there are no contractor's activities, active construction work sites, completed areas of work sites as well as ancillary sites such as borrow areas, quarries, asphalt and crusher sites, hot mix plant sites, construction camps and work shop areas to ensure contractors compliance with EMP stipulations and conditions of statutory bodies;
- Assisting contractor in all matters related to public contacts including public consultation pertaining to environmental and community issues;
- To organize periodic environmental training programs and workshops for the consultant's and contractor's environmental staff;
- Periodic reporting as mentioned in EMP; and
- Suggest any additional mitigation measures (if required).

c. Responsibilities of Contractor

Contractor will be bound through contract documents to appoint the Site Environmental and Social Expert (ESE) with relevant educational background and experience. ESE of contractor will carry out the implementation of the mitigation measures at construction site. The responsibilities of ESE of Contractor are as follows:

- ESE of contractor will be responsible for Implementation of the mitigation measures at construction site;
- Preparation of Site Specific EMP including Evacuation Plan, HSE Management Plan, Material Transportation Plan, Traffic Management Plan, Emergency Response Plan, Monitoring Plan, and asphalt and batching plant area plans, and will submit all the plans to the SC.
- Implementation of the EMP and to take effective measures against corrective actions plan;
- ESE will prepare the monthly compliance and monitoring reports as per schedule and will submit it to the SC;
- Provision of proper Personal Protective Equipment's (PPEs) to the workers and train them for their proper use;
- ESE will conduct the environmental, health and safety trainings for the staff and labor; and
- The Contractor shall submit the Code of Conduct that will apply to all of the contractor's staff. The contractor shall submit an outline of how the Code of Conduct will be implemented. The aspects to be addressed include:
 - Ensure compliance with applicable environment, health and safety standards and procedures associated with risks of Project activities;
 - Ensure compliance with all acquired approvals, applicable to the proposed Project;
 - Ensure protection of local community (including vulnerable and disable assemblies), and the Contractor's staff, sub-contractors and daily wage workers;
 - Ensure employment of fulltime security guards, and necessary security measures and instruments (CCTV) at site;



- Ensure provision of adequately stocked first aid kit at site for dealing with accidental injuries, and natural hazards;
- Prohibit use of illegal items such as weapons, alcohol and drugs at site;
- Ensure that Project property is protected against vandalism, theft, and noxious activity;
- Ensure that positive attitude of respect and warmth is given to staff and community members;
- Ensure good housekeeping practices shall be adopted at site;
- Ensure that employment decisions are not made on the basis of personal characteristics unrelated to inherent job requirements, including race, gender, nationality, religion or belief, disability, age, sexual orientation, or ethnic, social and indigenous origin;
- Ensure establishment and strictly enforcement of “No Sexual Harassment Policy”;
- Ensure provision of necessary sanitation requirements for site workers (both for men and women);
- Ensure workers only use specified sanitary facilities provided by their employer and not in open areas;
- Restriction on burning solid waste;
- Restriction on dumping solid and liquid waste into nearby water bodies;
- Prohibition for cutting trees, and clearing vegetative areas for construction camps, and for cooking purpose as a source of fuel; and
- Prohibition on illegal hunting of local fauna.

The Code of Conduct should be written in local and simple language (Urdu and English) and signed by each site staff to specify that they have received a copy of the code; code explained and clarified to them; acknowledged adherence to this Code of Conduct as a condition of employment; and understood that violations of the Code can result in serious consequences. A copy of the code shall be displayed at strategic location of the site, and mainly in the contractor’s site office.

d. Punjab Environmental Protection Agency (Punjab-EPA)

Punjab-EPA is the regulatory authority for issuance of NOC for the proposed Project. As part of its mandate, protection of environment is their responsibility. Therefore, the agency will undertake an audit (as and when required) of the activities of the Project (both phases i.e. Construction and Operation) with respect to the protocols as defined in EMP and in NOC. The specific responsibilities are as follows:

- Liaison with the Environmental Committee of Punjab CBD Development Authority on the proposed Project to ensure compliance of measures as given in the EMP and in NOC issued by them for the construction activities of the proposed Project;
- Environmental Audit of the activities being undertaken by the Environmental Committee of Punjab CBD Development Authority and all other relevant stakeholders as provided in the EMP and NOC through random site visits and meetings.



7.3.4 Institutional Arrangement for Implementation of EMP during O&M Phase

The proposed Project will be administrated by Punjab CBD Development Authority during the O&M phase. Therefore; it is suggested that the Project Director of the proposed Project shall depute / hire Environment and Social Expert (ESE) to monitor and implement EMP during operation phase.

The specific responsibilities of ESE are as follows:

- Coordinating with the operational staff working under the Project Director to monitor environmental compliance during operation phase;
- Advising on, and monitoring tree plantations along the road alignment as suggested in EMP;
- Reporting on the progress of environmental compliance to the Project Director and EPA-Punjab;
- Assess and propose mitigation measures for unforeseen long-term environmental and social impacts of operation; and
- Sustaining a working partnership among the Punjab CBD Development Authority, EPA-Punjab, PHA, Forest and Wildlife departments of Lahore District to ensure compliance of EMP during operation phase.

7.4 ENVIRONMENTAL MITIGATION AND MANAGEMENT MATRIX

Environmental Mitigation and Management Matrix (EMMM) is considered as one of the main elements of EMP. The EMMM provides the framework for the implementation of the mitigating measures against each identified potential adverse impacts, and management and monitoring of the same during the design, construction and operation phases of the proposed Project. **Table 7.1** provides information about all impacts to be raised due to project activities during different phases of the Project i.e. pre-construction, construction and operation.

The Contractor(s) will be responsible for the preparation of Site-Specific EMP along with the site-specific management plans based on the guidelines provided in this Section.

Table 7.1: Environmental Mitigation Matrix

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
Preconstruction / Design Phase					
1.	Land Acquisition The land associated with the proposed project is owned by the Government of Punjab. No private land acquisition is involved in the project as the construction activities will be carried out within the available land. Since, no private land acquisition is involved in the project, therefore, no impact is envisaged with respect to land acquisition at the design phase.	No impact is envisaged with respect to land acquisition at the design phase.	Audits and Checks	Design Consultant	Proponent
2.	Technical Design and Layout Planning Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the project area. Also low utilization of the available spaces and designing the structures without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality.	- The technical design of the proposed project must consider all the above-mentioned factors for the final design and should meet all the local and international standards; - The proponent must review and validate all the design considering the possible impacts (as mentioned) before the start of construction of proposed Project.	- Confirmation of design incorporation. - Audits and Checks	Design Consultant	Proponent
3.	Topography The project area is a plain terrain and	The project design would consider aesthetic concerns such as the Tree Plantation which is already	- Confirmation of design incorporation. - Audits and Checks	Design Consultant	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	the proposed project is going to be constructed on existing road, so, there is no significant change in the topography of the project area is expected.	recommended in the EIA Report; • Best engineering design measures should be adopted keeping in view the aesthetics of the project area; and • Ground disturbances should be limited to only the areas necessary for project related construction activities.			
4.	Storm Water Drainage / Urban Flooding The construction of proposed Project may be subjected to urban flooding as the project area has high frequency of rainfall during monsoon season. Improper design of storm water drainage of the proposed Project may result in stagnant water on the road.	• Provision of appropriate drainage structures with appropriate design capacity to avoid flooding especially during the rains; and • Proper slopes shall be incorporated in design to avoid the stagnant water.	• Confirmation of design incorporation. • Audits and Checks	Design Consultant	Proponent
5.	Seismic Hazard As per Building Code of Pakistan, Seismic Provisions, 2007, the project area is located in Seismic Zone 2A (low to moderate hazard), A high intensity earthquake impacting the project site can adversely impact the development.	• The proposed structure should be designed and constructed to withstand high earthquakes. For seismic hazard analysis, updated structural, geotechnical and seismic studies should be conducted; • To mitigate the seismic hazard, Seismic Building Code of Pakistan 2007 (SBC-07) should be adopted. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural, geotechnical and earthquake engineering.	• Confirmation of design incorporation. • Audits and Checks	Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
6.	Resource Conservation Resources involved in the construction of proposed Project would include construction materials, water and fuel. Construction material to be used for construction activities includes coarse aggregates, fine aggregates, asphalt, cementitious materials, reinforced and structural steel etc. Excessive water consumption for drinking and washing purposes by the construction staff may pressurize water resources in the project area. Fuel (diesel, petrol) will be used to operate construction machinery, asphalt and batching plants. Sustainable use of energy resources is very important not only to continue future use but also to reduce air emissions.	• Use potable water bowzers for construction works and mineral water bottles/ filtered or treated ground water for drinking purpose; • Plan for the provision/purchase of adequate insulation to reduce heat loss through batching plants; • Reduction of wastage of water through training of workers involved in water use; • Reuse of construction waste materials may be adopted wherever possible; • Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment; • Efficient and well maintained equipment and machinery should be used; • The equipment and machinery should be turned off when not in use; • Ensure adequate insulation to reduce heat loss through batching plants; • Regularly monitor CO and CO2 content of the flue gases to verify that combustion systems are using practical excess air volumes; • Use of solar panels at construction camps may be considered and plan for use of solar panels at operational phase may also be considered; and • A good camp design and an efficient worksite management plan can help the contractor to reduce the water	• Confirmation of design incorporation. • Audits and Checks	Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		demand, wastewater and solid waste volumes to the lowest levels.			
7.	Public Utilities Due to the proposed project, public utilities i.e. Electricity Poles, Power/Telephone Lines, etc. will be affected creating disruption of public services and inconvenience to the local residents.	- The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; and - All public utilities (e.g. electric lines, water pipes, power/ telephone lines, etc.) likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction works.	- Confirmation of design incorporation. - Audits and Checks	Design Consultant	Proponent
8.	Flora During the pre-construction phase, activities such as installation of construction camps, construction of temporary roads & mobility of construction staff may damage the local vegetation/trees. As the heavy machinery and camps will be moved and installed, which require significant space due to which available vegetation is expected to be removed.	- The camps, mobility of machinery and construction of temporary road should be proper planned and well designed to avoid any loss to local green cover; - It is recommended to establish the construction camps where minimum or no vegetation exists. - Similarly, the alternate routes for roads and points for camps are recommended where no loss of vegetation is expected; and - The location of construction camp should be selected so, as to have limited environmental impact during construction phase and to reduce the cost and land requirement.	Audits and Checks	Design Consultant	Proponent
9.	Fauna Movement and installations of	The standard measures must be adopted to minimize noise due to machinery movements and	Audits and Checks	Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	machinery and vehicles will take place so noise and habitat loss is expected. The routes of the available wildlife and other habitats may be affected due to camps set-up and machinery movements and installations	installations; - Wildlife movements and routes must be considered during activities and should be avoided to their maximum level; - The alternate routes and points are recommended to avoid any damage to locally available fauna; - The camps shall be properly fenced and gated to check the entry of animals in search of eatable goods; and - Similarly, wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them.			
Construction Phase					
10.	Soil Erosion and Contamination The clearing of vegetation can also loosen the soil and make it more susceptible to erosion due to wind and rain. Soil may be affected by erosion, compaction and contamination. Soil erosion may occur at active construction sites and at contractors' camps, as a result of uncontrolled run-off from equipment washing yards, excavation of earth/cutting operations and clearing of vegetation.	- Soil contamination by asphalt will be minimized by placing all containers in a bunded area away from water courses/drains; - Provision of impervious platform with oil and grease trap for collection of spillage during equipment and vehicle maintenance; - All spoils shall be disposed of safely and the site shall be restored back to its original conditions; - Non-bituminous wastes from construction activities shall be dumped in approved sites, in line with the legal prescriptions for dumpsites; - Solid waste generated at the camp sites will be properly treated and	- Visual observation and photographic record - Site restoration and rehabilitation plan implementation	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		safely disposed only in the demarcated waste disposal sites/areas; - If any contaminated soils are found, they shall be removed and deposited in a sealed pit in an area agreed with the concerned authorities; - Use of modern, well-maintained machinery and vehicles by the contractor to avoid leakages; and - Soils removed during construction would be stockpiled for reuse where possible.			
11.	Water Quality Groundwater may get contaminated from the wastewater generation from the construction camps, leachate from improper dumping of solid waste.	- Construction camp will be established in area with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that PEQS are met; - The proponent will ensure that the construction work is confined within the project boundary and water bodies are prevented from pollution during construction; - The solid waste will be disposed of in designated landfill sites to sustain the water quality for domestic requirements; - Regular water quality monitoring according to determined sampling schedule; - Water required for construction shall be obtained in such a way that the water availability and supply to nearby communities remain unaffected;	- Visual observation and photographic record - Regular environmental monitoring, sampling and testing reports - Site restoration and rehabilitation plan implementation	Construction Contractor	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		- The contractor will ensure that construction debris do not find their way into the drainage which may get clogged; - To maintain the surface water flow/drainage, proper mitigation measures will be taken for the proposed project, like drainage structures; - Wastes will be collected, stored and taken to approved disposal site; - Wastewater effluent from the Contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging into the natural streams. According to the PEQS, the BOD concentration in sewage must be brought down to less or equal to 80 mg/l before being discharged into a natural stream having capacity to dilute the effluent. For wastewater apart from BOD, COD of 150 mg/l will also be checked; and - Similarly, if the sewage after treatment is to be discharged into the land it will meet the requirements of the PEQS for disposal of wastewater.			
12.	Landscape Changes Visual intrusion from large piles of excavated and construction material is	- Material stockpiles should be removed as soon as work is completed and the area re-landscaped; and - The contractor should ensure minimal footprint of construction activities.	- Visual observation and photographic record - Site restoration and rehabilitation plan	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	one of the possible adverse impacts during the construction phase of the project.		implementation		
13.	Traffic Issues Due to the proposed project construction activities and movement of heavy project vehicles for construction material supply, traffic problems may arise for the commuters and transporters travelling especially through Walton Road and Ferozepur Road. The problems will include traffic jams and inconvenience to the public passing through the Project Area. It will also increase traffic load on the existing road network or access roads ultimately deteriorating the existing condition of the roads. The movement of vehicles along the haulage routes will cause soil erosion, debris flow, dust emissions, vibrational impacts, etc.	• Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime to reduce traffic load and inconvenience to the local population; • Construction vehicles, machinery and equipment will be parked at designated areas (at construction camps site) to avoid un-necessary congestions along the major roads; • Damages of roads due to construction vehicles will be instantly repaired and/or compensated after the completion of work; • Proper sign boards will be provided for smooth flow of traffic; • Period of construction and area / location of construction site shall be informed to public in general and specifically to local residents; • Any closure of the roads (especially main roads) and deviations / diversions proposed should be informed to the riders through standard signs and displays; and • Traffic Management Plan will be prepared by the contractor and implemented to avoid traffic accidents, jams/public inconvenience.	• Vehicle maintenance record • Training record • Implementation of TMP • Regular visual observations	Construction Contractor	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
14.	Deterioration of Ambient Air Quality Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. Besides, multifarious construction activities and increased vehicular traffic (construction vehicles) would also contribute to the localized airborne dust. The larger sized particles, under influence of gravity, tend to settle down in the immediate vicinity of the source. The Suspended Particulate Matter (SPM) of the size smaller than 10 micrometre (PM10) tends to remain suspended in the environment for much longer and persistent time and is an environmental hazard. The objectionable impacts of settling of the suspended dust would be its dry deposition on vegetation, motor vehicles, structures, and other exposed surfaces. Exhausts from fossil fuel	- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions; - Open burning of solid waste from the Contractor's camps and at construction site should be strictly banned; - Preventive measures against dust should be adopted for on-site mixing and unloading operations; - Construction materials (sand, gravel, and rocks) and spoil materials will be transported through trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS for carbon emissions and noise; - Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s); - Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions; - Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers.	- Visual observation - Regular environmental monitoring, sampling and testing reports - Vehicle maintenance records - Water sprinkling records.	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	burning in the construction machinery will also deteriorate local air quality. Similarly, exhausts from generators can also have impacts on air quality in the vicinity. The deteriorated ambient air quality may cause health hazards to the residents of nearby residential colonies and sensitive receptors e.g. Schools, Mosques, etc.	Diesel operated equipment should be equipped with well-maintained fuel filter and may be replaced timely (if required). In addition to that, regular maintenance activities comprising changing of lubricating oil, changing the air and fuel filter, cleaning the fuel system, draining the water separators and proper tuning may also help in reducing the emissions from diesel generators; • Construction equipment is generally left idling while the operators are on break or waiting for the completion of another task. Emissions from idling equipment tend to be high. Existing idling control technologies, which automatically shut the engine off after a preset time can reduce emissions, without intervention of the operators; • PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works; • Service roads (used for earthmoving equipment and general transport) should be regularly sprayed with water during dry weather; • All excavation work should be sprinkled with water; • Construction workers should be provided with masks for protection against the inhalation of dust;			

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		- Vehicles used for construction should be tuned properly and regularly to control emission of exhaust gases; - Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards; and - Regular monitoring of air quality in accordance with the formulated environmental monitoring plan.			
15.	Noise and Vibration The noise and vibration will be produced due to the operation of construction machinery equipment. Sources of noise and vibration during construction are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment's. Noise and vibration are perceived as one of the most undesirable consequences of construction activity. The above machinery is expected to generate noise levels that would be severe in the Project Area. The noise and vibration may cause health hazards	There are a variety of ways including Quieter Equipment; Modifying Existing Old Equipment; Barrier Protection; Work Activity Scheduling; Maintenance; Noise Perimeter Zones (NPZs) by which construction equipment and worksite noise can be controlled.	- Physical observation - Regular environmental monitoring, sampling and testing reports - Vehicle maintenance records	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	to the residents of nearby residential colonies and sensitive receptors e.g. Mosques and educational institutes etc.				
16.	Borrow Areas/ Open Pits Borrow / open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments. Borrow/ open pits may also result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the Project Area.	- Necessary permits will be obtained for any borrow pits from the competent authorities; - In borrow pits, the depth of the pit shall be restricted upto 5' and the sides of the excavation will have a slope not steeper than 1:4; - Soil erosion along the borrow pit shall be regularly checked to prevent/mitigate impacts on adjacent lands; and - In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.	- Visual observation and photographic record - NOC record of permits - Check and audits	Construction Contractor	Proponent
17.	Construction Camps/Camp Sites Improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which include health and safety, traffic problems, soil degradation, loss of vegetation and assets on the selected land, solid waste and water pollution in the vicinity settlements. Furthermore, cultural differences, behavior of construction workers, potential disregard	- The project will seek to avoid sitting camps where their presence might contribute to any conflicts with locals; - Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values; - Camps will be designed to be self-contained to reduce demand on infrastructure and services of nearby communities; - A comprehensive safety and security plan for the camp will be prepared which will comprise of a training	- Visual observation and photographic record. - Waste Management plan implementation	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	for local cultural norms can lead to increased tension between local communities and workers residing in the construction camps.	manual, use of safety equipment and emergency preparedness; • Training will be provided to all staff on camp management rules and overall discipline and cultural awareness; • Waste Management Plan will be implemented to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste; • Site for construction camp will be selected to minimize the removal of existing macro-plants at camp sites; • Photographical and botanical inventory of vegetation before clearing the site; • Compensatory plantation to be done when construction work near ends; and • The contractor(s) shall ensure removal and rehabilitation of site upon completion.			
18.	Wastewater Generation at Construction Camps Wastewater will be generated at the construction camps by the workers. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels etc. apart from soil contamination.	• Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks; • Proper monitoring to check the compliance of PEQS will be carried out; • Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit.	• Visual observation and photographic record. • Waste Management plan implementation	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
19.	Solid Waste Generation at Construction Camps The solid waste generation is estimated to be 52 kg/day¹⁶ for 116 construction workers during construction phase of the proposed Project. Different type of waste is likely to be generated during the construction phase of the proposed Project. The municipal waste will be in the form of food, cans, paper and wastewater from construction camps toilets and washing yards. Construction waste will include excavated soil, sand, gravel, rocks, asphalt, pieces of concrete, bricks, wood, metal pieces and electrical wires. Whereas, hazardous waste can be comprised of paints and construction chemicals. All these, if left unattended, can become a source of nuisance and environmental pollution in the Project Area. Insecure and unhygienic disposal of the solid wastes particularly garbage and trash may cause degradation of soil and land. Insecurely disposed off heaps of wastes containing kitchen garbage and	• Solid Waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; • Training of work force in the storage and handling of hazardous materials and chemicals Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste; proper labeling of containers, including the identification and quantity of the contents, hazard contact information, etc; • Waste disposal plan must be reviewed during the entire construction phase in the light of changing weather conditions; • Emergency response plan shall be prepared to address the accidental spillage of fuels and hazardous goods; • Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate technologies; • Reusing bitumen spillage; and	• Visual observation and photographic record. • Waste Management plan implementation	Construction Contractor	Proponent

¹⁶ Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day.

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	food waste can serve as breeding grounds for the disease spreading vectors and rodents. Throwing away of solid wastes into water channels and the wastewater network can result into choking of the latter.	disposing non-usable bitumen spills in a deep trench providing clay linings at bottom and filled with soil at the top (for at-least 0.5 m); - Used oil shall be collected in separate containers stored on impervious platform with restricted access and shall be sold to licensed contractor and the burning of waste oil shall be strictly restricted; - Segregating and stockpiling scarified/ milled bituminous material and reusing this material in sub grade/shoulders; - Construction waste such as waste wood can be recovered and recycled into wood for new building projects, and cement, bricks, and plaster can be crushed and reused in other construction and building projects; and - The contractor should ensure implementation of proposed Construction Waste Management Plan and it must be reviewed during the entire construction phase in the light of changing weather conditions.			
20.	Climate Change and Green House Gas Abatement The main sources of greenhouse gases (CO₂, CH₄, NO_x etc.) during the construction activities of the proposed	- Regular motioning of the vehicles for engine efficiency; - Avoid idling of construction vehicles; - Alternative energy resources shall be considered where possible; - PEQS applicable to gaseous emissions generated by construction	- Regular environmental monitoring, sampling and testing reports - Vehicle inspection record - Plantation record	Construction Contractor	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	project will include both mobile and stationary sources. The mobile source will be the construction and transportation vehicles while the stationary source will be the batching and asphalt plants.	vehicles, equipment and machinery shall be enforced during construction works.			
21.	Natural and Man-Made Disasters Natural disasters (earthquakes) and accidents such as fire, falls, slips and trips may result in injuries, financial losses and may even lead to deaths.	- An Emergency Response Plan (ERP) for earthquakes and manmade disasters should be developed by contractor in coordination with SC and Punjab CBD Development Authority should be implemented in close consultation with the RESCUE Services and other concerned departments; - Training of the Contractor and Punjab CBD Development Authority staff and employees regarding the emergency procedures and plans should be regularly conducted; - Emergency numbers should be clearly posted at active construction sites; and - Minor incidents and near misses should be reported, and preventive measures should be formulated accordingly by the Punjab CBD Development Authority management.	- Trainings, drills, record keeping - ERP implementation - Visual observation and photographic record.	Construction Contractor	Proponent
22.	Occupational Health and Safety Occupational Health and Safety (OHS) related impacts will arise during construction phase activities including	- Providing basic medical training to specified work staff and basic medical service and supplies to workers. - Complying with the safety precautions for the construction workers as per	- Implementation of HSE Plan - Use of PPEs - Training Records - Work permits	Construction Contractor	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	clearing of earth, levelling, compaction, carpeting, pavement finishing and testing & commissioning. Eye injury can be caused by stone or metal particles. Hazard of being hit by falling objects, major hand-arm and whole body vibration hazards, skin and respiratory tract irritation from exposure to cement dust, overexertion and awkward postures etc. will be another impact. Welding hazards include electric shock, fumes and gases, fire and explosions, falls from height, eye and head injuries etc. Other impacts will be fall from height, contact with heavy electrical and mechanical equipment, equipment failure, uncontrolled movement, unguarded moving mechanical equipment parts, fatigue, unbalanced load, falling objects, hand injury, slip and trip hazards, wind / storm activity, injury from releasing load too soon etc. Operating mechanical and electrical equipment will trigger the OHS related issues e.g. struck by moving vehicles or other equipment, slips or trips, struck by flying objects, such as dirt or splashed fluids, caught in pinch points, shear	International Labour Organization (ILO) Convention No. 62, as far as applicable to the Project Contract. • Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves and protective masks, goggles, shields and monitoring their proper and sustained usage. • Contractor will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site. • Work areas will be cordoned off where necessary. • Contractors will instruct their staff to use Personnel Protective Equipment (PPE) (e.g., wire containment, displaying warning signs along the work site, communicating advance warnings to mats) to enhance the safety. • Safety lookouts will be built to prevent people and vehicles from passing at the time of hot or cold work. • An emergency management plan must be devised by the contractor in close coordination with the provincial emergency services.	• Implementation of Emergency response plan and disaster management plan in case of natural disaster occurrence		



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	points, crush points, falling from machine etc.				
23.	Community Health and Safety The construction activities and vehicular movement at construction sites may result in roadside accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. The proposed project will also have potential of air (dust pollution), noise and vibrational impacts on nearby community	• Providing basic medical training to specified work staff and basic medical service and supplies to workers; • There will be proper control on construction activities and oil spillage leakage of vehicles; • The labourers with different transmittable diseases will be restricted within the construction site; • Ensure that the site is restricted for the entry of irrelevant people particularly children; • Efforts will be made to create awareness about road safety among the drivers operating construction vehicles; • Timely public notification on planned construction works; • Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links; • Seeking cooperation with local educational facilities (school teachers) at each village along the route for road safety campaigns; • Provision of proper safety and diversion signage at sensitive/accident-prone spots; • Setting up speed limits in close consultation with the local stakeholders;	• Implementation of HSE Plan • Use of PPEs • Community concerns record • Medical reports of worker	Construction Contractor	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		- The mitigation measures provided in the following sub-sections for air and noise shall be adopted to reduce the air pollution, noise pollution and vibrational impacts on nearby community; - The communicable disease of most concern during construction phase, like Sexually-Transmitted Disease (STDs) such as HIV/AIDS, will be prevented by successful initiative typically involving health awareness; education initiatives; training health workers in disease treatment; immunization program and providing health service; - Reducing the impacts of vector borne diseases will be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which include prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water; - The Contractor will prepare the construction camp management plan which, in addition to other components, will include the labor influx management plan; and - Contractor will take due care of the			

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions.			
24.	Flora The project will not involve any destruction of vegetation cover on construction areas. However, exhaust of noxious gases from movement of heavy machinery and dust will pollute air which will adversely affect health and vigor of plants. During construction activities, the Contractor's workers may damage the vegetation and trees in the surroundings.	• Cutting and / or disturbance of trees shall be avoided, as far as possible; • A tree plantation program shall be implemented with the recommendations and technical support of PHA; • NOC for tree cutting from PHA is mandatory; • Open fires should be banned in the area to avoid hazards of fire in the area; • Clearing of vegetation cannot be avoided at the areas specified for project structures, but damage to the natural vegetation may be minimized by establishing camp sites, workshops and batching plants on waste/barren land rather than on forested or green land. • However, if such type of land is not available, it shall be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth; • Construction vehicles, machinery and equipment will remain confined within their designated areas of movement; • The Contractor's staff and labor shall	• Implementation of Tree Plantation Plan • Visual Observations	Construction Contractor in association with PHA or Forest Department	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		be strictly directed not to damage any vegetation such as trees or bushes; and Contractor shall provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall be strictly prohibited.			
25.	Fauna The existing population of birds, mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. Noise generated from machinery particularly during the night hours will even scare the wildlife residing in habitats located at some distance from the construction areas.	- Care shall be taken during construction activities for avoiding purposely or chance killing of animals; - If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed; - Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard; - The Contractor must be held responsible for instructing his work force accordingly and for enforcing this restriction. In addition, this shall have to be controlled by the Wildlife Department. - Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding; - Noise generating activities shall not be carried out during the night by the	Visual Observations	Construction Contractor	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		work force; - Wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them; and - Noise produced due to construction activities may be kept to acceptable level.			
26.	Discovery of Heritage Sites/ Structures during Excavation During excavation, there is a chance of finding artifacts. In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate General (DG) of Archeology, Government of Punjab to take further suitable action to preserve those antiques or sensitive remains.	Chance finds procedure shall be adopted in case of any accidental discover of cultural heritage.	Implementation of chance find procedure	Construction Contractor	Proponent
27.	Social/ Cultural Conflicts During the construction phase of the project, conflicts may arise between labor force and local communities. Use of local resources (existing infrastructure and utilities) by the construction workers can generate stress on the local residents. Furthermore, difference in cultural values may also cause discomfort to local residents.	- Local labor should be preferably employed for the construction works; - Careful planning and training of work force to minimize disturbance to the local people; and - Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals.	- Visual observations - Regular monitoring, audit and checks	Construction Contractor	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
28.	Traffic, Noise, Privacy Issues and Disturbance/Nuisance to People Approach/ hindrance problems for the local residents in the surrounding areas, business owners and movement of the daily commuters will be disturbed due to construction activities. The movement of construction material carrying vehicles will cause traffic congestions at the entrance/exits of abovementioned housing societies. Moreover, the construction activities will produce dust and noise pollution that will cause nuisance to the residents of the surrounding housing schemes. There will be issues of privacy for the local residents due to construction of high-rise buildings.	- Assurance of timely completion of the construction works according to the agreed schedule by LDA; - Provision of alternate routes for the project site where the construction is being carried out; - Effective traffic management the Lahore Traffic Police during the peak hours to avoid traffic congestions and provide ease of traffic; - Continuous water sprinkling at the active sites to suppress the dust; - Restricting the construction activities to only daytime; and - Contractor should prepare and strictly implement SOPs for the workers to protect the privacy of the residents.	- Visual observations - Regular monitoring, audit and checks	Construction Contractor	Proponent
O&M Phase					
29.	Landscape After the completion of the proposed Project, the overall environmental conditions of the Project Area will greatly improve due to elimination of stagnant wastewater, plantation of trees and ornamental plants and rehabilitation of walton road.	Proper implementation of the tree plantation plan will improve landscape of the project area.	Monitoring of plant maintenance activities records	Proponent	

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
30.	Ambient Air Quality Increased traffic levels in the project area may lead to higher values of air emissions that will affect the ambient air quality of the Project Area.	- Client with the help of Punjab EPA may set up system to monitor air quality along project area at important intersections/sensitive receptors in accordance with PEQS for a specific period to record the quality of air during the operation phase. This may help in comparing the baseline conditions with the operation phase of the project; - Setting up to system to monitor air quality along the project area in accordance with acceptable International Standards; Monitoring emissions of vehicle as per PEQS; - Helping the owners and occupants of the affected premises/settlements to identify and implement special measure such as hedges and vegetation to reduce air pollution; and - Increasing vegetation in the form of greenbelt is one of the preferred methods to mitigate air pollution. Plants generate oxygen, serve as a sink for pollutants, reduce the flow of dust and reduce the noise pollution too alongside the proposed project.	- Visual observation - Regular environmental monitoring, sampling and testing reports - Vehicle maintenance records	Proponent	
31.	Noise The movement of vehicles and usage of horns will create noise which will be a hazard for the nearby residents/built-up areas.	Provision of adequate noise barriers such as hedges and indigenous tree species will reduce the noise. Further Improvement can be made by enforcing the laws and getting the vehicles tested, regularly after a specific time period, by some	- Physical observation - Regular environmental monitoring, sampling and testing reports - Vehicle maintenance records	Proponent	



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		reputable vehicle testing laboratory and obtaining a certificate. Noise measurements should be carried out at locations with respect to the schedule specified in the Environmental Monitoring Plan (EMMP) to ensure the effectiveness of mitigation measures; • Use of horn should be strictly prohibited in the close proximity of the built-up areas; • Proper signboards should be installed to ensure reduce noise levels in the project area; • Enforcement and penalties against traffic rules violators; and • Noise barriers may be installed/constructed near the built-up areas.			
32.	Operational Sustainability The most pressing need is the sustainability of Sewage & storm water collection system and its disposal, and it can be assessed on many factors including capacity issues of government departments dealing with municipal services, efficiency of the system and its performance, life cycle analysis (aging and deterioration), natural hazards (earthquakes, floods and fire outbreaks), escalation in population growth and	• The operational sustainability can be achieved by adopting following measures: Establishment of Monitoring and Maintenance System for wastewater treatment before its final disposal into surface water bodies; • Regular operation and maintenance of the scheme; • Capacity building and training of workers; • Periodic environmental monitoring; • Sewage & storm water Conduit system should be designed in a such ways that withstand existing climate	• Implementation of WMP • Regular monitoring, sampling and testing • Regular monitoring, audit and checks	Proponent	

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	energy requirements.	change issues e.g.: intense rainfall events and increase and decrease in temperature; and Cost for the operation and maintenance in the annual budget of WASA should be considered.			
33.	Maintenance Works During the operation phase related road and conduit maintenance works will be conducted time to time which may lead to social and environmental issues like traffic management, inconvenience to local residents, public safety, vehicular emissions, dust and increase in noise.	- Best Management Practices should be used for all the maintenance works; - Timely completion of all the maintenance works according to the agreed schedule; - Traffic management plan should be devised and implemented; and - HSE protocols should be strictly followed and implemented to avoid any incident/accident.	- Regular monitoring, sampling and testing - Regular monitoring, audit and checks	Proponent	
34.	Drainage During the operational phase, poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travellers and public due to flooding in the existing drainage line. In case of chocking of road drainage, the increased surface runoff due to heavy rains will accumulate at the surface and can cause traffic jams.	- The impact can be controlled/reduced by timely and continuous maintenance/ cleaning of the drainage system; and - Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain along the road alignment.	- Implementation of WMP - Regular monitoring, sampling and testing - Regular monitoring, audit and checks	Proponent	
35.	Flora During operational stage of the Project,	The implementation of plantation plan recommends compensation for cutting of trees and work should be started	- Tree plantation plan - Visual observations - Audit and Checks	Proponent in association with PHA or Forest Department	

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	there will be minimal effect on flora or release of any significant pressure detrimental to flora. Low level impact is expected at operational phase on Flora due to the operation and maintenance activities.	during operational phase to ensure the ecological balance and to avoid any impact on local environment; • Large scale planting with suitable indigenous trees, shrubs and ornamental plants in the form of tree groves, and linear plantation will be carried out in accordance with the Tree Plantation Plan to improve aesthetic value and offset the effect of removal of vegetation; • Proper check and balance for above activities is highly recommended. Plantations so raised must be maintained according to the Silvicultural practices which includes proper irrigation, cleaning, pruning, thinning at prescribed intensity, silt clearance and trench-opening, etc.; • Maintenance and security of the plantation should be done for at-least four years (in consultation with the PHA and forest department). Measures such as fencing, watch guards and fire protection should be considered; and • All activities must be done under the technical supervision of PHA and forest department.			
36.	Fauna There is no protected area, game reserve, game sanctuary or national park in the project area so no major	• Strict control must be exercised for stoppage of killing/poaching of available wildlife species (if any) by enhancing protection practices; and • The precautionary measures	• Visual observations • Audit and Checks	Proponent in association with Wildlife Department	

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	impact on wildlife and livestock in the area is expected through noise, vibration and any type of normal activity in the project area.	described for future shall also be applicable during operation phase as relevant for the conservation of wildlife species in the Study Area.			
37.	Impact on Tranquility of Residential Area and Issues of Privacy Due to commercialization of the area may affect the residential character and peacefulness of the catchment area. It may cause lot of traffic problems and environmental pollution. The change in land use (open and green area to commercial and construction of high- rise buildings) will pose privacy issues and accident hazards. The socio-economic impacts due to traffic congestion, air pollution and traffic delays may include loss of work time, waste of fuel, reduced efficiency of people due to adverse impacts on human health and resultant increase on health expenditures.	- The designers should ensure that the concerns on invasion of privacy are alleviated and eased; - To minimize inconvenience of residents living in the surrounding area there should be proper designing of the high-rise buildings; - The activities of persons should be confined to the relevant area and entry of the general public should be banned in the restricted areas; - Awareness should be created among the employees of the CBD to care the privacy of the local residents; - Improvements in the design to promote sustainable development of commercial areas; and - Land use policies such as development restrictions and zoning codes (residential or commercial) and implementation of LDA By-Laws.	- Visual observation - Regular monitoring, - Record keeping	Proponent	



7.5 ENVIRONMENTAL MONITORING PLAN

Environmental monitoring provides timely and useful information to the project management and implementation agencies. It helps in timely identification/analysis and removal of the bottlenecks and expedites actions. Environmental Monitoring will be undertaken during both the construction and operational phases, to ensure the effectiveness of the proposed mitigation measures against identified adverse environmental impacts during the EIA report preparation.

The objectives of environmental monitoring plan during the construction and O&M phases will be as follows:

- Monitor the actual project impacts on physical, ecological and socio-economic receptors;
- Recommend mitigation measures for any unforeseen impact or where the impact level exceeds the anticipated level in the EIA;
- Ensure compliance with legal and community obligations including safety during construction and O&M phases;
- Ensure the safe disposal of excess construction materials, solid waste, water and wastewater and gaseous emissions;
- Appraise the adequacy of the EIA with respect to the project's predicted long-term impacts on the area's physical, ecological and socio-economic environment;
- Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements in EMP, if required; and
- Compile periodic incidents/accidents data to support analyses that will help to minimize future risks.

7.5.1 Monitoring Strategy

Under the proposed monitoring strategy, it is recommended that Punjab CBD Development Authority should be responsible for all the monitoring activities. All the findings and results in the form of monitoring report will be finally shared with Punjab-EPA. The monitoring program has been designed carefully considering the identified impacts mentioned in **Chapter-6**. **Table 7.2** provides environmental monitoring schedule for construction and operations stages of the proposed Project.

7.5.2 Responsibilities for Environmental Testing and Reporting

The Contractor will be responsible for environmental monitoring and reporting throughout the construction phase under the supervision of Supervision Consultant (SC); in coordination with Project Director, PCBDDA. During construction phase, environmental testing reports will be prepared on quarterly basis and one comprehensive report will be prepared at the end of the construction phase and will be submitted to PCBDDA for its submission to Punjab EPA.

During the first year of the project operation, PCBDDA will be responsible to conduct environmental testing and monitoring along with its cost through Punjab EPA certified lab. The reports will be prepared biannually and one comprehensive report will be prepared annually and submitted to the Punjab-EPA. Contents of the final report will include results of



environmental monitoring in comparison to the standards for the various parameters, location and sampling time along with recommendations for the future environmental testing and monitoring.

7.5.3 Budget Estimate for Environmental Monitoring and Compliance

Budget Estimate for Environmental Monitoring and Compliance during the Construction and Operation Phase has been summarized in **Table 7.3**.

Table 7.2: Environmental Monitoring Schedule

Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	Duration
1.	Water Resources/ Water Quality	Monitoring of Physical, Chemical and Biological parameters and its compliance with PEQS, 2016 for surface water and drinking water.	- Major receptors are residential areas and educational and health institutes within the study area of the proposed project. - Other proposed effluent discharge points are: - Contractors camps; - Concrete preparation plants; - Fuel (Petrol. Oil and Grease) products storages; and - Vehicle and machines repairing and servicing yards.	- Visual checks of laboratory activities; and - Discrete grab sampling and laboratory testing of water samples by Punjab-EPA Certified Laboratory for monitoring.	- Once before the start of construction activities; - On quarterly basis during the construction phase; - Bi-annually for at least one year during O&M phase; and - Visual inspection daily.	- Punjab CBD Development Authority - Contractor - Punjab CBD Development Authority	As per PEQS, 2016.
2.	Soil Contamination	Soil contamination due to effluent / surface runoff and uncontrolled solid waste disposal activities at sites.	- Along Access Roads (proposed project); and - Other proposed sampling sites are: - Construction camps; - Equipment washing yards; - Spillage points of	- Visual observations and checking of laboratory activities; - Sampling and laboratory testing for soil samples.	- Once before the start of construction activities; - On quarterly basis during the construction phase; - Bi-annually for at	- Punjab CBD Development Authority - Contractor - Punjab CBD Development Authority	

Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	Duration
			fuel, chemicals and lubricants.		least one year during O&M phase; and • Visual inspection daily.		
3.	Dust Emissions	Monitoring of PM ₁₀ and PM _{2.5} and its compliance with PEQS, 2016 for Ambient Air.	Sensitive receptors within the study area of the proposed Project. However; estimated sampling points are three (3) which will be verified during construction stage.	• Visual checks of laboratory activities; • Onsite Ambient Air Monitoring Equipment; and • Daily visual monitoring of dust emissions at construction route.	• Once before the start of construction activities; • On quarterly basis during the construction phase; and • Bi-annually for at least one year during O&M phase.	• Punjab CBD Development Authority • Contractor • Punjab CBD Development Authority	
4.	Noise Pollution	Monitoring of Noise Level and its compliance with PEQS 2016 for Noise.	Sensitive receptors within the study area of the proposed Project. However; estimated sampling points are three (3) which will be verified during construction stage.	• Visual checks of laboratory activities; and • Onsite Noise Monitoring using Sound Meter.	• Once before the start of construction activities; • On quarterly basis during the construction phase; and • Bi-annually for at least one year during O&M	• Punjab CBD Development Authority • Contractor • Punjab CBD Development Authority	

Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	Duration
5.	Fumes and gases	Monitoring of CO, CO ₂ , SO _x , NO _x , Lead and PM _{2.5} PM ₁₀ , Vehicular emissions and its compliance with PEQS 2016.	Sensitive receptors, concrete plants, construction camps and vehicular emissions within the study area of the proposed Project. However; estimated sampling points are three (3) which will be verified during construction stage.	• Visual checks of laboratory activities; • Onsite Ambient Air Monitoring Equipment; and • Daily visual monitoring of dust emissions at construction route.	phase. • Once before the start of construction activities; • On quarterly basis during the construction phase; and • Bi-annually for at least one year during O&M phase.	• Punjab CBD Development Authority • Contractor • Punjab CBD Development Authority	
6.	Ecological Resources	Disturbance to natural habitat and uncontrolled floral cutting which can be avoidable.	Natural habitats within the COI of the proposed alignment. Construction camps	• Visual checks to ensure that only marked trees are cut within the Project corridor; and • Monitoring of Wildlife / birds hunting.	• Once before the start of construction activities; and • Visual inspection daily / weekly during construction phase. • Annually for at least one year during O&M.	• Punjab CBD Development Authority • Contractor • Punjab CBD Development Authority	
7.	Safety of workers	Medical record of workers	Construction site.	• Checking of accident/ near miss records. • Medical surveillance of	• On quarterly basis during the construction	• Contractor	



Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	Duration
8.	Restoration of work sites	Site cleared and no solid and construction waste along the alignment	The road alignment and camp sites	Construction workers • Visual inspection	phase. • After completion of construction work	• Contractor	



Table 7.3: Budget Estimate for Environmental Monitoring and Compliance

Components	Parameters	Quantity (No. of samples x No. of Locations x Frequency)	Frequency	Responsibility	Duration	Cost (Rs.)
A) Construction Phase (12 Months)						
Ambient Air Quality	Visual checks and monitoring of SO ₂ , NO, NO ₂ , CO, Suspended Particulate Matter, PM ₁₀ , PM _{2.5} according to PEQS, 2016.	1x2x3= 6	Quarterly @ Rs. 35,000 per sample	CC and SC	24 hours	210,000/-
Noise Level	Noise level monitoring (Day and Night) as per PEQS, 2016.	1x2x3= 6	Quarterly @ Rs. 2,000 per point	CC and SC	24 hours	12,000/-
Drinking Water Quality	Sampling and laboratory testing of water samples by Punjab-EPA approved Laboratory as per PEQS, 2016.	1x1x3=3	Quarterly @ Rs. 25,000 per sample	CC and SC	-	75,000/-
Surface Water Quality	Sampling and laboratory testing of water samples by Punjab-EPA approved Laboratory as per PEQS, 2016.	1x1x3=3	Quarterly @ Rs. 25,000 per sample	CC and SC	-	75,000/-
TOTAL (A) =						372,000/-
B) Operation Phase (12 Months)						
Ambient Air Quality	CO, NO ₂ , SO ₂ , Lead, SPM, PM _{2.5} and PM ₁₀	1x2x2 = 4	Biannually @ Rs. 35,000 per sample	Punjab CBD Development Authority	24 hours	140,000 /-
Noise Level	Day and night time levels on dB (A) Scale (min-max)	1x2x2 = 4	Biannually @ Rs. 2,000 per point	Punjab CBD Development Authority	24 hours	8,000/-



Components	Parameters	Quantity (No. of samples x No. of Locations x Frequency)	Frequency	Responsibility	Duration	Cost (Rs.)
Drinking Water Quality	Discrete grab sampling and laboratory testing of water samples by Punjab-EPA approved Laboratory for monitoring.	1x1x2 = 2	Biannually @ Rs. 25,000 per point	Punjab CBD Development Authority	-	50,000/-
Surface Water Quality	Discrete grab sampling and laboratory testing of water samples by Punjab-EPA approved Laboratory for monitoring.	1x1x2 = 2	Biannually @ Rs. 25,000 per point	Punjab CBD Development Authority	-	50,000/-
TOTAL (B) =						248,000/-
GRAND TOTAL (A+B) =						620,000/-

KEY

CC Construction Contractor
CBD Central Business District

SC Supervision Consultant

Notes:

- Provision must be given in annual budget of operation phase for environmental monitoring. For this, the cost of operation phase (i.e. Rs. 248,000/-) must be considered with an annual increment of 10%.
- The Environmental Monitoring Cost for next years of construction phase will be calculated accordingly.
- All the environmental parameters will be analyzed as per Punjab Environmental Quality Standards (PEQS), 2016.



7.6 TREE PLANTATION

No tree cutting is involved in the project. However, to minimize the negative impacts arising due to increased vehicular activity in the Study Area and to enhance the landscape of the project area, plantation at available spaces may be carried out especially along sides and at the median of roads.

Plantation Plan shall be carried out by the Client in coordination with PHA or Forest Department, which has the requisite expertise and experience for such tasks.

Total 7,000 trees will be planted in compensation of 700 affected trees. The tentative cost for the plantation is about Rs. 24 Million. Detailed Tree Plantation Plan is attached as **Annex-IX**.

7.7 TRAINING AND CAPACITY BUILDING

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

Punjab CBD Development Authority will be responsible to engage TA consultant to conduct environmental and social training programs. The objective of the TA will be as follows:

- To help in establishment of appropriate systems;
- To train senior Punjab CBD Development Authority staff, Contractor and Sub-Contractor workers and Supervision Consultant employees, responsible for managing environment and social tasks and planning during construction and post construction phase; and
- Training courses on specialized areas such as air, water and noise pollution monitoring.

Table 7.4 provides brief detail of the capacity building and training plan for the proposed project.

Table 7.4: Capacity Building Programs and Technical Assistance Services

Provided by	Contents	Trainees	Duration
TA Individuals, Consultants and Organizations specializing in Environmental Management and Monitoring	Short Seminars and Courses on: • Environmental laws and regulations; • Environmental Sustainability; and • Environmental Management and Monitoring Plan (EMMP)	Members of Environmental Committee, Punjab CBD Development Authority Staff and Contractor Workers	3 Days



Provided by	Contents	Trainees	Duration
TA Individuals, Consultants and Organizations specializing in Social Management and Monitoring, and Occupational Health and Safety	Short Seminars and Courses on: • Occupational Health and Safety Plan (OHS); • Basic First Aid; • Occupational and Community Health and Safety Management; • Labour Camp Management; • Traffic Management; • COVID-19 Protection and Control; • Use and Importance of Personal Protective Equipment's (PPEs); and • Fire Safety and Emergency Response Measures.	Members of Environmental Committee, Punjab CBD Development Authority Staff and Contractor Workers	3 Days
TA Individuals, Consultants and Organizations specializing in Environmental and Social Management and Monitoring	Short Seminars and Courses on: • Environmental Management Plan (EMP); • Environment Health and Safety Management; • Occupational Health and Safety; • Basic First Aid; • Waste Management; • Fire Safety and Emergency Response Measures; • Electrical Safety; and • Use and Importance of Personal Protective Equipment's (PPEs)	Operation and Maintenance Staff of Punjab CBD Development Authority	3 Days

7.8 COMMUNICATION & DOCUMENTATION

Communication and documentation is an essential feature of EMP. The key features of such mechanism are:

7.8.1 Data Recording and Maintenance

All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.

7.8.2 Database

The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliances;



- Corrective actions
- List of environmental data; and
- List of environmental data to be maintained:
 - Soil and land pollution;
 - Disposal of waste;
 - Water resources;
 - Fuel oil and chemical spills;
 - Vegetation record;
 - Noise pollution;
 - Air and dust pollution;
 - Socio-economic data; and
 - Ecological sensitivities.

7.8.3 Meetings and Reporting

Monthly meetings will be held at site during the construction phase. The purpose of these meetings will be to discuss the routine activities, non-compliances and their remedial measures. Various reports will also be produced at periodic time intervals, as provided in **Table 7.5** along with information regarding persons responsible for report preparation and review process. Additionally, minutes of meeting will also be submitted as part of routine environmental reports.

Table 7.5: Periodic Reporting Mechanism

Sr. No.	Report Category	Prepared by	Reviewed by
1	Monthly	Contractors' environmental staff	Punjab CBD Development Authority / SC
2	Quarterly	Contractors' environmental staff	Punjab CBD Development Authority / SC
3	Semi-Annual Environmental Monitoring Report	Construction Supervision Consultant (CSC)	Punjab CBD Development Authority / SC
4	Annual Report	Contractors' environmental staff	Punjab CBD Development Authority / SC
5	Completion Report	Contractors' environmental staff	Punjab CBD Development Authority / SC

7.8.4 Social Complaint Register

The Contractor will maintain a register of complaints record from local communities and measures taken to mitigate these concerns.

7.8.5 Photographic Records

Contractors will maintain photographic records during the implementation of the proposed Project. As a minimum, the photographic records will include the site photographs, all the roads, camp sites and monitoring activities, etc.



7.8.6 Non-Compliance of the EMP

The implementation of the proposed EMP involves inputs from various functionaries. The Contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of Project, for which the Contractor will be paid on the basis of monthly compliance reports. However, if the Contractor fails to comply with the implementation of EMP and submission of the monthly compliance reports, deductions will be made from the payments to the Contractor claimed under the heads of environmental components.

7.8.7 Review of Recorded Data

All the data and communication recorded and maintained by the Contractor will be periodically reviewed and checked by SC and Punjab CBD Development Authority and necessary action will be recommended to Contractor to improve the recording and documentation.

7.9 MANAGEMENT PLANS

Various site-specific management plans will be prepared by Contractor as a part of EMP for the better management and implementation of EMP during all phases of the proposed Project. However, approval of these site-specific plans from Punjab CBD Development Authority should be sought before start of construction activities. These site-specific plans are listed below but not limited to these:

- Tree Plantation / Reforestation Plan;
- Health, Safety and Environment (HSE) Management Plan;
- Emergency Preparedness and Response Plan;
- Site Restoration and Rehabilitation Plan;
- Waste Management Plan;
- Disaster Management Plan;
- Drinking Water Supply and Sanitation Plan;
- Solid Waste Management Plan;
- Management Plan to combat with Covid-19;
- Traffic Management Plan;
- Change Management Plan; and
- Resource Conservation Plan.

7.10 ENVIRONMENTAL MITIGATION COST

The contractor will be responsible for implementation of mitigation measures and environmental Monitoring during construction phase, whereas Punjab CBD Development Authority will be responsible for implementation of mitigation measures and environmental Monitoring during operation phase. For an effective implementation of environmental mitigation measures during construction and operational phase, it is very important to provide sufficient funds for the implementation of environmental and social mitigation



measures, monitoring and training. The estimated cost of environmental and social mitigation measures, monitoring and training is given in the **Table 7.6**.

Table 7.6: Environmental Mitigation Cost

Sr. No.	Activity	Description	Cost (Rs.)	Rationale
1.	Medical screening for workers	Rs. 5,000 per person for 116 employees <i>At time of deployment:</i> $116 \times 5,000 \times 1 = 580,000$ <i>Construction Phase:</i> $116 \times 5,000 \times 2 = 1,160,000$	1,740,000/-	Medical screening of the workers before deployment on site and twice a year during whole construction period.
2.	Water Sprinkling	Sprinkling of water to control dust at site on alternate day @ 60,000/Month	720,000 /-	Sprinkling of water to control dust emissions at site during whole construction period.
3.	Handling of solid waste	Includes the cost of collection, segregation, transportation, disposal and management of domestic, commercial and construction wastes	360,000/-	Rs. 30,000 per month for 12 months to collect waste at construction camps and construction waste from all the active sites on daily basis.
4.	Health and Safety of Workers	For 116 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi Vis) and provision of dust bins, warning tap, safety cones and safety sign boards.	1,239,600/-	For detail, please refer to Annex-X .
5.	Environmental and Social Expert	Environmental and Social Expert to monitor / conduct all HSE related activities e.g. TBTs, PPEs, housekeeping, safety signage, emergency preparedness, etc. during construction and operational phase <i>Construction Phase:</i> $1 \times 12 \times 200,000 = 2,400,000$ <i>Operational Phase:</i> $1 \times 12 \times 200,000 = 2,400,000$	4,800,000/-	Cost for hiring Environmental and Social Expert along with their monthly logistics during construction and operational phase.
6.	Environmental Testing Cost	Ambient air, drinking water, surface water and noise	620,000/-	Refer to Table 8.3 for detailed schedule and cost of environmental testing during construction and operation phase.
7.	Cost of environmental and social training	Short Seminars, Courses, Trainings and Lectures on Environment, Social and Occupational, Health and Safety constituents and components (Rs.	300,000/-	Refer to Table 8.4 for details.



Sr. No.	Activity	Description	Cost (Rs.)	Rationale
		100,000/- per session twice a year during construction phase). <i>Construction Phase:</i> $3 \times 100,000 = 300,000$		
8.	Environmental Audit	Environmental Auditing through third party twice a year during construction and operational phase $2 \times 500,000 = 1,000,000$ <i>Operational Phase:</i> $2 \times 500,000 = 1,000,000$	2,000,000/-	Cost for at least two auditors along with logistics, travels and accommodation charges.
9.	Tree Plantation	No tree cutting is involved. However, to enhance the landscape of the project area, plantation (1000 trees) at available spaces may be carried out especially along sides and at the median of roads.	24,000,000/-	For detail, please refer to Annex-IX
Total =			35,779,600/-	

*Environmental Cost for one (01) year of construction phase

The total estimated cost for the environmental management, monitoring and auditing during construction and O&M (annual cost will be calculated for next upcoming years accordingly) comes to about **PKR 35.78 Million**.



8 CONCLUSION AND RECOMMENDATIONS

8.1 GENERAL

This section depicts conclusion and recommendations of the EIA study for the proposed Project i.e. Up-gradation of Walton Road. The EIA report has been prepared in accordance with the requirements of the Punjab Environmental Protection Act, 1997 (Amended 2012 & 2017).

8.2 CONCLUSION

Central Business Districts (CBDs) are impeccable areas of traffic attractions exacerbated by the increase of rapid population density, enormous urbanization, and increasing economic and commercial activities. Traffic congestion in the CBD areas is a perpetual problem for sustainable urban development.

After Up-gradation of Walton Road along with improved facilities, it will provide an efficient transport corridor in the Project area as well as cater the traffic issues of CBD. Main objective of the proposed Project is to provide a safe, congestion free and high speed facility to the commuters of Project area.

Significant efforts were made to identify the main physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed Project. Various stakeholders including government departments and agencies were also contacted for obtaining salient information in this regard along with that from area residents. After the construction of the proposed Project, people living in the Project area and the road users / travelers will get the following major benefits:

Reduced Travelling Time: The road conditions and the load of traffic on the road will be resolved with the implementation of the proposed Project and the commutes at this section will become easier, time saving and comfortable.

Employment Opportunities: Upgradation of Walton Road will generate employment opportunities for skilled and unskilled labors and for business owners in and around the Project area during construction phase.

Increased Accessibility: The Project will increase accessibility to residential colonies, health care facilities, educational institutes and commercial facilities in the vicinity of the area.

Social Benefit: Increased accessibility will increase the land value of the area and will also save time and fuel for travelling in the area. Moreover, lesser wear and tear of vehicles and lesser stress due to conflicts/accidents are the social benefits expected as result of this Project.



Ecological Benefit: Planting of new trees in two rows on either side of the proposed road will enhance the landscape and aesthetic values of the area, and will absorb CO₂ emissions through photosynthesis, emitted from an expected large number of cars, vehicles and public transport, thus purifying air of hazardous particles.

During the pre-construction, construction and operational phases, following are the main issues and concerns:

- Disturbance to infrastructure and public utilities;
- Disturbance to the public movement and cultural norms during construction;
- Reduction in the daily routine activities of local residents during construction;
- Noise and air pollution due to the working of construction machinery during construction and traffic operation phases of the Project;
- Solid waste and wastewater generation during construction;
- Oil spillages from construction machinery, resulting in soil and groundwater contamination;
- Surface water bodies contamination due to soil erosion and construction activities; and
- Occupational and community health and safety issues.

Project will be environment friendly, if EMP is implemented in true letter and spirit. Results of the EIA Study have shown that there are no critical environmental impacts associated with the Project. However, several concerns / impacts with regard to physical, ecological and social environment have been identified in report, which needs to be mitigated by strict implementation of Environmental Management Plan. These impacts could also be reduced by proper and well planned meticulous design of the facility and by implementing an appropriate tree plantation plan. In fact, in times of diminishing economic and natural resources, using sustainable approaches in transportation infrastructure will help us to enhance quality of life and serve the transportation needs of the present leaving provision for future generations to meet their needs.

An Environmental Management Plan (EMP) for both the phases (construction and operation) has been developed as part of the report, which provides a detailed mitigation matrix that covers impacts, mitigation measures, roles and responsibilities, and timings to avoid, minimize or mitigate the adverse impacts of the proposed Project.

8.3 RECOMMENDATIONS

Based on the field visit, environmental monitoring and analysis of primary and secondary data, the following recommendations have been conferred so that the Proponent gets the necessary direction and clarity to ensure efficient environment friendly and compliant operation:

- The proposed road and associated facilities will be designed and constructed to withstand high magnitude earthquakes as per Seismic Building Code of Pakistan, 2007;



- Proper location(s) for construction camps should be selected by contractor in close coordination with Client that cause minimal/no damage to the prevailing environmental conditions of the Project area;
- Formulation and implementation of a comprehensive safety and security plan by contractor before the start of the construction activities for the camps which will be comprised of a training manual, use of safety equipment, emergency preparedness and code of ethics;
- Wearing of Personal Protective Equipment (PPEs) such as helmet, masks, adequate footwear for bituminous pavement works, protective goggles and gloves will be made compulsory during construction activities and formulation and implementation of Health and Safety Plan (HSP) for construction workers;
- Preparation and implementation of Solid Waste Management Plan during construction stage by contractor in close coordination with concerned authorities for collection, reuse, recycling and disposal of waste;
- A provision of adequate budget in the overall cost of the Project and on-site space for plantation as per guidelines of the concerned departments will be provided in the design of proposed Project to compensate tree cutting and to eradicate air pollution. Moreover, tree plantation must be considered along the road side to create a buffer zone for the noise pollution arising from the road traffic;
- Surface runoff and wastewater generated during construction stage will be controlled and collected in septic tanks and soakage pits;
- Dust and fugitive emissions will be controlled by maintenance of equipment, fine tuning of the vehicles and regular sprinkling of water on soil;
- Noise and vibration will be controlled by equipment maintenance, by providing noise barrier and by scheduling the construction activities to avoid peak activity hours in the area; and
- EMP, its mitigation and monitoring programs will be included within the Bidding documents for Project works for all components. The Bidding documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own site specific EMP, which will adopt all of the conditions of the EMP. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

ANNEXES

ANNEX-I: SURVEY TOOL FOR PUBLIC CONSULTATION



**REMODELING OF WALTON ROAD, LAHORE
PUBLIC CONSULTATION**

Project: _____

1- Identification:

Date _____

Settlement: _____

Tehsil: _____ District: _____ UC _____

Location of Meeting _____ Resource Person _____

Contact No. _____

2- Introduction of the Project: _____

3- Impacts of the Project

What types of impacts do you expect due to implementation of project in the area?

4- Question & Response

Question	Response



[illegible]



NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

Sr. No.	Name	Occupation	Signature/ Thumb (NIC)

Conducted by:

Name: _____Signature_____

ANNEX-II: ENVIRONMENTAL MONITORING REPORT

REMODELING OF WALTON AND CONDUIT

Main Walton Road, Lahore

ENVIRONMENTAL MONITORING, SAMPLING & TESTING REPORT

Monitored by:

**INTEGRATED
LABORATORY**



ENVIRONMENT

Head Office: Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman, Lahore, Pakistan.

Tell Office: +92 42 35960091 : **Email:** inenvconsultants@yahoo.com;

Peshawar Office: Suite # 302, Level III, Afzal Appartements, Phase III Chowk, Peshawar.

Tell Office : +92 91 5852913: **Web:** www.iec-consultants.com

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LIST OF ACRONYMS

APHA	American Public Health Association
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CO ₂	Carbon Dioxide
CO	Carbon Monoxide
µg/m ³	Micro Gram per Cubic Meter
mg/m ³	Milligram per Cubic Meter
NO _x	Nitrogen Oxides
PM	Particulate matter
PEQS	Punjab Environmental Quality Standards
PDWQS	Punjab Drinking Water Quality Standards
PEQSAA	Punjab Environmental Quality Standards for Ambient Air
SO ₂	Sulphur Dioxide
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

EXECUTIVE SUMMARY

Environmental Monitoring

In compliance with regulatory requirements, Environmental monitoring as part of baseline environmental monitoring for Impact Assessment study was conducted by the **M/S Integrated Environment Laboratory (IEL)** at two pre selected points. The main purpose of monitoring is to figure out the state of environmental conditions (ambient air, water and ambient noise) at predefined sites. In this regard mutually agreed sampling points near sensitive receptors were selected to conduct comprehensive environmental testing.

The monitoring of ambient Particulate Matter (PM₁₀, PM_{2.5}), SO_x, NO_x, CO, Noise Level, Physical and Chemical parameters of drinking water and wastewater samples was carried out. The monitoring was carried out keeping in view the requirements of, Punjab Environmental Quality Standards (PEQS) to ascertain the compliance status at the site.

The findings of the onsite environmental monitoring are as follow:

A) Ambient Air Particulate Matter (PM₁₀ & PM_{2.5})

Ambient particulate matter (PM₁₀ & PM_{2.5}) was monitored from two locations.

Parameters	GPS Coordinates	Location
Ambient Air Particulate Matter		
Location-1	31°28'05.2"N 74°20'57.7"E	Near PEL Factory, Opposite Packages Mall, Walton Road, Lahore
Location 2	31°25'57.1"N 74°21'24.4"E	Near Medix Hospital, Ferozpur Road Lahore

The monitored data for ambient particulate matter (PM₁₀) after its processing revealed that the concentration of particulate matter (PM₁₀) in ambient air during the 24 hours average monitoring were carried out at two locations. These monitored values are incompliance with the prescribed value of the Punjab Environmental Quality Standards for Ambient Air (PEQSAA).

B) Ambient Gases

Ambient gaseous monitoring (CO, SO_x, and NO_x) was carried out from two predefined locations

Parameters	GPS Coordinates	Location
Ambient Gases		
Location-1	31°28'05.2"N 74°20'57.7"E	Near PEL Factory, Opposite Packages Mall, Walton Road, Lahore
Location 2	31°25'57.1"N 74°21'24.4"E	Near Medix Hospital, Ferozpur Road Lahore

The monitored data for ambient gases (CO, SO₂, and NO₂) after its processing revealed that the concentration of these gases in ambient air during the 24 hours average were in compliance with the prescribed value of the PEQSAA.

C) Noise Levels

The monitored data for noise levels at two different locations during day and night times revealed that all the measurements are in compliance with the PEQS prescribed values for day and night times. However, it is recommended that during construction of project the workers may be provided with the ear muffs in high noise like during excavation of topsoil, cutting and welding of steel bars.

Parameters	GPS Coordinates	Location
Ambient Noise		
Location-1	31°28'05.2"N 74°20'57.7"E	Near PEL Factory, Opposite Packages Mall, Walton Road, Lahore
Location 2	31°25'57.1"N 74°21'24.4"E	Near Medix Hospital, Ferozpur Road Lahore

D) Drinking Water

One drinking water sample was collected from Qainchi Chowk Walton Road Lahore . The analyses were carried out in comparison to Punjab Environmental Quality Standards for Drinking Water to assess their quality. The data for drinking water analysis revealed that all the parameters are in compliance with Punjab Drinking Water Quality Standards-Pakistan.

E) Wastewater

One wastewater sample was collected from main drain of Walton road. The analyses were carried out in comparison to Punjab Environmental Quality Standards for Wastewater to assess their quality

F) Conclusion

This Environmental Monitoring Report recognizes relative environmental concerns at different sites with respect to its ambient air, noise level, and drinking water to provide the appropriate mitigation measures to contractor to be incorporated into their environmental management plans. The obtained results were then used to comprise the profiles of natural and socioeconomic environments likely to be affected by the project.

Environmental monitoring results confirms no hazardous gaseous emissions or liquid effluent that could harm the environment of the project site or its vicinity is produced.

No negative impacts were found on the macro-environment of the project. There is no significant impact on the demographic pattern or on the social and cultural values of the settled population.

INTRODUCTION

1. Environmental Monitoring Plan

In accordance to the Punjab Environmental Quality Standards (PEQS) and Environmental, Health and Safety standards, the contractor of the project will be liable to show the compliance of all environmental parameters. Therefore, to fulfill these compliance requirements and to ascertain the state of environment at site, environmental monitoring was carried out for the following environmental parameters:

- A. Ambient Air for Particulate Matter (PM₁₀ PM_{2.5}) Gases (CO, NO, NO₂ and SO₂)
- B. Ambient Noise Levels.
- C. Drinking Water Analysis.
- D. Wastewater

2. Monitoring Objective

The main objective of the Environmental Monitoring is to ensure that all the necessary corrective actions are carried out to counter any adverse environmental impacts and that enhancement measures are used where feasible and practical. One of the goals of the monitoring program is to regularly monitor those factors which may affect the safety of the environment under a systematic monitoring approach. The emissions from any project concern need to be consistently measured and monitored in order to understand their impact on environment. This growing awareness is developing a sense of responsibility among the projects to play a pivotal role in improvement of the environment according to National and International Standards.

3. Methodology for Monitoring

The standard methods were employed for the analysis of environmental parameters. The detail of each method has been duly described in the respective section.

4. Calibrations

The equipments were calibrated using the prescribed methods before to go for monitoring. During the monitoring hours the calibration was checked to ensure the quality of the results.

SECTION - 1

AMBIENT AIR MONITORING FOR PARTICULATE MATTER

1.1 General

This section deals with the ambient particulate matter monitoring that was carried out for assessment of (PM₁₀, and PM_{2.5}) concentration at two locations near sensitive receptors of the proposed project. The monitoring was carried out from the ambient condition of the site.

Parameters	GPS Coordinates	Location
Ambient Air Particulate Matter		
Location 1	31°27'56.4"N 74°21'10.6"E	Near PEL Factory, Opposite Packages Mall, Walton Road,Lahore
Location 2	31°28'40.7"N 74°21'30.0"E	Near Medix Hospital, Ferozpur Road Lahore

1.2 Methodology

Air Quality Monitoring System (AQMS-65) was employed for PM₁₀ and PM_{2.5} is a fully integrated air monitoring station that delivers 'near reference levels' of performance parameters. With a size of large suitcase it can measure up to 20 different gaseous and particulate pollutants and environmental parameters simultaneously. The AQMS 65 offers the optimal balance between performance and measuring criteria pollutants to WHO air quality limits.

➤ Particle Counter (Profiler)

The particle counter can be integrated into the AQM 65 along with gas analyzer modules to give continuous and simultaneous measurement of dust/particulate and gas.

Designed for those who want maximum data from a single sensor, the particle profiler module provides continuous and simultaneous measurement of PM₁₀, and PM_{2.5}. This breadth of measurement is valuable in research and monitoring studies and industrial applications where more than one size fraction is of interest.

➤ Sensor specifications

Sensor Code	AQM: AQM PP8 AQS: AQS PP8
Range	PM _{2.5} 2000 µg/m ³ PM ₁₀ 5000 µg /m ³ Optional Particulate Counts: 0.3, 0.5, 0.7, 1.0, 2.0, 3.0, 5.0, 10 microns (counts range: 0-100,000 counts/L)
Sensor Type	Optical Particle Counter
Accuracy	< ± (5 µg/m ³ + 15% of reading)
Flow Rate	1L per minute

1.3 Results and Discussions

Ambient particulate matter (PM₁₀, and PM_{2.5}) was monitored) from two locations. The monitored data for ambient particulate matter (PM₁₀, and PM_{2.5}) after its processing revealed that the concentration of particulate matter (PM₁₀, and PM_{2.5}) in ambient air during the 24 hours average monitoring values are in compliance with the prescribed value of the Punjab Environmental Quality Standards for Ambient Air (PEQSAA)

SECTION-2

AMBIENT AIR MONITORING FOR GASES

2.1 General

This section deals with the ambient gaseous monitoring for Carbon monoxide (CO), Sulphure Dioxide (SO₂) and Oxides of Nitrogen (NO_x) at two locations of proposed project site, the monitored locations are given below;

Parameters	GPS Coordinates	Location
Ambient Air Gases		
Location 1	31°27'56.4"N 74°21'10.6"E	Near PEL Factory, Opposite Packages Mall, Walton Road,Lahore
Location 2	31°28'40.7"N 74°21'30.0"E	Near Medix Hospital, Ferozpur Road Lahore

2.2 Methodology

Air Quality Monitoring System (AQMS-65) was employed for Ambient Air Temperature, Pressure and Gases (CO, NO, NO₂ & SO₂) is a fully integrated air monitoring station that delivers 'near reference levels' of performance parameters. With a size of large suitcase it can measure up to 20 different gaseous and particulate pollutants and environmental parameters simultaneously. The AQMS 65 offers the optimal balance between performance and measuring criteria pollutants to WHO air quality limits.

➤ Carbon Monoxide Analyzer Module

The CO module is a continuous sensor-based carbon monoxide analyzer used to detect pollutant gas in ambient air. It can also be used to detect point source emissions. The module is designed for use in the AQM 65 compact air monitoring station and AQS mini air quality station.

The carbon monoxide analyzer module incorporates next-generation electrochemical cells with nano-catalyst coated working electrodes that provide higher sensitivities. The lowest possible detection limits are achieved by proprietary signal processing and maintaining the AQM 65 enclosure at a constant temperature.

Just like a traditional analyzer using NDIR gas filter correlation, this sensor-based CO module can be field calibrated using standard calibration equipment and gases. This ensures direct traceability to USEPA (40 CFR Part 53) and EU (2008/50/EC) certified equivalent method instruments.

In contrast to traditional analyzers using NDIR gas filter correlation, the CO module is compact, lightweight, and costs 5 x less to own and operate.

➤ Nitrogen Dioxide Analyzer Module

Just like a traditional analyzer using chemiluminescence, this sensor-based system can be fully field calibrated using standard calibration equipment and gases. This ensures direct traceability to USEPA (40 CFR Part 53) and EU (2008/50/EC) certified equivalence and reference methods.

In contrast to traditional analyzers using chemiluminescence, the NO₂ module is compact, lightweight, and costs 5 x less to own and operate.

➤ **Nitrogen Oxide Analyzer Module**

The NO_x module is a continuous sensor-based nitrogen oxide analyzer used to detect pollutant nitrogen oxide gas in ambient air. The module is designed for use in the AQM 65 compact air monitoring station.

The NO_x analyzer module incorporates Aeroqual's proprietary gas-sensitive semiconductor (GSS) sensors. This sensor is similar to the GSS O₃ but with a tuned microstructure for NO_x detection. A thermal scrubber removes the effect of ambient ozone and a zero cycle compensates for sensor drift and interference effects from humidity and VOCs. Finally, the module has an integrated NO to NO₂ converter that is >95% efficient.

Just like a traditional analyzer using chemiluminescence, this sensor-based NO_x module can be field calibrated using standard calibration equipment and gases. This ensures direct traceability to USEPA (40 CFR Part 53) and EU (2008/50/EC) certified equivalent method instruments.

In contrast to traditional analyzers using chemiluminescence, the NO_x module is compact, lightweight, and costs 5 x less to own and operate.

➤ **Sulfur Dioxide Analyzer Module**

The SO₂ module is a continuous sensor-based sulfur dioxide analyzer used to detect pollutant gas in ambient air. It can also be used to detect point source emissions. The module is designed for use in the AQM 65 compact air monitoring station.

The sulfur dioxide analyzer module incorporates next-generation electrochemical cells with nano-catalyst-coated working electrodes that provide higher sensitivities. The lowest possible detection limits are achieved by proprietary signal processing, adding a zero cycle scrubber, and maintaining the AQM 65 enclosure at a constant temperature.

Just like a traditional analyzer using UV fluorescence, this sensor-based SO₂ module can be field calibrated using standard calibration equipment and gases. This ensures direct traceability to USEPA (40 CFR Part 53) and EU (2008/50/EC) certified equivalent method instruments.

In contrast to traditional analyzers using UV fluorescence, the SO₂ module is compact, lightweight, and costs 5 x less to own and operate.

2.3 Results and Discussions

The monitored data for ambient gases (CO, SO₂, NO, NO₂) after its processing revealed that the concentration of these gases in ambient air during the 24 hours monitoring period are incompliance with the prescribed value of the PEQSAA.

SECTION-3 NOISE LEVELS MONITORING

3.1 General

This section deals with the measurements of noise levels at two locations of proposed project followings;

Parameters	GPS Coordinates	Location
Noise Level		
Location 1	31°27'56.4"N 74°21'10.6"E	Near PEL Factory, Opposite Packages Mall, Walton Road,Lahore
Location 2	31°28'40.7"N 74°21'30.0"E	Near Medix Hospital, Ferozpur Road Lahore

3.2 Methodology

Digital Sound level meter with the following specifications was employed during the noise levels measurements.

HME® 9011 Sound Levels Meter
IEC651 Type 2 & ANISI.4TYPE2
Japan.

3.3 Features

- Accuracy: ± 1.5 dB (under reference condition)
- Frequency range: 31.5 Hz to 8.5K Hz
- Linearity range: 50 dB
- Measuring level: 30 – 130 dB(A), 35 – 130 dB(C)
- Digital display: 4 digits
- Resolution: 0.1 dB
- Display: 0.5 secretary
- Bar graph: 50 dB scale at 1 dB step for monitoring current sound pressure level display period: 50 mS.

3.4 Calibration

Instrument has an inbuilt calibration mechanism. Before each round calibration was made and also checked during measurement period.

3.5 Results and Discussions

The monitored data for noise levels at two locations of the project revealed that all the measurements are in compliance with the NEQS prescribed values for commercial area.

SECTION - 4 WATER ANALYSIS

4.1 General

This section deals with the sampling and analysis of the Drinking water and Wastewater samples collected from different locations and analyzed as per the client requirements.

Nature of sample	GPS Coordinates	Location
Water Samples		
Drinking Water	31°27'56.4"N 74°21'10.6"E	Qainchi Chowk Walton Road, Lahore
Wastewater	31°28'40.7"N 74°21'30.0"E	Walton Road wastewater Drain, Lahore

4.2 Sampling and Analysis Methodology

One drinking water and one wastewater samples were collected from different locations. High density sterilized polyethylene bottles were used for the sampling. The collected samples were preserved, sealed and chilled at 4°C as recommended.

APHA standard methods used for the sampling and preservation of water and Surface Water. The following standards methods were used for analysis.

- American Water Works Association (**AWWA**) and
- American Public Health Association (**APHA**)

4.3 Results and Discussion

The analyses were carried out in comparison to Punjab Environmental Quality Standards for Drinking Water and Wastewater to assess their quality. The data for drinking water analysis revealed that all the parameters are in compliance with Punjab Drinking Water Quality Standards, while the analysis data for wastewater sample revealed that all the parameters are in compliance with Punjab Wastewater Quality Standards.

PICTORIAL VIEW OF ENVIRONMENTAL MONITORING



Ambient Air & Noise Monitoring at Location

31°28'05.2"N 74°20'57.7"E





Ambient Air & Noise Monitoring at Location 31°25'57.1"N 74°21'24.4"E
Near Medix Hospital Ferozpur Road Lahore



Drinking water sample Qainchi Chowk Walton Road, Lahore 31°27'56.4"N 74°21'10.6"E



Wastewater Sample from Walton Road wastewater Drain, Lahore 31°28'40.7"N
74°21'30.0"E



AMBIENT PARTICULATE MATTERS MONITORING REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Monitoring Location:	Near PEL Factory, Opposite Packages Mall, Walton Road, Lahore
Monitoring Date:	04/05-05-2023	Source:	Ambient Air
GPS Coordinates:	31°28'05.2"N 74°20'57.7"E	Monitoring Instrument:	AQMS 65

Sr. No	Time	Parameters		Results (Average 24 Hrs)	
		PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀
	Hours	Units ($\mu\text{g}/\text{m}^3$)	Units ($\mu\text{g}/\text{m}^3$)		
1.	08:00 P.M	21.97	73.13	17.83 ($\mu\text{g}/\text{m}^3$)	49.39 ($\mu\text{g}/\text{m}^3$)
2.	07:00 P.M	19.7	74		
3.	08:00 P.M	17.78	72.45		
4.	09:00 P.M	17.03	75.74		
5.	10:00 P.M	17.06	45.41		
6.	11:00 P.M	17.42	44.7		
7.	12:00 A.M	17.36	42.17		
8.	01:00 A.M	16.96	40.95		
9.	02:00 A.M	15.86	37.73		
10.	03:00 A.M	14.63	36.21		
11.	04:00 A.M	13.86	34.48		
12.	05:00 A.M	14.26	35.96		
13.	06:00 A.M	14.76	33.24		
14.	07:00 A.M	15.13	32.51		
15.	08:00 A.M	12.87	31.99		
16.	09:00 A.M	14.75	29.26		
17.	10:00 A.M	13.89	28.73		
18.	11:00 A.M	22.79	58.09		
19.	12:00 P.M	22.09	58.52		
20.	01:00 P.M	21.67	56.83		
21.	02:00 P.M	21.26	57.68		
22.	03:00 P.M	20.39	59.96		
23.	04:00 P.M	22.07	60.87		
24.	05:00 P.M	22.59	64.86		
PEQSAA				35 ($\mu\text{g}/\text{m}^3$)	150 ($\mu\text{g}/\text{m}^3$)

PEQSAA: Punjab Environmental Quality Standards for Ambient Air

Note:

- Selected measurement units were $\mu\text{g}/\text{m}^3$ otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

Signature of Analyst:

Signature of Chief Chemist

FOR ENVIRONMENTAL MONITORING, ANALYSIS & SURVEYS

Street No. 09, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan

Toll: +92 91 5202323 Cell: +92 3000391053 Email: inenvconsultants@yahoo.com www. iec-consultants.com

Environmental Protection Agency (EPA-KPK) Certified



AMBIENT PARTICULATE MATTERS MONITORING REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Monitoring Location:	Near Medix Hospital, Ferozpur Road Lahore
Monitoring Date:	05/06-05-2023	Source:	Ambient Air
GPS Coordinates:	31°25'57.1"N 74°21'24.4"E	Instrument:	AQMS 65

Sr. No	Time	Parameters		Results (Average 24 Hrs)	
		PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀
	Hours	Units	Units		
		($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)		
1.	05:30 P.M	31.04	90.55	28.01 ($\mu\text{g}/\text{m}^3$)	92.76 ($\mu\text{g}/\text{m}^3$)
2.	06:30 P.M	28.77	91.42		
3.	07:30 P.M	26.85	89.87		
4.	08:30 P.M	26.1	93.16		
5.	09:30 P.M	26.13	91.61		
6.	10:30 P.M	26.49	90.9		
7.	11:30 P.M	26.43	88.37		
8.	12:30 A.M	26.03	87.15		
9.	01:30 A.M	24.93	83.93		
10.	02:30 A.M	28.89	98.65		
11.	03:30 A.M	28.12	96.92		
12.	04:30 A.M	28.52	98.4		
13.	05:30 A.M	29.02	95.68		
14.	06:30 A.M	29.39	94.95		
15.	07:30 A.M	27.13	94.43		
16.	08:30 A.M	29.01	91.7		
17.	09:30 A.M	28.15	91.17		
18.	10:30 A.M	29.72	92.46		
19.	11:30 A.M	29.02	92.89		
20.	12:30 P.M	28.6	91.2		
21.	01:30 P.M	28.19	92.05		
22.	02:30 P.M	27.32	94.33		
23.	03:30 P.M	29.00	95.24		
24.	04:30 P.M	29.52	99.23		
PEQSAA				35 ($\mu\text{g}/\text{m}^3$)	150 ($\mu\text{g}/\text{m}^3$)

PEQSAA: Punjab Environmental Quality Standards for Ambient Air

Note:

- Selected measurement units were $\mu\text{g}/\text{m}^3$ otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

Signature of Analyst:

Signature of Chief Chemist

FOR ENVIRONMENTAL MONITORING, ANALYSIS & SURVEYS

Street No. 09, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan

Tell: +92 91 5202323 Cell: +92 3000391053 Email: inenvconsultants@yahoo.com www. iec-consultants.com

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AMBIENT GASEOUS MONITORING REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Monitoring Location:	Near PEL Factory, Opposite Packages Mall, Walton Road, Lahore
Monitoring Date:	04/05-05-2023	Source:	Ambient Air (Gases)
GPS Coordinates:	31°28'05.2"N 74°20'57.7"E	Monitoring Instrument:	AQMS 65

Sr. No	Time	Parameters			
		CO	NO	NO ₂	SO ₂
		Units			
	Hours	(mg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)
1	06:00 P.M	0.48	9.32	12.25	11.41
2	07:00 P.M	0.53	10.17	12.43	11.28
3	08:00 P.M	0.45	10.24	12.7	10.55
4	09:00 P.M	0.56	10.99	11.61	10.68
5	10:00 P.M	0.59	10.39	11.48	10.83
6	11:00 P.M	0.48	10.57	11.59	9.91
7	12:00 A.M	0.46	11.11	11.95	10.53
8	01:00 A.M	0.41	10.25	12.1	11.72
9	02:00 A.M	0.37	9.41	11.62	9.55
10	03:00 A.M	0.43	9.18	11.74	10.04
11	04:00 A.M	0.41	9.96	12.32	11.47
12	05:00 A.M	0.39	10.29	11.43	11.14
13	06:00 A.M	0.4	11.1	11.86	10.71
14	07:00 A.M	0.38	9.38	11.71	10.37
15	08:00 A.M	0.39	8.95	12.54	11.22
16	09:00 A.M	0.56	10.13	11.79	11.5
17	10:00 A.M	0.53	10.2	11.33	10.43
18	11:00 A.M	0.52	9.45	11.49	10.24
19	12:00 P.M	0.52	11.24	11.37	10.02
20	01:00 P.M	0.53	10.45	11	10.33
21	02:00 P.M	0.58	10.21	10.43	10.7
22	03:00 P.M	0.56	9.74	11.29	10.86
23	04:00 P.M	0.58	10.49	11.58	11.15
24	05:00 P.M	0.61	9.73	11.68	11.02
Average Concentration		0.48	10.12	11.72	10.73
PEQSAA		05 (24 hr)	40 (24 hr)	80 (24 hr)	120 (24 hr)

PEQSAA: Punjab Environmental Quality Standards for Ambient Air

Note:

- Selected measurement units were mg/m³ and µg/m³ otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request.
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FOR ENVIRONMENTAL MONITORING, ANALYSIS & SURVEYS

Street No. 09, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan
 Tell: +92 91 5202323 Cell: +92 3000391053 Email: inenvconsultants@yahoo.com www. iec-consultants.com
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AMBIENT GASEOUS MONITORING REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Monitoring Location:	Near Medix Hospital, Ferozpur Road Lahore
Monitoring Date:	05/06-05-2023	Source:	Ambient Air (Gases)
GPS Coordinates:	31°25'57.1"N 74°21'24.4"E	Monitoring Instrument:	AQMS 65

Sr. No	Time	Parameters			
		CO	NO	NO ₂	SO ₂
		Units			
	Hours	(mg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)
1.	05:30 P.M	0.63	16.69	22.03	18.34
2.	06:30 P.M	0.68	17.54	22.21	18.21
3.	07:30 P.M	0.6	17.61	22.48	17.48
4.	08:30 P.M	0.71	18.36	21.39	17.61
5.	09:30 P.M	0.74	17.76	21.26	17.76
6.	10:30 P.M	0.63	17.94	21.37	16.84
7.	11:30 P.M	0.61	18.48	21.73	17.46
8.	12:30 A.M	0.56	17.62	21.88	18.65
9.	01:30 A.M	0.52	16.78	21.4	16.48
10.	02:30 A.M	0.58	16.55	21.52	16.97
11.	03:30 A.M	0.56	17.33	22.1	18.4
12.	04:30 A.M	0.54	17.66	21.21	18.07
13.	05:30 A.M	0.55	18.47	21.64	17.64
14.	06:30 A.M	0.53	16.75	21.49	17.3
15.	07:30 A.M	0.54	16.32	22.32	18.15
16.	08:30 A.M	0.56	17.5	21.57	18.43
17.	09:30 A.M	0.53	17.57	21.11	17.36
18.	10:30 A.M	0.52	16.82	21.27	17.17
19.	11:30 A.M	0.52	18.61	21.15	16.95
20.	12:30 P.M	0.53	17.82	20.78	17.26
21.	01:30 P.M	0.58	17.58	20.21	17.63
22.	02:30 P.M	0.56	17.11	21.07	17.79
23.	03:30 P.M	0.58	17.86	21.36	18.08
24.	04:30 P.M	0.61	17.1	21.46	17.95
Average Concentration		0.58	17.49	21.50	17.66
PEQSAA		05 (24 hr)	40 (24 hr)	80 (24 hr)	120 (24 hr)

PEQSAA: Punjab Environmental Quality Standards for Ambient Air

Note:

- Selected measurement units were mg/m³ and µg/m³ otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
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NOISE LEVEL MONITORING REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Monitoring Location:	Near PEL Factory, Opposite Packages Mall, Walton Road, Lahore
Monitoring Date:	04/05-05-2023	Source:	Ambient Noise
GPS Coordinates:	31°28'05.2"N 74°20'57.7"E	Monitoring Instrument:	Noise Meter-IEC651-Type-2

Sr. No.	Monitoring Time	Unit	Minimum	Maximum	Leq
1.	06:00 P.M	dB(A)	60.9	63.2	62.05
2.	07:00 P.M		60.3	64.5	62.4
3.	08:00 P.M		58.9	61.1	60
4.	09:00 P.M		57.4	61.3	59.35
5.	10:00 P.M		62.3	66.6	64.45
6.	11:00 P.M		63.3	64.4	63.85
7.	12:00 A.M		58.7	61.3	60
8.	01:00 A.M		61.4	63.2	62.3
9.	02:00 A.M		64.3	65.5	64.9
10.	03:00 A.M		63.4	65.7	64.55
11.	04:00 A.M		65.9	69.7	67.8
12.	05:00 A.M		59.9	63.2	61.55
13.	06:00 A.M		57.9	60.8	59.35
14.	07:00 A.M		62.2	65.4	63.8
15.	08:00 A.M		59.9	62.5	61.2
16.	09:00 A.M		62.2	64.1	63.15
17.	10:00 A.M		63.9	66.7	65.3
18.	11:00 A.M		58.3	59.8	59.05
19.	12:00 P.M		61.8	64.7	63.25
20.	01:00 P.M		60.1	63.9	62
21.	02:00 P.M		58.9	61.3	60.1
22.	03:00 P.M		58.4	60.7	59.55
23.	04:00 P.M		62.2	64.7	63.45
24.	05:00 P.M		61.3	63.3	62.3

PEQS limit : 65 dB- 55 dB

PEQS: Punjab Environmental Quality Standards for Noise
 Leq: Log Equivalent Continuous Sound Level

Note:

- Selected measurement units were dB (A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

Signature of Analyst:

Signature of Chief Chemist



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Street No. 09, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan
 Tell: +92 91 5202323 Cell: +92 3000391053 Email: inervconsultants@yahoo.com www. iec-consultants.com

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NOISE LEVEL MONITORING REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Monitoring Location:	Near Medix Hospital, Ferozpur Road Lahore
Monitoring Date:	05/06-05-2023	Source:	Ambient Noise
GPS Coordinates:	31°25'57.1"N 74°21'24.4"E	Monitoring Instrument:	Noise Meter-IEC651-Type-2

Sr. No.	Monitoring Time	Unit	Minimum	Maximum	Leq
1.	05:30 P.M	dB(A)	62.9	65.3	64.1
2.	06:30 P.M		64.7	67.3	66
3.	07:30 P.M		64.4	68.3	66.35
4.	08:30 P.M		60.9	64.1	62.5
5.	09:30 P.M		67.1	68.6	67.85
6.	10:30 P.M		67.5	68.7	68.1
7.	11:30 P.M		66.3	69.4	67.85
8.	12:30 A.M		64.4	65.8	65.1
9.	01:30 A.M		60.4	63.2	61.8
10.	02:30 A.M		64.8	67.3	66.05
11.	03:30 A.M		63.2	65.8	64.5
12.	04:30 A.M		62.8	67	64.9
13.	05:30 A.M		62.9	71.4	67.15
14.	06:30 A.M		67.2	68.5	67.85
15.	07:30 A.M		64.9	70.1	67.5
16.	08:30 A.M		67.2	72.7	69.95
17.	09:30 A.M		63.1	65.4	64.25
18.	10:30 A.M		63.3	70.7	67
19.	11:30 A.M		66.8	69.9	68.35
20.	12:30 P.M		65.1	67.3	66.2
21.	01:30 P.M		63.9	66.7	65.3
22.	02:30 P.M		63.4	70.7	67.05
23.	03:30 P.M		67.2	69.3	68.25
24.	04:30 P.M		68.9	71.4	70.15
PEQS limit : 65 dB- 55 dB					

PEQS: Punjab Environmental Quality Standards
Leq: Log Equivalent Continuous Sound Level

Note:

- Selected measurement units were dB (A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

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Street No. 09, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan
Toll: +92 91 5202323 Cell: +92 3000391053 Email: inenvconsultants@yahoo.com www. iec-consultants.com

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DRINKING WATER ANALYSIS REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Sampling Location:	Qainchi Chowk Walton Road, Lahore
Sampling Date:	06-05-2023	Source:	Drinking Water
GPS Coordinates:	31°27'56.4"N 74°21'10.6"E	Analysis Method	APHA/USEPA Standard Methods

Sr. No.	Parameters	Standard Methods	Units	PDWQS	Results
1.	pH	APHA-4500H+ B	--	6.5-8.5	7.8
2.	Temperature	---	°C	---	16
3.	Taste & Odor	In-house	--	Non Objectionable	Non Objectionable
4.	Color	APHA-2120 B/C	TCU	<15	3
5.	Turbidity	APHA-2130 B	NTU	<5	4.2
6.	Total Dissolved Solids (TDS)	APHA-2540 C	mg/L	<1000	209
7.	Total Hardness as CaCO ₃	APHA-2340 C	mg/L	<500	74
8.	Nitrate (NO ₃)	APHA-4500NO3 B	mg/L	≤50	0.4
9.	Nitrite (NO ₂)	APHA-4500NO2 B	mg/L	≤3	0.006
10.	Arsenic (As)	APHA-3500As B	mg/L	≤0.05	N.D.
11.	Nickel (Ni)	ASTM E3047-16	mg/L	≤0.02	0
12.	Antimony (Sb)	APHA-3500Sb B	mg/L	<0.005	N.D.
13.	Chloride (Cl)	APHA-4500Cl- B	mg/L	<250	54
14.	Chlorine	APHA-4500 CL	mg/L	0.5-1.5	0.4
15.	Lead (Pb)	APHA-3500 Pb-B	mg/L	≤0.05	0.001
16.	Fluoride	APHA-4500F- C	mg/L	≤1.5	0.58
17.	Aluminum	APHA-3500 Al	mg/L	≤0.2	N.D.
18.	Manganese (Mn)	APHA-3500 MN-B	mg/L	≤0.5	N.D.
19.	Cadmium (Cd)	APHA-3500 Cd-B	mg/L	0.01	N.D.
20.	Barium (Ba)	API IA-3500 Ba B	mg/L	0.7	0.057
21.	Mercury (Hg)	APHA-3500 Hg-B	mg/L	≤0.001	N.D.
22.	Copper (Cu)	APHA- 3500 Cu-B	mg/L	2	0.05
23.	Zinc (Zn)	APHA- 3500 Zn B	mg/L	5	1.09
24.	Boron (B)	APHA 4500 B- C	mg/L	0.3	N.D.
25.	Chromium (Cr)	APHA 3500 cr B	mg/L	≤0.05	N.D.
26.	Selenium (Se)	APHA- 3500 Se C	mg/L	0.01	N.D.
27.	Cyanide (CN)	APHA 4500-CN	mg/L	≤0.05	N.D.
28.	E-Coli	APHA:9222 D	Number/100 mL	0 Number/100 mL	0
29.	Total Coliform	APHA:9222 B	Number/100 mL	0 Number/100 mL	0

PDWQS

Punjab Drinking Water Quality Standards

N D

Not Detectable

Signature of Analyst:

Signature of Chief Chemist



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Street No. 09, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan

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WASTEWATER ANALYSIS REPORT

Reference Number	NESPAK-059/ENV-2023	Client Name:	National Engineering Services Pakistan Limited
Project Name	Remodelling of Walton and Conduit	Sampling Location:	Walton Road wastewater Drain, Lahore
Sampling Date:	06-05-2023	Source:	Wastewater
GPS Coordinates:	31°28'40.7"N 74°21'30.0"E	Analysis Method	APHA/USEPA Standard Methods

Sr. No	Parameters	Analysis Method	Units	PEQS	Results
1.	Temperature	----	°C	40	19
2.	pH	APHA-4500H+ B	--	6-9	8.4
3.	Chemical Oxygen Demand (COD)	APHA-5220-D	mg/l	150	119.7
4.	Biological Oxygen Demand (BOD ₅) at 20 °C	APHA, 5210	mg/l	80	76.4
5.	Total Dissolved Solids (TDS)	APHA-2540 C	mg/l	3500	2461
6.	Total Suspended Solids (TSS)	APHA-2540 D	mg/l	200	188
7.	Total Hardness	APHA-2340 C	mg/l	--	164
8.	Oil & Grease	Separation Method	mg/l	10	5.9
9.	Chromium (Hexa & Trivalent)	APHA-3500Cr B	mg/l	1.0	0.64
10.	Total Iron	APHA-3500-Fe-B	mg/l	8.0	2.5
11.	Chloride	APHA-4500Cl- B	mg/l	1000	438
12.	Fluoride	APHA-4500F- C	mg/l	10	5.9
13.	Ammonia	ASTM-D1426-15	mg/l	40	11.8
14.	Cadmium	APHA-3500 Cd-B	mg/l	0.1	0.07
15.	Lead	APHA-3500-Pb B	mg/l	0.5	0.1
16.	Arsenic	APHA-3500As B	mg/l	1.0	N.D
17.	Copper	APHA-3500Cu B	mg/l	1.0	0.04
18.	Barium	APHA-3500Ba B	mg/l	1.5	N.D
19.	Selenium	APHA- 3500 Se C	mg/l	0.5	N.D
20.	Silver	APHA-3500Ag-B	mg/l	1.0	N.D
21.	Manganese	APHA-3500-Mn B	mg/l	1.5	0.37
22.	Zinc	APHA-3500-Zn B	mg/l	5.0	0.62
23.	Nickel	ASTM E3047-16	mg/l	1.0	0.21
24.	Boron	APHA-4500B-C	mg/l	6.0	N.D
25.	Mercury	APHA-3500 Hg-B	mg/l	0.01	N.D
26.	Sulphide (S ²⁻)	APHA-4500 S ₂	mg/l	1.0	0.22
27.	Sulphate (SO ₄)	APHA-4500-SO ₄ C	mg/l	600	249
28.	An Ionic Detergent (as MBAS)	----	mg/l	20	9.61
29.	Phenolic Compound (as Phenol)	APHA-5530-D	mg/l	0.1	N.D
30.	Cyanide (as CN) total	APHA 4500-CN	mg/l	1.0	N.D

PEQS: Punjab Environmental Quality Standards for Wastewater N.D: Not Detectable

Signature of Analyst:

Signature of Chief Chemist

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ANNEX-III: RESOURCES CONSERVATION PLAN

RESOURCE CONSERVATION PLAN

1. INTRODUCTION

The most of the resources in this world are finite and non-renewable in nature. 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 meet our needs of present generation as well as future generation, especially the non-renewable resources.

2. OBJECTIVE OF THE PLAN

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

- Minimize the use of natural resources; and
- Mitigate and prevent pollution contaminating the natural resources.

3. PLANNING

Careful estimations of quantities of material, fuel, water and energy required directly or indirectly shall be done to avoid excessive or unnecessary wastage of these materials. In addition to this, pollution prevention strategies shall also be devised to prevent 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;
- Estimations of the energy requirements during all the stages of the project; and
- Estimations of water consumption for construction activities and construction camp sites.
- 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.

4. EXECUTION OF THE PLAN

The planned strategies shall be implemented to conserve the 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 execution shall be disposed off safely to the designated disposal sites through approved contractors; and

ANNEX-III

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

Water

- Avoid using potable water for sprinkling, curing and washing of equipment and vehicles. Surface water or treated effluent can be used instead;
- Wastage of water should be controlled through providing proper valves and through controlling 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 IEE report;
- Waste water shall not be discharged directly into the canal and must be managed as per the recommendations presented in IEE; and
- Construction and demolition waste, and municipal solid waste shall not be dumped and burnt openly, and shall be handled according to the preventative measure given in IEE report.

5. CHECKING AND CORRECTIVE ACTIONS

The KPITB shall bind the construction contractor through contract agreement to comply with the strategies outlined in the Resource Conservation Plan. The Environmental Committee shall also appoint an Inspector who shall monitor the daily onsite activities and shall report any issues and concerns raised in relation to Resource Conservation Plan. The inspector shall recommend adequate corrective actions to mitigate the issues raised.

ANNEX-IV: TRAFFIC MANAGEMENT PLAN

GUIDELINE TRAFFIC MANAGEMENT PLAN

1 Need for Plan

During the construction period of the project, considerable vehicular movement carrying large amounts of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residents in terms of noise, dust, congestion and inconvenience.

2 The plan

The objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such as tipping areas and wash-out areas. It is intended to compliment and work alongside relevant EMP. The TMP will be classed as “live” and therefore be subjected to updates as required.

The Contractor, at the time of the execution of the project, will prepare a comprehensive TMP in coordination with local traffic police department, Lahore CBD Development Authority, emergency services and local administrative department. Lahore CBD Development Authority and CSC will review and approve the Contractor's TMP. The Contractor's TMP shall include following mitigation measures during its preparation:

- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project development.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as a result of the Project.
- Spoil dumpsites located close to project site to minimize journey distance and limit movements to site access roads.
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site.
- Provision of bus/minibus services for personnel living in nearby settlements.
- Movements of construction workers will be planned to avoid the busiest roads and times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods.
- Driver training for HGV drivers and refresher course every six months for project drivers.
- Speed restrictions for project traffic travelling through communities (to be agreed with Local Traffic Police and Client).

- Run a safety campaign to improve the people's knowledge of the traffic hazard on their roads, public information and other activities to address the issues.
- Run a pedestrian awareness programme.
- Temporary signage

The traffic management plan for the project corridor is provided below.

3 Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the tower sites would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

3.1 Public Access Routes

The use of public road for site access may be restricted in terms of:

- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts

Contractor should have consultation with the local police or local authority to address these issues and to effectively manage them before the beginning of the construction.

3.2 Site Workers Traffic

Site personnel should not be permitted to park vehicles right on the road; this will lead to disruption in material deliveries. Designated parking areas with appropriate parking space will be needed for this purpose; any plain area near construction site can be used for this purpose.

3.3 Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.
- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

4 Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of any access roads and construction of the detours (as applicable and practical) must be completed prior to start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. Contractor must ensure that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to CSC, Lahore CBD Development Authority, emergency services and Traffic Police, and also publish weekly programme in the local newspaper.

ANNEX-V: GUIDELINE QUARRY MANAGEMENT PLAN

Quarry Management Plan

1.0 Introduction

After the completion of construction phase of the proposed project, it is the responsibility of the contractor to restore the site that has been disturbed due to construction activities. Lahore CBD Development Authority has a stewardship responsibility to ensure that the environmental value of the project area is maintained for future generations to appreciate.

2.0 General Quarry Planning and Progressive Rehabilitation

A well-considered quarry development plan prior to starting work, or when opening up new areas will greatly reduce the effort required to achieve appropriate leading practice environmental and safety outcomes for quarry rehabilitation and closure.

The selection of a site, sequencing of quarrying and rehabilitation and final land-use should all be carefully planned prior to commencement of work at a quarry or borrow pit.

2.1 Progressive Rehabilitation

Progressive rehabilitation refers to the rehabilitation of completed parts of a quarry while extractive operations continue in other parts of the quarry. As new quarry sections are opened, worked out areas should be progressively rehabilitated to avoid increasing the total disturbed area of a quarry. Overburden and topsoil can be stripped from areas being opened up and placed directly onto worked out areas which are being rehabilitated. This will avoid double handling of materials and prevent degradation of the topsoil.

Progressive rehabilitation helps to minimize the visual impact of a quarry, control dust and erosion. It also assists in fostering good landowner and community relations.

Recommended progressive rehabilitation practices are:

- Agree on the final land form and use of a site with the relevant landowner.
- Rehabilitate in accordance with the intended final use of the land.
- Plan and develop the quarry in stages towards terminal areas so that progressive rehabilitation works can commence as soon as possible).
- Once the final landform is established, re-vegetate areas to stabilize the landform and to give the vegetation maximum time to establish while the quarry is still in operation.

2.2 Re-vegetation

Establishing a self-sustaining cover of vegetation is the best way to stabilize disturbed sites in the long term. Re-vegetation also minimizes the visual impact of quarries. Generally, the vegetation type which existed before the disturbance, or a similar vegetation type will regenerate most successfully.

Prior to the commencement of a quarrying activity the type of re-vegetation should be agreed with the landowner, and should be consistent with the proposed final land-use.

Some indigenous plant species may not thrive in areas where soil conditions are substantially different after quarrying. If this is the case, and the objective is to re-establish vegetation, which fulfils the function of the original native vegetation, then some species from outside the quarry area, may have to be introduced. Care must be taken to avoid introducing a species, which could become an unacceptable fire hazard, invade surrounding areas of native vegetation or become agricultural weeds.

Where agriculture is the planned land-use then the species planted should be those commonly used for pasture or crops known to be successful on soils of similar texture, drainage status, pH and fertility. Suitable legumes should always be considered for their ability to improve soil fertility.

3.0 Rehabilitation of Borrow Pits

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

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

ANNEX-VI: WASTE MANAGEMENT PLAN

CONSTRUCTION WASTE MANAGEMENT PLAN

1. GENERAL INTRODUCTION

Construction work refers to a wide range of materials depending on their origin; they are categorized as excavation material, demolition materials and worksite waste material. Construction waste material of the proposed project consists mainly of concrete, bentonite, masonry, limestone, sandstone, metal, and wood. In addition to this, significant amount of municipal waste will also generate from the construction camps. The solid waste generation estimated to be 650 kilogram per day for 1,000 construction workers during construction phase of the proposed project.

2. ORIGINS AND CAUSES OF CONSTRUCTION WASTE

Origins of Waste	Causes of Waste
Contractual	▪ Errors in contract documents; and ▪ Contract documents incomplete at commencement of construction.
Design	▪ Design changes; ▪ Design and detailing complexity; ▪ Design and construction detail errors; ▪ Unclear and unsuitable specifications; and ▪ Poor coordination and communication (late information, last minute client requirements, slow drawing revision and distribution).
Procurement	▪ Ordering errors (i.e. ordering items not in compliance with specification); ▪ Over allowances (i.e. difficulties to order small quantities); and ▪ Supplier errors.
Transportation	▪ Damage during transportation; ▪ Difficulties for delivery vehicles accessing construction sites; ▪ Insufficient protection during unloading; and ▪ Inefficient methods of unloading
On-Site Management and Planning	▪ Lack of on-site waste management plans; ▪ Improper planning for required quantities; ▪ Delays in passing information on types and sizes of materials and components to be used; ▪ Lack of on-site material control; and ▪ Lack of supervision.
Material Storage	▪ Inappropriate site storage space leading to damage or deterioration; ▪ Improper storing methods; and ▪ Materials stored far away from point of application.
Material Handling	▪ Materials supplied in loose form; ▪ On-site transportation methods from storage to the point of application; and ▪ Inadequate material handling.
Site Operation	▪ Accidents due to negligence; ▪ Unused materials and products; ▪ Equipment malfunction; ▪ Poor craftsmanship; ▪ Use of wrong materials resulting in their disposal; ▪ Time pressure; and ▪ Poor work ethics.
Residual	▪ Waste from application processes (i.e. over preparation of mortar); ▪ Off-cuts from cutting materials to length;

Origins of Waste	Causes of Waste
	▪ Waste from cutting uneconomical shapes; and ▪ Packaging.
Other	▪ Weather ▪ Vandalism ▪ Theft

3. CONSTRUCTION WASTE MANAGEMENT PLAN

a) Waste Management Goals

The contractor established goal that this project will generate at least 50 percent less waste into landfills and the processes shall be employed to ensure that this goal is met. These shall include prevention of damage to materials to be incorporated into the work due to mishandling, improper storage, contamination, inadequate protection, minimizing poor quantity estimation, and through design.

b) Responsibility

- a) The Contractor shall be responsible for the implementation of the administrative portions of this program, including the notification of subcontractor management, the training of the site supervisor and the onsite posting of this plan.
- b) The site supervisor shall be responsible for the implementation of the onsite portions of this program including the training of subcontractor personnel.

c) Waste Prevention Planning

- a) In addition to other requirements specified herein it is a requirement for the work of this project that the contractor comply with the applicable city waste disposal requirements.
- b) Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling where practical and possible. Waste disposal in landfills shall be minimized as much as possible.
- c) Project Construction Documents: The Contractor will contractually require all subcontractors to comply with the Construction Waste Management Plan (WMP)". A copy of the WMP will accompany all subcontractor agreements and require subcontractor participation.
- d) The "Construction Waste Management Plan" shall be implemented and executed as follows and as on the chart:
 - i) Salvageable materials will be diverted from disposal where feasible;
 - ii) There will be a designated area on the construction site reserved for materials that can be recycled;
 - iii) Areas shall be marked to designate what recycle materials are to be stored there; and
 - iv) Hazardous waste shall be managed by a licensed hazardous waste vendor.

d) Communication and Education Plan

- a) This Waste Management Plan will be posted onsite;

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- b) Each subcontractor will be made aware of the intent of this project with respect to reduction of waste and recycling. Onsite recycling containers and/or areas will be plainly marked;
- c) The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan;
- d) All recycling containers and areas will be clearly marked;
- e) Lists of acceptable and unacceptable materials will be posted at the site; and
- f) All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.

e) Motivation Plan

The Contractor will conduct a pre-award meeting for subcontractors. Subcontractors under consideration will be required to attend the meeting to review project goals and requirements with the project team. Attendance will be a prerequisite for award of subcontracts. This document will be an attachment to every subcontract. Copies of the attachment will be posted prominently at the job site.

f) Expected Project Waste, Disposal, and Handling

The following chart identifies waste materials expected on the proposed project, their expected disposal methods and handling procedures. New items may be added as needed.

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Material	Disposal Method	Handling Procedure
Land Clearing Debris	Keep separate for reuse and or wood sale. Suitable materials may be delivered to a composting site. Separate topsoil and rock for future landscaping use.	Keep separated in designated areas onsite.
Clean Dimensional Wood and Palette Wood	Keep separate for reuse by on-site construction or by site employees for either heating stoves or reuse in home projects. May be offered to public.	Keep separated in designated areas onsite.
Painted or Treated Wood	Reuse, off site recycle, and landfill.	Keep separated in designated areas onsite. Place in "Trash" container.
Concrete	Recycle when possible.	Keep separated in designated areas onsite.
Concrete Masonry Units	Keep separate for re-use by on-site construction or by site employees	Keep separated in designated areas onsite
Metals	Recycle off site when possible. Separate copper wire when possible.	Keep separated in designated areas onsite. Place in "Metals" container.
Gypsum drywall (unpainted)	Recycle with supplier when possible.	Keep scraps separate for recycling – stack on pallets in provided onsite. All scrap drywall should be taken back by contractor to drywall supplier
Paint	Reuse onsite; donate to Habitat for Humanity Restore.	Keep separated in designated areas onsite
Insulation	Reuse and landfill.	Keep separated in designated areas onsite.
Glass	Recycle locally.	Keep separated in designated areas onsite.
Plastics	Plastic Bottles: recycle locally; be aware of plastics that are acceptable to recycle facility.	Keep separated in designated areas onsite.

g) Waste Disposal Company:

- a) Lahore Waste Management Company (LWMC)

h) Recycle Hauler

- a) To be determined;
- b) Contact Address; and
- c) Some or all recycle may be hauled by the authorized representative.

i) Possible Recycle Locations and Acceptable Materials

- a) Coordinate with companies in Lahore or which are registered with LWMC that accept materials for recycle; and
- b) Using the above as a resource, a list will be kept indicating local opportunities for recycle of expected materials. New locations should be added as needed.

ANNEX-VII: Occupational Health and Safety Plan

Guideline OCCUPATIONAL HEALTH AND SAFETY Plan

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank EHS guidelines on health and safety.

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

Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

1. SCREENING AND REGULAR UNANNOUNCED CHECKING OF WORKERS

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as COVID-19, HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

2. MINIMIZING HAZARDS AND RISKS AT THE WORKPLACE

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

- i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
- ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
- iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
- iv. 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.

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- v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.
- vi. 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;
- vii. 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 horizontal.
- viii. 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.
- ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.
- x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.
- xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

3. PROVISION OF PERSONAL PROTECTIVE EQUIPMENT

Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

- i. High visibility clothing for all personnel during road works must be mandatory.
- ii. 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.
- iii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.
- iv. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
- v. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.
- vi. Eye and face protection equipment shall be provided to all welders to protect against sparks.
- vii. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.
- viii. 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.

Table 1: PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.

Type of Work	PPE
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

4. PROCEDURES TO DEAL WITH EMERGENCIES SUCH AS ACCIDENTS, SUDDEN ILLNESS AND DEATH OF WORKERS

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

- i. Provision of dispensaries by the individual EPC contractor.
- ii. 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.
- iii. 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.
- iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

5. RECORD MAINTENANCE AND REMEDIAL ACTION

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigative actions to change any unsafe or harmful conditions.

6. COMPENSATION FOR INJURIES AND DEATH

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

7. AWARENESS PROGRAMS

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

- i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS, COVID-19), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.
- ii. 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.

8. NOMINATION OF A HEALTH AND SAFETY FOCAL PERSON

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:

- i. Function as the focal person/representative for all health and safety matters at the workplace;
- ii. 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;
- iii. 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;
- iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;
- v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

9. SUGGESTED CONTENTS OF OCCUPATIONAL HEALTH AND SAFETY PLAN

The suggested contents of Occupational Health and Safety Plan to be developed by the Contractor(s) are described below:

- a Purpose
- b Scope of Application
- c Complying Basis
- d Occupational Health and Safety Objectives
- e Organization and Responsibility
 - Contractor's Project Manager

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- HSE Management Department of the Contractor(s)
- Medical Treatment Room of the Contractor(s)
- Subcontractor's Project Manager
- Subcontractor's HSE Managers
- Occupational Health and Safety
- Community Health and Safety
- f Health Plan
 - Labour Protection
 - Sanitary Epidemic Prevention
- g Safety Plan
 - Summary
 - Qualification Review
 - Safety Training
 - Construction Plans and Documents
 - Control Measures
 - Monitoring Measures
 - Management of the Key Safety Accidents
- h Public Security Plan
- i Local Community Health and Safety

ANNEX-VIII: CHANCE FIND PROCEDURE

ARCHAEOLOGICAL 'CHANCE FIND' PROCEDURE

1. BACKGROUND

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

The Antiquities Act, 1975, protects archaeological sites, whether on Provincial Government owned or private land. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling. It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

2. POTENTIAL IMPACTS TO ARCHAEOLOGICAL SITES

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

3. RELEVANT LEGISLATION

It ensures the protection, preservation, development and maintenance of antiquities in the provinces of Pakistan. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the relevant provincial governments to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, any archaeological discovery made during the course of the project.

4. REMEDIES AND PENALTIES

The Antiquities Act, 1975 provides for heritage inspection or investigation orders, temporary protection orders, civil remedies and penalties to limit contraventions. These powers provide: "A contravention of any provision of this Act or the rules shall, where no punishment has been specifically provided be punishable with rigorous imprisonment for a term which may extend to two years, or with fine up to rupees ten hundred thousand, or with both. "

5. ARCHAEOLOGICAL 'CHANCE FIND' PROCEDURE

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

The following 'chance-find' principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

- i. Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.
- ii. Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.
- iii. If the site supervisor determines that the item is of potential significance, an officer from the Department of Archaeology (DoA) will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.
- iv. Work will not re-commence in this location until agreement has been reached between DoA and Lahore CBD Development Authority as to any required mitigation measures, which may include excavation and recovery of the item.
- v. A precautionary approach will be adopted in the application of these procedures.

6. DETAILED PROCEDURAL STEPS

- If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.
- Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.
- If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.
- Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.
- If any person, who discovers or finds any movable antiquity contravenes the provisions of the Act, he shall be punishable with imprisonment for a term which may extend to five (05) years, or with fine not less than fifteen hundred thousand rupees or with both and the Court convicting such person shall direct that the antiquity in respect of which such contravention has taken place shall stand forfeited to Government.
- The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.
- The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.

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- No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.
- Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.
- If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part under the Land Acquisition Act, 1894 (I of 1894), as for a public purpose.

ANNEX-IX: TREE PLANTATION PLAN

1. TREE PLANTATION/ AFFORESTATION PLAN

The basic purpose of afforestation/plantation of suitable species in the project area is to reduce the risk been made due to cutting of trees for the proposed project and to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk been made but will also increase the carrying capacity of the area regarding many positive aspects.

Plantation will be done after the removal of trees during the construction work immediately. Plantation of indigenous trees species is highly important to maintain the 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 roads construction, the afforestation activity will further help in enhancing the socio-economic condition of the area and project sustainability.

Note: *The compensation for trees (if any) may be notified by the Forest Department and PHA or competent authority with Ecologists consultant team after proper filed survey/assessment and consultation with stakeholders, for this purpose special team to be constituted under the approval of competent authority, to assess the losses and propose compensations.*

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 filter 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 eco-systems in which they reside.
- Trees absorb and store rainwater which reduce runoff and sediment deposit after storms. This helps the ground water supply recharge, prevents the transport of chemicals into streams and prevents flooding.
- Trees, shrubs and turf also filter 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 living environment through active planting, proper maintenance and preservation of trees together with other vegetation.
- To Protect and conserve flora and fauna of the project area.
- To attract rain which is a positive impact on the project area at all.
- To reduce sedimentation by plantation in the project area which will act as protection wall against wind born dust particles.

Area Enhancement

Plants will be raised along the nearby available area or roads, two on either side of the road. Distance from the outer boundary of the AOI and between two plants will be kept as 4 meters. Thus in one kilometer, 250 number of plants are to be raised in single row. Total number of plants, along road (if suitable space along the road is not available then PHA or Forest department may decide) will be 7,000 Number. Thus a total of 7,000 trees shall be planted in lieu of expected 700 effected plants.

**The Forest Department, PHA or concerned Authority may update the standards of planting and choice of species as per the actual requirements and site suitability.*

Trees Recommended

Following Trees Are Recommended for Plantation.

Sr. No.	Local/English Name	Scientific Name
1	Neem	<i>Azadirachta indica</i>
2	Sukh Chain	<i>Pongamia pinnata</i>
3	Sirris	<i>Acacia lebbek</i>
4	Jacarnda	<i>Jacaranda moniosifolia</i>
5	Silver Oak	<i>Grevillea robusta</i>
6	<i>Pilkan</i>	<i>Ficus virens Spp</i>
7	Jaman	<i>Eugenia jambolina</i>
8	Kachnar	<i>Bauhinia variegata</i>

PLANTATION TECHNIQUE

Plantation of suitable broad leaved species is to be carried out in the immediate vicinity or in project area. The project area can be afforested and vegetation cover can be improved by adopting standard afforestation technique of digging pits. The project area is suitable for plantation activities and can be managed thoroughly with care.

When to plant

Planting should be completed early in the rains in as short a time as possible. The trees must be given time to become well established prior to the dry season. A good rule of thumb is to start planting when the soil is moist to a depth of 15-25 cm or to the bottom of the planting hole. Failures because planting is too late are more common than failures because of planting too early. To obtain good results and avoid labor shortage in these areas considerable preparatory planning is needed. The size of the plantation might have to be adapted to the availability of labor. If dry sites cannot be planted in time, planting should be postponed until the next season.

Cost

Break-up of Expenditure per Avenue kilometer @ Rs. 1500/- per diem: Break-up of Expenditure 250 plants @ Rs. 1500/- per diem:

ANNEX-IX

FIRST YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Layout	1 Av.km	2 MD/Av.km	3000.00
2.	Digging of Pits 2.5 ft. each 2.5x250 = 625 cft.	625 cft.	5 MD/Av.km	7500.00
3.	Cost of Plants including	250 No.	Rs100/- plant	25,000.00
4.	Cost of planting of plants	250 No.	Rs. 25/- plant	6250.00
5.	Carriage of plants from private nursery to site including loading/unloading	250 No.	Rs. 10/- plant	2500.00
6.	Cost of Manure and Bhall (silt) including carriage	1 Av. Km		20,000.00
7.	H/watering 50 times 250x50 with water bowser, one driver and one coolie	12500 no.	5MD/per %0	100,000.00
8.	Weeding twice 250x2	500 no.	2 MD/per %	15,000.00
9.	Reopening of Pits twice (250x2)/cft/pit	500 cft.	2 MD/per %	15,000.00
10.	Unforeseen			5750.00
Total				200,000.00

SECOND YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Plants 20% Restocking	50 No.	Rs.100/- plant	5,000.00
2.	Cost of planting	50 No.	Rs. 25/- plant	1250.00
3.	Carriage of plants	50 No.	Rs. 10/- plant	500.00
4.	H/watering 50 times with water bowser, one driver and one coolie	12500 no.	5MD/per %0	100,000.00
5.	Reopening of Pits twice (250x2)	500 cft.	2 MD/per %	1,5000.00
6.	Weeding twice 250x2	500 no.	2 MD/per %	1,5000.00
7.	Unforeseen			1250.00
Total				1,38,000.00

THIRD YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Plants 10% Restocking 25 No.	25 No.	Rs.100/- plant	2500.00
2.	Cost of planting	25 No.	Rs. 25/- plant	625.00
3.	Carriage of plants	25 No.	Rs. 10/- plant	250.00
4.	H/watering 40 times x250 no.	10,000 no.	5MD/per %0	75000.00
5.	Reopening of Pits twice (250x2)	500	5MD/per %0	3750.00
6.	Unforeseen			2875.00
Total				85,000.00

FOURTH YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	H/watering 30 times	7500 no.	5MD/per %0	56250.00
5.	Pruning and cleaning of plants	250 no.	5MD/per %0	1875.00
6.	Unforeseen			1875.00
Total				60,000.00

*Cost for raising 250 plants and Maintenance For 4 years. = Rs. 483,000/-

Total cost for 7,000 standard Plantation and Maintenance for 4 years = 13,524,000 PKR

Total Cost (A) = 13.524 Million PKR

Cost for purchasing one plant = 1,500 PKR

Total Plants need to be purchased = 7,000 Numbers

Total cost of purchasing plants = 1500 x 7000

= 10,500,000 PKR

Total Cost (B) = 10.5 Million PKR

Grand Total Cost (A+B) = 24.0 Million PKR

**The above calculations and standards are approximate and tentative, provided on the basis of available data which may be updated by the implementing agency as per actual during the implementation.*

ANNEX-X: BREAKUP OF HEALTH AND SAFETY COST

ANNEX-X

Items	Quantit y	Cost / Item (Rs.)	Total Cost (Rs.)	Rationale
(A) Personal Protective Equipments PPEs				
Dust masks	5,568	20	111,360	One dust mask to be used in a week by each labourer for 12 months and for 48 weeks the quantity will be 5568 dust masks.
Safety Shoes	116	2,000	232,000	One pair of safety shoes are supposed to be used for 12 months by each labourer and for 116 labourers for 12 months construction period
Gloves	928	200	185,600	Eight pairs of gloves is to be used by each labourer for 12 months and 928 gloves are estimated to be used by 116 labourers.
First Aid Box	5	3,000	15,000	One First Aid Box is proposed for 25 labourers and for 116 labourers 05 aid boxes are estimated.
Ear Plugs	5,568	30	167,040	One set of ear plug to be used for a week by each labourer and for 48 weeks (12 months).
Safety Helmets	232	1,000	232,000	Two safety helmets are to be used by each labourer for 12 months and for 116 labourers 232 safety helmets are estimated.
Safety Jackets (Hi Vis)	232	800	185,600	Two safety Jacket (Hi Vis) to be used by each labourer for 12 months are estimated to be used by 116 labourers.
Sub-Total (A)			1,128,600	
(B) Others				
Provision of Dust Bins	12	500	6,000	Twelve dust bins are proposed to be placed at construction site for the whole construction period.
Warning Tape	40	500	20,000	---
Safety Cones	40	1,000	40,000	40 safety cones are estimated to be placed at active construction sites.
Safety Sign Boards	30	1,500	45,000	30 safety sign boards are proposed to be placed at active construction sites.
Sub-Total (B)			111,000	
Grand Total (A + B)			1,239,600	

Time required for Construction = 12 Months

No. of labour required during construction = 116 (Tentative)

***The subject cost is for One year and will be calculated for next years of construction phase accordingly.**