Project Implementation Unit
Pakistan Meterological Department (PIU-PMD),

ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

(ESMP) for

Lot-1 Upgradation of Institute of Meteorology and Geo Physics (IMG) at Met Office Karachi

Lot-2 Upgradation of Meteorology Workshop at Met Office Karachi

LOAN NO. IDA-73330– INTEGRATED FLOOD RESILIENCE AND ADAPTATION PROJECT (IFRAP) – COMPONENT II: STRENGTHENING HYDROMET AND CLIMATE SERVICES

September 2025

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CONSULTANCY SERVICES FOR SUPERVISION OF WORKS UNDER INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING COMPONENT

Environmental & Social Management Plan (ESMP) for Lot-1 Upgradation of Institute of Meteorology and Geo Physics (IMG) at Met Office Karachi & Lot-2 Upgradation of Meteorology Workshop at Met Office Karachi

September 2025

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LIST OF ACRONYMS

ACI	American Concrete Institute
AOI	Area Of Influence
ASTM standards	American Society for Testing and Materials Standards
BOQs	Bills Of Quantities
CAA	Civil Aviation Authority
CCs	Construction Contractors
CESMP	Contractor's ESMP
cfu/ml	Colony Forming Units Per Milliliter
CH4	Methane
CITES	Convention On the International Trade of Endangered Species
CNIC	Computerized National Identity Card
CO	Carbon Monoxide
CSC	Construction Supervision Consultant
°C	Degrees Celsius
°F	Degrees Fahrenheit
µS/cm	Microsiemens Per Centimeter
dB	Decibels
E&S	Environment & Social
EC	Environmental Checklist
ECPs	Environmental Code of Practices
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESS	*Environmental and Social Standards*
ft	Foot
GBV	Gender Based Violence
GRC	Grievance Redressal Committee
GRM	Grievance And Redressal Mechanism
H_2S	Hydrogen Sulfide
HSE	Health Safety and Environment
IDA	International Development Association
IEE	Initial Environmental Examination
IFC	International Financial Corporation
IFRAP	Integrated Flood Resilience and Adaptation Project
ILO	International Labour Organization
LAA	Land Acquisition Act
LMP	Labour Management Procedure
mg/L	Milligrams Per Liter
MHSP	Modernization of Hydromet Services Project
MPN/100 mL	Most Probable Number Per 100 Milliliters
NO_2	Nitrogen Dioxide
NOC	No Objection Certificate
NTU	Nephelometric Turbidity Units
O_2	Oxygen Molecule
OHS	Occupational Health and Safety

PEPA	Pakistan Environmental Protection Act
PIC	Project Implementation Consultant
PIU	Project Implementation Unit
PKR	Pakistani Rupee
PM_{10}	Particulate Matter with A Diameter Of 10 Micrometers or Less
$PM_{2.5}$	Particulate Matter with A Diameter Of 2.5 Micrometers or Less
PMD	Pakistan Meteorological Department
PPBV	Parts Per Billion (109) By Volume
PPE	Personal Protective Equipment
ppm	Parts Per Million
Pt-Co	Platinum Cobalt Solution
RCC	Reinforced Concrete
REA	Rapid Environment Assessment
SEA	Sexual Exploitation & Abuse
SEPA	Sindh Environmental Protection Agency
SEQS	Sindh Environmental Quality Standards
SH	Sexual Harassment
SLP	Sindh Labor Policy
SMRI	Self-Monitoring and Reporting by Industry
SO_2	Sulfur Dioxide
SO_2	Sulfur Dioxide
SOPs	Standard Operating Procedures
TDS	Total Dissolved Solids
TMP	Traffic Management Plan
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
WASH	Water, Sanitation, And Hygiene
WB ESF	World Bank's Environmental and Social Framework
WMO	World Meteorological Organization

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EXECUTIVE SUMMARY

Pakistan faces significant risks from climate change, with frequent extreme weather events highlighting the urgent need for improved disaster management and climate adaptation, particularly through enhanced early warning and hydrometeorological services. The Integrated Flood Resilience and Adaptation Project (IFRAP) is a major initiative supported by the International Development Association (IDA) to strengthen Pakistan's resilience against climate-induced disasters, particularly floods. The project adopts a multi-sectoral approach, focusing on restoring essential infrastructure, modernizing early warning systems, and empowering communities to better manage climate risks. Key components include the upgradation & rehabilitation of community infrastructure, modernization of hydrometeorological and climate services, reconstruction of resilient housing, livelihood support, and flexible emergency response mechanisms.

A significant part of IFRAP involves the modernization of the Pakistan Meteorological Department's (PMD) capabilities, particularly through the upgradation of the Institute of Meteorology and Geophysics (IMG) and the Meteorology Workshop in Karachi. These upgrades involve enhancing academic and operational facilities, digitalizing classrooms, improving residential amenities, and equipping the workshop with modern tools. Furthermore, this component, also known as the Modernization of Hydromet Services Project (MHSP) Component II, refers to "Strengthening Hydromet and Climate Services" under the MHSP in Pakistan. Lot-1: Upgradation & Rehabilitation of Institute of Meteorology and Geophysics (IMG) & Upgradation & Rehabilitation of Meteorology Workshop at MET Office Karachi.

The proposed project includes comprehensive renovations, modernization of academic and operational facilities, and the development of recreational and residential amenities for staff and students. The Sindh Environmental Protection Agency (Environmental Assessment) Regulations 2021 provide screening categories of projects for which an Environmental Checklist (EC), an IEE or an EIA must be conducted. The proposed project falls under Schedule II, J. Urban development 2. Residential, Commercial, and multistory high-rise construction projects with covered areas of more than 100,000 sq ft to 500,000 sq ft. This category requires an IEE to be conducted. Hence, an IEE for Sindh Environment Protection Agency (SEPA) and an ESMP for the World Bank have been prepared to fulfil the statutory requirements.

The Project Area refers to the land legally owned by the Pakistan Metrological Department where all upgradation & rehabilitation and construction activities will occur, directly experiencing environmental impacts like land disturbance, noise, and dust. Surrounding this, an Area of Influence extends 850 feet (250 meters) outward as a buffer zone to capture indirect effects such as changes in air quality, noise, traffic, and local socioeconomic conditions. Although most residences within this buffer are not directly affected by construction, they may face secondary impacts like increased noise and minor air quality or traffic changes. This dual-zone approach ensures that both the immediate site and nearby communities are considered in environmental management and impact mitigation efforts.

The Project Area refers to the land legally owned by the Pakistan Meteorological Department, where all upgradation, rehabilitation, and construction activities will occur, directly experiencing environmental impacts such as land disturbance, noise, and dust. Surrounding this, an Area of Influence extends 850 feet (250 meters) outward as a buffer zone to capture

indirect effects such as changes in air quality, noise, traffic, and local socioeconomic conditions. Although most residences within this buffer are not directly affected by construction, they may face secondary impacts like increased noise and minor air quality or traffic changes. This dual-zone approach ensures that both the immediate site and nearby communities are considered in environmental management and impact mitigation efforts.

The project in Karachi is governed by a robust legal and regulatory framework that ensures compliance with both national and international environmental standards. Key legislation includes the Sindh Environmental Protection Act (SEPA) 2014 and its supporting regulations, which require environmental assessments and approvals before work begins. The project also adheres to cross-sectoral laws on climate, water, sanitation, labor, and waste management, and follows international standards such as the World Bank's Environmental and Social Standards and ILO conventions to protect labor rights and promote sustainability. Additionally, international agreements like the Convention on Biological Diversity and the Kyoto Protocol guide the project's environmental commitments, with stringent air, noise, and water quality standards adopted from both local and global benchmarks for effective environmental management.

There is no need for a large-scale camp area for this project, as local labor will be employed. These workers will commute daily from their homes, significantly reducing the requirement for on-site accommodation. Only a small group of 10 to 15 skilled and semi-skilled personnel will be housed in the meteorological office hostel, which will be specifically designated and secured for construction workers. This arrangement has been discussed and agreed upon with both the Project Implementation Unit (PIU) and the client.

The Upgradation and Rehabilitation of the Institute of Meteorology & Geophysics (IMG) and the Meteorology Workshop in Karachi, under the IFRAP and funded by the IDA, aims to modernize Pakistan's hydrometeorological infrastructure to manage climate-related disasters better. Located in Gulistan-e-Iqbal Sub Division, the project includes comprehensive upgrades to academic, residential, and technical facilities, such as renovating buildings, improving utilities, enhancing recreational spaces, and updating technical workshops. Due to the age and structural limitations of existing buildings, major repairs and replacements are prioritized to ensure safety and functionality. The project adheres to strict design and construction standards, with an estimated total cost of PKR 548.4 million, and is scheduled for completion within 12 months. Worker welfare, local employment, and adherence to quality, safety, and environmental standards are emphasized throughout the implementation.

The project alternatives for upgrading the Institute of Meteorology & Geophysics (IMG) and the Meteorology Workshop in Karachi were evaluated to address Pakistan's climate vulnerability and modernize hydromet services. The "no project" option would leave facilities in disrepair, resulting in increased operational inefficiencies and a limited climate response. Basic rehabilitation would only partially extend building life and marginally improve efficiency, still falling short of international standards. Full upgradation and modernization preferred for its comprehensive scope would rehabilitate all key buildings, enhance efficiency by 25–35%, reduce downtime by up to 50%, create jobs, and significantly boost the PMD's disaster response capacity through new automated systems. Developing a new site, while offering design flexibility, would be costlier, take longer, and cause greater environmental disruption. Thus, full upgradation of existing facilities is the most effective and sustainable option.

The baseline environmental and social assessment for the upgradation project in Karachi's Gulshan-e-Iqbal area highlights a densely populated, urbanized region with diverse

geography, semi-arid climate, and significant infrastructure challenges. The project area falls within Zone 2B according to the Pakistan Building Code (2007), where the Peak Ground Acceleration ranges from 0.16 to 0.24g. This classification indicates a low-damage risk zone, suggesting a reduced likelihood of significant earthquake events affecting the area. Karachi's climate is characterized by highly variable and generally unreliable rainfall, with most precipitation occurring during the summer monsoon months from July to September. During this period, large and intense storms are common, sometimes resulting in daily rainfall amounts that exceed the city's annual average. The 2022 monsoon season, for example, brought extraordinary rains that led to catastrophic flooding and severe damage to road infrastructure. Summers in Karachi are hot, with average maximum temperatures ranging from 32°C to 36°C, and humidity levels rise significantly during the monsoon season. Despite the rich urban biodiversity in parks, no endangered species are present.

The water quality in the project area is visually clear, with both color and turbidity levels well below the maximum permissible limits. Despite this, several chemical parameters warrant attention. Chloride and sulfate concentrations are measured at 438.7 mg/L and 226.1 mg/L, respectively, both of which are within or close to the World Health Organization's recommended limits. However, the total hardness of the water is 538.2 mg/L, exceeding the recommended threshold of 500 mg/L, and the total dissolved solids (TDS) level is 1530.0 mg/L, surpassing the maximum recommended level of 1000 mg/L. Total alkalinity is also notable at 286.8 mg/L. These findings indicate that the water is quite hard and contains a substantial amount of dissolved minerals, which may impact its taste and could pose long-term health concerns if consumed regularly. Karachi, particularly the Gulshan-e-Iqbal area, is experiencing severe air and noise pollution, with $PM_{2.5}$ levels during winter months far exceeding both WHO and local standards. Even after rainfall, pollution remains high, making Karachi one of the world's most polluted cities. Major sources include vehicle emissions, industrial activity, open waste burning, and construction. These conditions have led to a marked increase in respiratory illnesses and hospital admissions, especially among vulnerable groups, with high sulfur dioxide levels further raising risks of asthma, bronchitis, and cardiovascular diseases. Noise pollution is a significant concern in Karachi's urban districts, including Gulshan-e-Iqbal.

The project area supports a limited but diverse habitat, largely due to the increased human population, with only a few faunal and floral species present. Notably, no endemic or endangered species of flora or fauna have been identified in the project area, and there are no protected forests in the vicinity of the proposed site. The local population is ethnically diverse, highly literate, and primarily engaged in services, commerce, and education, with limited industrial activity. The district boasts advanced healthcare and educational facilities, but it also contends with issues related to waste management and energy sustainability. Cultural and recreational landmarks enrich the community, emphasizing the need for resilient infrastructure and improved urban services.

Stakeholder consultations for the project involved engaging residents, business owners, government agencies, and institutional representatives to inform them about the planned upgrades and gather their feedback. The process aimed to ensure transparency, address concerns, and incorporate community input into project design and implementation, in line with World Bank guidelines. Key concerns raised included local employment opportunities, potential noise, dust, and traffic disruptions, and the need for clear communication and safety measures during construction. Stakeholders generally supported the project, provided that

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environmental and social safeguards, local hiring, and effective mitigation strategies are implemented. Information about the project and its environmental management plan will be disclosed in local languages and made available at the site and online to maintain transparency and community trust.

The project's environmental and social impact assessment found that potential adverse effects from the planned upgrades are mostly minor to moderate, short-term, and confined to the construction phase, with no significant long-term impacts expected. Key risks include air and noise pollution, soil and water contamination, waste generation, traffic disruptions, and concerns regarding occupational health and safety. Social risks such as labor influx, gender-based violence, and child labor are considered low due to the preference for local hiring. Mitigation measures, including dust and noise control, safe waste disposal, strict safety protocols, community engagement, and compliance with labor and environmental regulations, are planned to address these issues. The project will not affect protected areas, cultural heritage, or endangered species. It will implement a robust grievance mechanism and continuous monitoring to ensure community safety and environmental protection throughout its execution.

The Environmental & Social Management and Monitoring Plan (ESMP) establishes a comprehensive framework to ensure that all environmental and social safeguards are implemented during the upgradation & rehabilitation works, in compliance with national laws and World Bank standards. It defines clear institutional roles for the Project Implementation Unit (PIU), Construction Supervision Consultant (CSC), and contractor, each responsible for specific monitoring, reporting, and mitigation actions. The contractor must prepare site-specific plans for labor management, pollution control, waste management, traffic, and emergency response, and provide regular training to staff and communities on key issues, including occupational safety, gender-based violence, and resource conservation. The ESMP includes detailed monitoring protocols, regular compliance checks, and a robust three-tier grievance redress mechanism to address community and worker concerns promptly and transparently. Payment milestones are linked to environmental and safety performance, and strict penalties apply for non-compliance, ensuring accountability and continual improvement throughout project execution.

The estimated environmental costs for the project cover measures to minimize socio-environmental risks during construction. The total budget is Rs. 4,477,000. These allocations ensure compliance with environmental standards, safeguard the health of workers and the community, and support effective monitoring and mitigation throughout the project's lifecycle.

CHAPTER - 1: INTRODUCTION

1.1 Background

Pakistan is among the countries most vulnerable to the adverse impacts of climate change, particularly extreme weather events such as floods, droughts, and heatwaves. According to the Global Climate Risk Index 2023, Pakistan consistently ranks among the top ten countries most affected by climate-related disasters over the past two decades (Germanwatch, 2023)[1]. The catastrophic floods of 2010 and 2022 underscored the urgent need for robust disaster risk management and climate adaptation measures, especially in the realm of early warning and hydrometeorological services.

The Pakistan Meteorological Department (PMD) plays a pivotal role in providing weather forecasts, early warnings, and climate information critical for disaster risk reduction and sustainable development. However, PMD's infrastructure, including its technical institutes and workshops, has faced chronic underinvestment, leading to outdated facilities, limited technical capacity, and insufficient maintenance of meteorological equipment (World Bank, 2022)[2].

1.2 Integrated Flood Resilience and Adaptation Project (IFRAP)

The IFRAP[3], supported by the International Development Association (IDA) under Loan No. IDA-73330, is a flagship initiative aimed at enhancing Pakistan's resilience to climate-induced disasters. The project is designed to strengthen the country's capacity for flood risk management, climate adaptation, and disaster preparedness through a multi-sectoral approach.

IFRAP is a practical representation of Pakistan's national climate adaptation vision, translating policy frameworks into on-the-ground action by strengthening early warning systems, building resilient infrastructure, and empowering communities to better cope with climate risks[4].

IFRAP consists of six components addressing various aspects of flood resilience and recovery:

i. Rehabilitation of community infrastructure (roads, bridges, irrigation, flood protection)
ii. Strengthening hydrometeorological and climate services through the PMD
iii. Reconstruction of resilient housing units
iv. Livelihood support and watershed management
v. Project management, technical assistance, and institutional strengthening
vi. A Contingent Emergency Response Component allowing flexible fund reallocation during emergencies.

The proposed project falls under Schedule II, Section J (Urban Development) of the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021, specifically for residential, commercial, and high-rise buildings with covered areas between 100,000 and 500,000 sq. ft., which require an Initial Environmental Examination (IEE).

[1] *https://www.germanwatch.org/en/cri*
[2] *https://www.worldbank.org/en/country/pakistan/publication/building-resilience-to-climate-change*
[3] *https://ifrap.org.pk/*
[4] *https://unfccc.int/sites/default/files/resource/National_Adaptation_Plan_Pakistan.pdf*

Accordingly, an IEE has been prepared for SEPA compliance, along with an Environmental and Social Management Plan (ESMP) to meet World Bank requirements for the Moderate Risk category.

Component II: Strengthening Hydromet and Climate Services

Component II of IFRAP, implemented by the PMD, focuses on modernizing Pakistan's hydrometeorological infrastructure and improving the quality, accessibility, and timeliness of weather and climate services. This component aligns with the best international practices recommended by the World Meteorological Organization (WMO) for building effective Multi-Hazard Early Warning Systems and enhancing institutional capacity (WMO, 2021)[5].

Furthermore, this component, also known as Modernization of Hydromet Services Project (MHSP) Component II refers to "Strengthening Hydromet and Climate Services" under the MHSP in Pakistan.

As part of this component, the project includes the upgradation and rehabilitation of the Institute of Meteorology & Geophysics (IMG) and the Meteorology Workshop in Karachi. As the huge area of open land is available on site, all new facilities would be located at open land area.

These improvements are expected to enhance PMD's operational capabilities significantly, contribute to more reliable climate information services, and ultimately support national efforts in disaster risk reduction and climate adaptation.

1.3 Proposed Project

The Upgradation of the Institute of Meteorology and Geophysics (IMG) at the MET Office Karachi, under the IFRAP Component II, is designed to enhance both academic and operational capacities of the Pakistan Meteorological Department.

- Lot-1 Upgradation of Institute of Meteorology and Geophysics (IMG) at MET Office Karachi
- Lot-2 Upgradation of Meteorology Workshop at MET Office Karachi

The project's first LOT focuses on comprehensive improvements to the IMG building and auditorium. Additionally, the auditorium will be extended and upgraded with modern interiors and audio-visual systems, while classrooms will be digitalized to support advanced learning environments. Furthermore, the LOT I addresses the upgradation of hostel facilities, playgrounds, and overall site development to improve residential and recreational amenities for faculty, staff, and students. This includes internal maintenance of the hostel building, upgraded water supply and electrical systems, and the construction of various sports facilities such as football, basketball, tennis, and volleyball courts, as well as a jogging track, pathways, and an open gymnasium. . The scope also covers the construction of a visiting faculty block, landscaping, plantation, and the installation of site lighting to create a conducive and vibrant campus environment.

The second LOT of the project pertains to the upgradation of the Meteorology Workshop at the MET Office Karachi. This component ensures the workshop remains fully functional by undertaking structural repairs, internal refurbishment, and the provision of essential tools and

[5] *https://library.wmo.int/doc_num.php?explnum_id=10661*

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equipment. (Refer to Figure 1-1).

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Figure 1.1: Project Footprint Area

1.4 Justification for the Proposed Project

- The proposed works and procurement of goods are fully aligned with the approved PC-I under the MHSP Component II[6], ensuring compliance with the project's strategic objectives and funding guidelines.
- The existing facilities at the Institute of Meteorology and the Meteorology Workshop are outdated and inadequate for supporting modern hydrometeorological systems, making comprehensive renovation and upgrade essential for operational efficiency.
- Detailed site assessments and engineering designs have been meticulously prepared by the technical team, ensuring that all proposed interventions are technically sound and tailored to actual needs.
- All designs and technical specifications adhere to established engineering best practices, effectively achieving project objectives while ensuring optimal use of available funds.
- The allocation of resources, including manpower and materials, is well-matched to the project's timeline and is consistent with the approved designs and specifications, ensuring timely and quality completion of works.

1.5 Need for Environmental & Social Study

The apex Pakistani law governing environmental matters is the Pakistan Environmental Protection Act 1997 (PEPA-97). Under Section 12 of the Act, the proponents of the projects must execute the Initial Environmental Examination (IEE) and/or Environmental Impact Assessment (EIA) (where warranted) and get approval from a federal agency (i.e., Pak-EPA). This function has been delegated under Section 26 to the provincial Environmental Protection Agencies (EPAs).

Following the 18th Amendment to the Constitution of Pakistan, the environment became a provincial subject. The environmental law governing the proposed project, titled "Upgradation and Rehabilitation of Institute of Meteorology & Geophysics (IMG) and Meteorology Workshop – Karachi under IFRAP Component - II," is now the Sindh Environmental Protection Act, 2014. In terms of its contents, the provincial act is the same as the national act. Under Section 17 of the Act, the proponents of the project must execute the IEE (ESMP for World Bank) and/or EIA, where warranted, and obtain approval from the relevant Environmental Protection Agency (EPA), which in this case is the Sindh EPA, for this project.

The Sindh Environmental Protection Agency (Environmental Assessment) Regulations 2021 provide screening categories of projects for which an Environmental Checklist (EC), an IEE or an EIA must be conducted. The proposed project falls under Schedule II, *J. Urban development 2. Residential, Commercial, and multistory high-rise construction projects with covered areas of more than 100,000 sq ft to 500,000 sq ft.* This category requires an IEE to be conducted.

Hence, an IEE for Sindh Environment Protection Agency (SEPA) and an ESMP for the World Bank have been prepared to fulfil the statutory requirements.

[6] *MHSP Component II refers to "Strengthening Hydromet and Climate Services".*

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1.6 The objective of the ESMP Study

The primary objectives of the ESMP are as follows:

- Identify the social and environmental risks of the proposed project and related activities.
- Suggest suitable mitigation measures for identified risks at the sub-project planning, designing, and implementation stage and eliminate or reduce any risks.
- Propose an Environmental and Social Monitoring Program to ensure that mitigation measures are implemented during the subproject execution and timely corrective actions are taken where required, and
- Propose the institutional arrangements along with the budget required to implement and monitor the ESMP.

1.7 Location and Accessibility of the Project

The designated project site is situated within the administrative boundaries of District Karachi East, specifically in the Gulshan-e-Iqbal Sub-division. The precise geographical coordinates for this location are 24°55'51.34" North latitude and 67°8'37.64" East longitude.

Weather Radar, Pakistan Meteorological Department, Karachi

1.8 Approach Adopted for ESMP Study

The Consultants along with E&S team of PIU carried out the ESMP study of the project area in a systematic manner. This included the collection of secondary data, maps, and related literature, as well as conducting field surveys for primary data collection, engaging in public consultations, and conducting desk studies.

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1.9 Project Area & Area of Influence

The Project Area is defined as the land under the legal ownership of the Karachi Meteorological Department, encompassing all locations where rehabilitation and construction activities will take place within a demarcated boundary. This area is subject to direct environmental & social impacts resulting from project operations, such as land disturbance, noise, and dust.

Beyond this, the Area of Influence extends outward, forming a buffer zone with a radius of 850 feet (250 meters)[7] from the center of the Project Area. This buffer is established to account for all indirect or induced effects that may arise from project activities, including changes in air quality, noise levels, traffic patterns, and local socioeconomic conditions. While most residential areas within this buffer are not directly affected by construction, they may still experience secondary impacts, such as increased noise or minor changes in air quality and traffic flow. This comprehensive approach ensures that both the immediate project site and the surrounding community are considered in environmental & social management and impact mitigation.

1.10 Structure of the Report

This ESMP comprises nine chapters and a summary. The chapters are as follows:

Chapter 1, Introduction, provides an overview of the Project, the consultants' scope of services for ESMP studies, and the approach adopted by the consultants to achieve compliance with the Terms of Reference.

Chapter 2, Legal and Regulatory Framework, describes national laws applicable during the implementation of the Project. National, Provincial and international guidelines must be complied with during the preparation of the ESMP report, as well as followed during the implementation of the Project. It also describes the need for inter- and intra-agency coordination.

Chapter 3, Description of the Project, provides a detailed account of the Project, with a particular emphasis on those components that are important in relation to environmental and social aspects.

Chapter 4, Project Alternatives Considered, provides a brief account of the country's need for resilient measures and examines the role of the present project in this context. The chapter also deals with various alternatives considered for the proposed project construction in consideration of technical, economic and environmental aspects.

Chapter 5, Environmental and Social Baseline Conditions. This chapter discusses various environmental and social entities, including biodiversity, Fauna and Flora, Water, and the human environment, prior to the project.

[7] *There is no explicit provision in the SEPA Act 2014 that defines a fixed 250-meter range as the standard environmental impact area for a project. The relevant regulations and guidelines leave the determination of the impact area to the discretion of the authorities and the specifics of each project rather than prescribing a fixed distance. The 250-meter parameter (environmental impact for this project) reflects a pragmatic approach to impact mitigation in project design, guided by environmental monitoring data and engineering best practices rather than a nationwide regulatory threshold*

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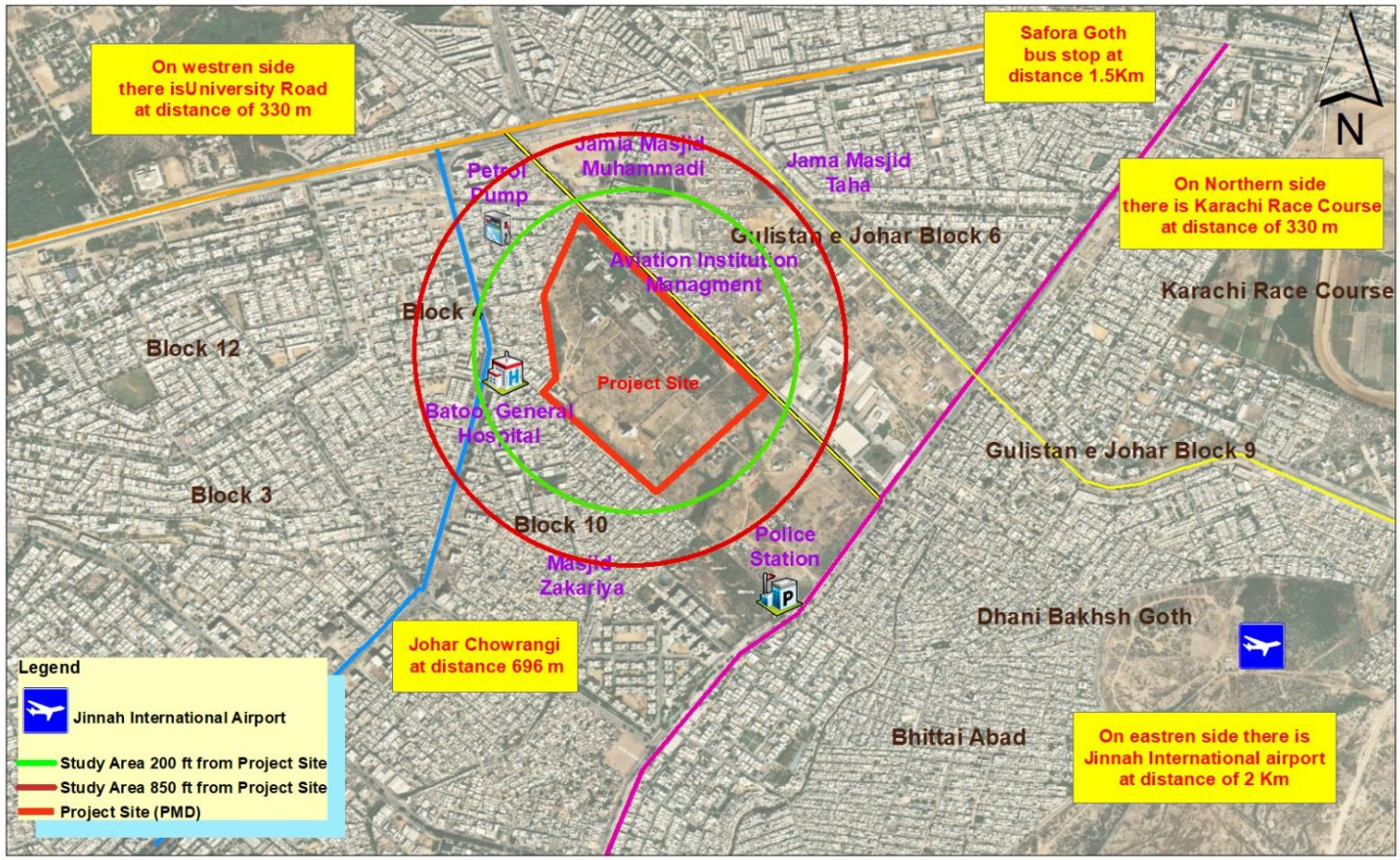

Figure 1.2: Project Area and *Area* of Influence Map

Chapter 6, Information Disclosure, Consultation, and Participation, addresses the outcomes of consultation and scoping sessions conducted with local communities, knowledgeable individuals, public representatives, PMD staff at IMG met worker and others. It addresses the concerns of various population tiers and provides an outline of how these concerns have been addressed within the project framework.

Chapter 7, Project Impacts and Mitigation Actions, provides an analysis of the environmental and social impacts of the project and discusses measures to mitigate adverse impacts and enhance the environment of the project-affected area.

Chapter 8, Environmental & Social Management and Monitoring Plan and Institutional Requirements, outlines plans and associated costs for implementing environmental management and monitoring. It proposes an organizational setup required for the implementation of mitigation actions and, in light of this, identifies strengthening needs in institutional arrangements presently existing within and allied departments.

Chapter 9, Estimated Environmental Cost. This chapter estimates an environmental cost, which comprises environmental mitigation costs during the construction and operation of the proposed project.

CHAPTER - 2: LEGAL AND REGULATORY FRAMEWORK

2.1 General

This Chapter provides an overview of the legal frameworks and environmental assessment process in Pakistan, as well as a list of key environmental legislation and guidelines applicable to the proposed project. It also provides an overview of the Sindh Environmental Protection Act (SEPA) and World Bank Environment and Social Standards (ESS), including applicable Environmental, Health and Safety Guidelines, among others.

2.2 National/ Provincial Legislation

2.1.1 Sindh Environmental Protection Act, 2014

The SEPA, 2014 is a comprehensive legislation and provides the legislative framework for the 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 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/EC with the Provincial Agency designated by the Provincial EPAs an IEE/EIA/EC, and has obtained an approval;
- Establishment and formation of the Environmental Protection Council;
- Prohibition of certain discharges or emissions;
- Sindh Environmental Quality Standards (SEQS) for wastewater, air emissions and noise; and
- The provincial government can issue notices and enforce them to protect the environment.

2.3 Project Category

2.1.2 SEPA (Environmental Assessment) Regulations, 2021

According to Sindh – EPA: The Sindh Environmental Protection Agency (Environmental Assessment) Regulations 2021 provide screening categories of projects for which an Environmental Checklist (EC), an IEE or an EIA must be conducted. The proposed project falls under

Schedule II,

J. Urban development

2. Residential, Commercial, and multistory high-rise construction projects with covered areas of more than 100,000 sq ft to 500,000 sq ft.

This category requires an IEE to be conducted.

Hence, an IEE for SEPA and an ESMP for the World Bank have been prepared to fulfill the

statutory requirements. The completed IEE has to be submitted to SEPA for No Objection Certificate (NOC) approval before project commencement.

2.4 World Bank Environment and Social Standards (ESS)

World Bank's Environmental and Social Framework (ESF) sets out ten ESS to (a) support borrowers in achieving good international practice relating to environmental and social sustainability, (b) assist borrowers in fulfilling their national and international environmental and social obligations, (c) enhance non-discrimination, transparency, participation, accountability and governance, and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

Each ESS has mandatory requirements that the borrowers should meet. The ESSs are designed to guide the borrowers in managing the risks and impact of the project and improve their environmental and social performance. A summary of the environmental and social standards and their relevance to the project is provided in Table 2. 1 below.

Table 2-1: World Bank Env. & Social Standards Relevant to the Project

Environmental and Social Standards	Relevance to the Project
ESS1 – Assessment and Management of Environmental and Social Risks and Impacts	Relevant.
ESS2 – Labor and Working Conditions	Relevant.
ESS3 – Resource Efficiency and Pollution Prevention and Management	Relevant.
ESS4 – Community Health and Safety	Relevant.
ESS5 – Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Not Relevant.
ESS6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources	Not Relevant.
ESS7 – Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not relevant.
ESS8 – Cultural Heritage	Not Relevant.
ESS9 – Financial Intermediaries	Not relevant.
ESS10 – Stakeholder Engagement and Disclosure	Relevant.

2.5 Other Applicable Cross-Sectoral Laws in Sindh

The scope of cross-sectoral law, as implied by the legal definition of the environment given in SEPA 2014, results in numerous laws enacted since the nineteenth century being classified as environmental laws. These include laws pertaining to forests, water resources, wildlife, land, agriculture, health and town planning. Laws relevant to the environment, along with their brief scope and applicability, are listed in Tables 2.2 & 2.3.

Table 2-2: Key Applicable Cross-Sectoral Legislation in Sindh

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
1.	National Climate Change Policy 2012 (updated 2021) Sindh Climate Change Policy, 2022	It also proposes promoting futuristic building designs with special emphasis on solar panels for energy self-sufficiency, especially in public sector buildings and developing all types of renewable energy generation technologies. The policy thus provides a comprehensive framework for developing	Proposed Project objectives directly addressed by MHSP-IFRAP through its focus on hydromet services, resilient infrastructure, and community-based adaptation.

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
		Action Plans for national efforts on adaptation and mitigation.	
2.	National Drinking Water Policy, 2009 Sindh Drinking Water Policy 2017	The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in providing safe drinking water to the people. Drinking water is a constitutional responsibility of provincial governments, and the specific provision function has been devolved to specially created agencies in cities and towns, as well as Tehsil Municipal Administrations, under the Local Government Ordinance 2001.	This policy applies to the proposed project regarding regular water quality monitoring during the construction phase.
3.	Sindh Sanitation Policy 2017	The sanitation policy primarily emphasizes enhancing the accessibility of sanitation services, ensuring the safe disposal of liquid and solid waste, and advocating for improved health and hygiene practices across the province. This encompasses the effective management of solid and liquid waste from municipal, hospital, and industrial sources.	This policy is applicable as the proposed project involves the establishment of facilities to provide safely managed sanitation services during the construction phase and operation phase.
4.	National Environmental Policy, 2005	In March 2005, the Government of Pakistan launched its National Environmental Policy, which provides a framework for addressing environmental issues. Section 5 of the policy commits to integrating the environment into development planning as a means of achieving the objectives of the 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 ensure effective management of their environmental resources.	Clause (b) of Subsection 5.1: Integration of Environment into Development Projects states that Environmental Impact Assessment-related provisions in the Environmental Protection Act, 1997, will be diligently enforced for all development projects.
5.	Sindh Labor Policy 2018 (SLP 2018)	The focus of SLP 2018 is on eliminating child labor, addressing the issue of bonded labor, tackling wage discrimination and unequal work opportunities, promoting freedom of association and collective bargaining, enhancing the labor inspection system, and improving occupational safety and health. In addition, SLP 2018 addresses women's labor issues, including opportunities and equal remuneration, in line with International Labour Organization (ILO) conventions and the protection of vulnerable groups, such as mine workers, women, children, and persons with disabilities.	The provision of this policy will apply to all the labor employed.

Table 2-3: Main Social and Environmental Legislation Relevant to the Project

Sr. No.	Act	Brief Coverage	Relevance to Project
1.	Sindh Environmental Protection Act, 2014	The Act is comprehensive legislation that provides the legislative framework for protecting, conserving, rehabilitating, and improving the environment. The notable points of the law are: No project proponent shall	The provision of the act applies to the proposed project for conducting an IEE/EIA/EC, as per Section 17, and for obtaining environmental approval from SEPA.

Sr. No.	Act	Brief Coverage	Relevance to Project
		commence construction or operation unless they have filed an IEE with the Provincial Agency designated by the Provincial EPAs and have obtained approval.	Section 18 of the Act applies to compliance with the SEQS. Similarly, sections 11, 12, 13, and 14 of the Act prohibit the discharge or emission of hazardous waste, as well as the failure to comply with standards and the import of hazardous waste.
2.	Sindh Environmental Protection Agency, (Review of EC, IEE and EIA) Regulations, 2021	These regulations set out: • Key policy and procedural requirements for filing an EIA/IEE/EC; • The purpose of environmental assessment. • The requirement that environmental assessment be integrated with feasibility studies; • The responsibilities of proponents; • Provides schedules of proposals that the project requires either an EC or IEE or EIA; • The environmental screening process of the projects under schedule I, II and III; and • The procedure for obtaining environmental approval involves filing the case with the relevant SEPA to obtain a NOC.	These regulations mandate environmental screening of the project, necessitating the completion of an EIA/IEE/EC for the project.
3.	Sindh Environmental Quality Standards (SEQS), 2016	SEQS was promulgated recently in 2016. Specified standards under SEQS 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 Sindh must conform to SEQS, 2016, throughout all phases, including construction and operation.
4.	Self-Monitoring and Reporting by Industry (SMRI) Rules, 2014	The SMRI Rules promote responsible environmental practices and transparency within industries, supporting environmental protection and regulatory enforcement by requiring regular self-assessments and reports on environmental performance.	These rules will apply to contractors and subcontractors regarding environmental monitoring and the submission of reports to SEPA.
5.	The Sindh Transparency and Right to Information Act, 2016	This Act aims to promote transparency and facilitate access to information, ensuring all citizens have improved access to public information. It seeks to enhance government accountability to citizens and uphold the fundamental right to information in all matters of public significance. Additionally, the Act aims to foster transparency across all government affairs. Transparency and access to information are fundamental	This act applies as it is a public sector initiative and is required to maintain transparency for the public.

Sr. No.	Act	Brief Coverage	Relevance to Project
		tenets of democracy, empowering citizens to hold their government and its institutions accountable and contributing to the enhancement of governance systems.	
6.	The Sindh Local Government Act 2013 and Sindh Local Government (Amendment) Act, 2021	The Sindh Local Government Act 2013, Chapter VI, outlines the responsibilities of municipal corporations/committees, including land use planning, enforcement of building regulations, management of environmental and health risks, combating food adulteration, provision and upkeep of water supply systems and public drinking water sources, and engaging communities in local infrastructure enhancement such as transportation, landscaping, and removal of encroachments. The 2021 amendment aimed to clarify the roles of municipal corporations and committees while also establishing a structured relationship between elected councils and provincial departments operating within administrative boundaries.	The application of this act to the proposed project stems from its location and the utilization of public sources during the construction and operational phases. Additionally, the implementation of the project will be overseen by Pakistan Meteorological Department.
7.	Land Acquisition Act, 1894 and Land Acquisition (Sindh Amendment) Act, 2009	The primary law for the acquisition of land for public purposes in Pakistan is the "Land Acquisition Act (LAA), 1894" (hereinafter referred to as the Act). The land acquired under the Act vests in the Province and only thereafter may the Province transfer it to someone else. The Sindh Amendment 2009 of LAA 1894 specifically related to Section 16, Section 23, Section 24 and Section 28-A.	Not applicable as No Land Acquisition has been involved. The land belongs to the Met Department.
8.	Sindh Factories (Amendment) Act, 2021	The Act deals with regulations related to Project Area workers and workplace environmental health and safety (EHS) requirements. The Factories Act also provides regulations with provisions for the general health and safety of the workforce in their work area. Conditions are specified for a clean workplace, toilets, waste handling, provision of drinking water quality, worker health and hygiene, among others. Under the Act, no factory occupier shall commence the manufacturing process unless they have obtained a factory registration certificate from the Directorate of Labor. The Act prohibits children under the age of 14 from working in a factory. The new Law restricts the employment of contractual labor in the manufacturing process. The 2021 amendment is specifically related to providing safe transportation facilities for women workers, as well as regulating working hours and periods for seasonal and year-round factories.	This act applies to the Project workers and those belonging to the community, including men, adults, women, and adolescents working in and near the construction industry (during the construction phase).

Sr. No.	Act	Brief Coverage	Relevance to Project
9.	The Sindh Occupational Safety and Health Act (2017)	The Act governs regulations concerning the health and safety of workers, as well as workplace EHS requirements, in the project area. It includes provisions outlined in the Factories Act, ensuring the overall well-being of the workforce within their work environment. These provisions encompass maintaining workplace cleanliness, providing adequate toilet facilities, handling waste properly, supplying high-quality drinking water, and promoting worker health and hygiene. Additionally, the Act mandates that no factory operation can commence without obtaining a factory registration certificate from the Directorate of Labor. It strictly prohibits the employment of children under the age of 14 in any factory setting. Furthermore, the recent 2021 amendment imposes restrictions on the use of contractual labor in manufacturing processes. It introduces specific provisions for the safe transportation of female workers and regulations governing working hours for seasonal and year-round factories.	This law applies to projects that respect and protect the rights and interests of workers. It pertains to construction and project workers and will be adhered to throughout the construction and operational phases.
10.	The Protection against Harassment of Women at the Workplace Act, 2010 Amendment Bill 2022	The Protection Against Harassment of Women at the Workplace Act (2010) addresses sexual harassment in the workplace.	This Act will apply to the Project if women are employed to construct the proposed Project.
11.	Sindh Prohibition of Child Employment Act, 2017	Article 11(3) of the Pakistani Constitution prohibits employing children below 14 years in hazardous jobs, and the Prohibition of Child Employment Act 2017 in Sindh enforces this, allowing adolescents (14-17 years) to work under specific rules but not in hazardous occupations listed in the Act's schedule.	The relevance of this act to the Project is that it prohibits child employment during the construction of the proposed Project.
12.	Sindh Bonded Labor (Abolition) Act 2015	The Act incorporates gender sensitivity, integrating an anti-discrimination clause mandated by the ILO. This clause stipulates that no discrimination shall occur based on factors such as sex, religion, political affiliation, sect, color, caste, creed, or ethnic background when addressing matters related to the enforcement of this Act. Additionally, within all proposed laws, the jurisdictional authority has been shifted from the Judicial Magistrate to the Presiding Officer of Labor Courts, who holds the position of a Session Judge.	This act is relevant as the proposed project may employ a diverse workforce comprising individuals with various religions, political affiliations, sects, colors, castes, creeds, and ethnic backgrounds.
13.	The Sindh Minimum Wages Act, 2021 (Amendment 2023)	To provide the regulation of minimum rates of wages and various allowances for different categories of workers employed in certain industrial and	This Act will apply to the Project to ensure that minimum wages and allowances are provided to the Project labor (both skilled and

Sr. No.	Act	Brief Coverage	Relevance to Project
		commercial undertakings and establishments.	unskilled) for the construction of the proposed Project.
14.	The Sindh Solid Waste Management Board Act, 2014	The Sindh Solid Waste Management Board Act, 2014 for the collection and disposal of all solid waste, to arrange for effective delivery of sanitation services, to provide a pollution-free environment and to deal with other relevant matters.	The proposed project may generate various types of solid and liquid waste; therefore, this act shall apply to the proposed project to address relevant matters.
15.	The Sindh Forest (Amendment) Act, 2012	Regulates forest resources. Empower the government to declare any forest area reserved or protected.	It is irrelevant, as no reserve or protected forest falls within the project area or the Area of Influence (AOI).
16.	The Sindh Wildlife Protection Ordinance 1972 (Amendment 2001, 2010) Act, 2007, 2020	The law specifies three broad classifications of the protected areas:- a) National Parks - Hunting and breaking of land for mining are prohibited in national parks, as are removing vegetation or polluting water flowing through the park. b) Wildlife Sanctuaries - Wildlife Sanctuaries are areas left as undisturbed breeding grounds for wildlife. Cultivation, grazing, and habitation are prohibited in the demarcated areas. Special permission is required to enter the public. However, in exceptional circumstances, these restrictions are relaxed for scientific purposes or the betterment of the respective Area at the discretion of the authority. Game Reserves - Game reserves are designated as areas where hunting or shooting is not allowed except under special permits.	All interventions are anticipated to occur within the urban region of Karachi City. There are no foreseen direct impacts on biodiversity and natural resources, as construction activities will be conducted in areas that have already been transformed.
17.	The Antiquities Act 1975 & Sindh Cultural Heritage (Preservation) Act - 1994	Preserving and protecting antiquities (any object over 75 years old). Empower the government to declare any antiquity as protected. The Act 1994 provides rules and regulations to preserve and protect ancient places and objects of agricultural, historical, archaeological, artistic, ethnological, anthropological and national interest in the province of Sindh.	The law will apply to the proposed project primarily because of two key provisions: Construction activities within a radius of 61 meters (200 feet) or less of protected antiquities are prohibited by law. No such Physical cultural resource is present near the proposed project. The provisions of this act would also be relevant in the event of accidental archaeological discoveries during excavation work for the construction of proposed project.
18	Building Code of Pakistan (Seismic Provisions, 2007)	Specifies structural standards for seismic zones. Mandates earthquake-resistant designs.	Critical for hydromet infrastructure in Sindh, where flood-resilient structures must also withstand seismic risks, ensuring continuity of climate services during disasters.

2.2 International Labor Organization (ILO) Conventions – Ratified by Pakistan

Pakistan has ratified 8 fundamental and 26 technical ILO conventions, the following of which

are relevant to the proposed project and are summarized in Table 2.4 below.

Table 2-4: Relevant ILO Conventions

Sr. No.	ILO Conventions	Objectives	Relevance to the Project
i.	C029 - Forced Labor Convention, 1930 (No. 29)	This convention states that each member undertakes to suppress the use of forced or compulsory labor in all its forms within the shortest possible period. The convention also states that the term forced or compulsory labor shall mean all work or service which is exacted from any person under the menace of any penalty and for which the person has not offered himself voluntarily.	The proposed project must adhere to this convention to prohibit all forms of forced or compulsory labor. Accessible means to raise workplace concerns and complaints will also be ensured for all workers through an effective grievance and redressal mechanism (GRM).
ii.	C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	For the purposes of this Convention, discrimination includes any distinction, exclusion, or preference made based on race, color, sex, religion, political opinion, national origin, or social origin which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation.	The proposed project will ensure fair treatment, non-discrimination, and equal opportunity for workers while also supporting freedom of association and collective bargaining. The proposed project must aim to close the gender gap rather than widen it through its intervention.
iii.	C138 - Minimum Age Convention, 1973 (No. 138)	Article 1 of the convention states that each Member which ratifies this Convention shall specify, in a declaration appended to its ratification, a minimum age for admission to employment or work within its territory and on means of transport registered in its territory, subject to Articles 4 to 8 of this Convention, no one under that age shall be admitted to employment or work in any occupation.	The proposed project should avoid, in particular, child labor that is mentally, physically, socially or morally harmful.
iv.	C001 - Hours of Work (Industry) Convention, 1919 (No. 1)	The term industrial undertaking under this convention includes (c) construction, reconstruction, maintenance, repair, alteration, or demolition of any building, railway, tramway, harbor, dock, pier, canal, inland waterway, road, tunnel, bridge, viaduct, sewer, drain, well, telegraphic or telephonic installation, electrical undertaking, gas work, waterworks or other work of construction, as well as the preparation for or laying the foundations of any such work or structure; Article 2 of the Convention states that the working hours of persons employed in any public or private industrial undertaking or in any branch thereof, other than an undertaking in which only members of the same family are employed, shall not exceed eight in the day and forty-eight in the week. The limit of hours of work prescribed in Article 2 may be exceeded in case of an accident, actual or threatened, or in case of urgent work to be done to machinery or plant, or in case of "force majeure", but only so far as may be necessary to avoid serious interference with the ordinary working of the undertaking.	The proposed project may involve wage labor; if it does, the working conditions should comply with this Convention.

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Sr. No.	ILO Conventions	Objectives	Relevance to the Project
v.	C011 - Right of Association (Agriculture) Convention, 1921 (No. 11)	Each Member of the International Labor Organization, which ratifies this Convention, undertakes to secure to all those engaged in agriculture the same rights of association and combination as to industrial workers and to repeal any statutory or other provisions restricting such rights in the case of those engaged in agriculture.	The proposed project may create wage labor; if it does, the rights of association and combination should be respected in accordance with this Convention. Accessible means to raise workplace concerns and complaints will also be ensured for all workers through an effective grievance and redressal mechanism (GRM).

2.2.1 International Financial Corporation (IFC) EHS Guidelines

The General EHS[8] Guidelines contain information on cross-cutting environmental, health, and safety issues that are potentially applicable to all industry sectors. It should be used together with the relevant industry sector guideline(s).

The EHS General Guidelines will apply to this Project. (Table 2.5).

Table 2-5: General EHS Guidelines

1. Environmental	2. Occupational Health and Safety	3. Community Health and Safety	4. Construction and Decommissioning
1.1 Air Emissions and Ambient Air Quality	2.1 General Facility Design and Operation	3.1 Water Quality and Availability	4.1 Environment
1.2 Energy Conservation	2.2 Communication and Training	3.2 Structural Safety of Project Infrastructure	4.2 Occupational Health and Safety
1.3 Wastewater and Ambient Water Quality	2.3 Physical Hazards	3.3 Life and Fire Safety	4.3 Community Health and Safety
1.4 Water Conservation	2.4 Chemical Hazards	3.4 Traffic Safety	
1.5 Hazardous Materials Management	2.5 Biological Hazards	3.5 Transport of Hazardous Materials	
1.6 Waste Management	2.6 Radiological Hazards	3.6 Disease Prevention	
1.7 Noise	2.7 Personal Protective Equipment (PPE)	3.7 Emergency Preparedness and Response	
1.8 Contaminated Land	2.8 Special Hazard Environments		
	2.9 Monitoring		

2.6 International Protocol/ Conventions

As Pakistan is a member of a number of international organizations, such as the United Nations Organization (UNO), the Organization of the Islamic Conference, the South Asian Association for Regional Cooperation, the Economic Cooperation Organization, etc., 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

[8] *(www.ifc.org/ehsguidelines)*

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given in Table 2.6:

Table 2-6: International Agreements/Conventions Relevant to the Project

Sr. No	Agreement/Convention	Ratification	Description/Relevance
1	Convention on Biological Diversity, 1994 Web Link: https://www.cbd.int/	Pakistan signed this treaty in 1992 and cabinet ratified it in 1994.	The Convention on 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. *The law is partially relevant, as the proposed intervention involves natural resource management, and there are no natural habitats or game reserves within the project AOI.*
2	The Rio Declaration, 1992 Web Link: http://www.unep.org/documents. Multilingual /default.asp?documented =78 & articled = 1163	Pakistan signed the treaty on 13 Jun 1992 and ratified it on 1 June 1994	The Rio Declaration comprises 27 principles, which address important issues such as sustainable development, integrating environmental protection into the development process; common but differentiated responsibilities to conserve, protect, and restore the Earth's ecosystems; and public participation and access to information at the national level, to reduce and eliminate unsustainable patterns of production and consumption. *The law is relevant because the proposed project focuses on protecting the natural environment, which is currently an Urban area. The construction and upgrade of the Met Office is a foundational investment for climate adaptation, enabling Pakistan to manage climate risks better weather forecoast, fulfill its international commitments, and protect its people and economy from the growing impacts of climate change*
3	Kyoto Protocol, 1992 Web Link: http://unfccc.int/kyoto_protocol/items/ 2830.php	Pakistan has ratified Kyoto Protocol in 2005	The Kyoto Protocol is a protocol designed to reduce greenhouse gases that contribute to climate change. It was agreed upon on 11 December 1997 at the 3rd Conference of the Parties to the treaty, which was held in Kyoto, and entered into force on 16 February 2005. As of November 2007, 175 countries have ratified the protocol. One hundred thirty-seven (137) developing countries have ratified the protocol, including Brazil, China, India, and Pakistan; however, they have no obligation beyond monitoring and reporting emissions. *The project has been proposed to fulfill the protocol by making no changes to the climate, rather than mitigating the effects of climate change. While IFRAP does not directly reduce greenhouse gas emissions, it is highly relevant to the Kyoto Protocol's objectives for developing countries by supporting adaptation, improving climate data*

Sr. No	Agreement/Convention	Ratification	Description/Relevance
			systems, and helping Pakistan meet its international monitoring and reporting obligations.
4	Convention on the International Trade of Endangered Species (CITES), 1975 Web Link: https://www.cites.org/	Pakistan signed the Convention in 1973 and ratified it in April 1976	The convention entered into force on 1 July 1975. The principal obligations of contracting parties to the CITES are to safeguard the trade in rare or endangered species and it established a permit system to control imports and exports of wild fauna and flora. According to this convention, species threatened with extinction whose movement between countries is prohibited except for conservation purposes, such as captive breeding, and species whose commercial trade is permitted but export permits are needed. *CITES obligations are not triggered by MHSP-IFRAP because the project's activities do not involve the import, export, or commercial use of endangered species. The project's focus is on climate adaptation, infrastructure, and community resilience, not on wildlife trade or management.*

2.3 A Comparison of Applicable Local and International Guidelines

To select the most stringent standards applicable, a combination of local SEQS and IFC, United States Environmental Protection Agency (USEPA) regulations has been chosen.

2.3.1 Ambient Air Quality Comparison

A comparison of applicable local and international guidelines for ambient air quality has been provided in Table 2.7 below. Regarding CO, NO_2, and suspended particulate pollutants, the SEQS standards for ambient air quality are more stringent than those of the USEPA and WHO/IFC standards. However, for SO_2, PM_{10}, and $PM_{2.5}$, the WHO/IFC standards are more stringent.

Table 2-7: Comparison of International and Local Air Quality Standards

Sr. No.	Pollutants	USEPA		WHO/IFC		SEQS	
		Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
1	SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr 10 min	20 ug/ m^3 500 ug/ m^3	Annual Mean 24 hrs	80 ug/ m^3 120 ug/ m^3
2	CO	8 hrs	9 ppm (11 mg/m^3)	-	-	8 hrs	5 mg/ m^3
		1 hr	35 ppm (43 mg/m^3)			1 hr	10 mg/ m^3
3	NO_2	Annual Mean	100 ug/m^3 (53 ppb)	1 year	40 ug/ m^3	Annual Mean	40 ug/m^3
		1 hr	100 ppb	1 hr	200 ug/m^3	24 hrs	80 ug/m^3
4	O_3	8 hrs	0.07ppm (148 ug/m^3)	8 hrs. daily maximum	100 ug/m^3	1 hr	130 ug/m^3

Sr. No.	Pollutants	USEPA		WHO/IFC		SEQS	
		Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
5	Suspended Particulate	-	-	-	-	Annual Mean	360 µg/ m^3
						24 hrs	500 ug/ m^3
6	PM_{10}	24 hrs	150 ug/ m^3	1 yr	20 ug/m^3	Annual Mean	120 µg/ m^3
				24 hr	50 ug/m3	24 hrs	150 µg/m3
7	PM2.5	Annual Mean	15 ug/m^3	1 yr	10 ug/m3	Annual Average	15 ug/m3
		24 hrs	35 ug/m^3	24 hr	25 ug/m3	24 hrs.	35 ug/m3
						1 hr	15 ug/m3

2.3.2 Noise Values Comparison

A comparison of noise standards (see Table 2.8) clearly shows that SEQS standards are more stringent than the WHO/ IFC standards for residential and commercial areas. The only exception is the daytime noise level standard for industrial areas, where the WHO/ IFC standard is more stringent, i.e., 70 dB(A), compared to the SEQS, i.e., 75 dB(A). For this particular parameter, the WHO/IFC standard will be used.

Table 2-8: Comparison of International and Local Noise Standards

Sr. No	Category of Area/ Zone	Limit in dB(A) Leq			
		SEQS		WHO/IFC	
		Day Time	Night Time	Day Time	Night Time
		06:00 - 22:00	22:00 - 06:00	07:00 - 22:00	22:00 - 07:00
1	Residential Area (A)	55	45	55	45
2	Commercial Area (B)	65	55	70	70
3	Industrial Area (C)	75	65	70	70
4	Silence Zone (D)	50	45	55	45

2.3.3 Drinking Water Values Comparison

The comparison of drinking water quality standards is given in Table 2.9, which clearly shows the comparison between SEQS and WHO standards.

Table 2-9: Comparison of Local and International Drinking Water Standards

Sr. No.	Parameters	Units	SEQS	WHO standards
1	Temperature (During Sample Collection)	^{O}C	NS	NS
2	Color	Pt-Co	≤15TCU	≤15TCU
3	pH	pH unit	6.5-8.5	6.5-8.5
4	Turbidity	NTU	<5	<5
5	Total, Hardness	mg/L	<500.00	NS
6	Total Dissolved Solid (TDS)	mg/L	<1000.00	<1000.00

Sr. No.	Parameters	Units	SEQS	WHO standards
7	Total Suspended Solid (TSS)	mg/L	NS	NS
8	Ammonia	mg/L	NS	NS
9	Fluoride F-	mg/L	≤1.50	1.5
10	Sulfate (SO4-2)	mg/L	NS	NS
11	Chloride(Cl-)	mg/L	<250.00	250
12	Nitrate (NO3)-	mg/L	≤50.00	50
13	Odor	-	Non-Objectionable / Acceptable	
14	Taste	-	Non-Objectionable / Acceptable	
15	Sodium	mg/L	NS	NS
16	Iodine	ppm	NS	NS
17	Arsenic (As)	mg/L	≤ 0.05	0.01
18	Iron (Fe 3+)	mg/L	NS	NS
19	Zinc (Zn 2+)	mg/L	5	3
20	Conductivity	µS/cm	NS	NS
21	Bicarbonate	mg/L	NS	NS
22	Nitrite	mg/L	≤3	3
23	Magnesium	mg/L	NS	NS
24	Calcium as Ca	mg/L	NS	NS
25	Phosphate	mg/L	NS	NS
26	Potassium	mg/L	NS	NS
27	Boron	mg/L	<0.3	0.3
28	SAR Iodine (I)	mg/L	NS	NS
29	Aluminum	mg/L	≤ 0.2	0.2
30	Antimony	mg/L	≤0.005	0.02
31	Cadmium	mg/L	0.01	0.003
32	Mercury	mg/L	≤0.001	0.001
33	Nickel	mg/L	≤0.02	0.02
34	Selenium	mg/L	0.01	0.01
35	Barium	mg/L	0.7	0.7
36	Total Chromium	mg/L	≤0.05	0.05
37	Copper	mg/L	2	2
38	Lead	mg/L	≤0.05	0.01
39	Cyanide (CN)	mg/L	≤0.05	0.07
40	Manganese	mg/L	<0.5	0.5
41	Total Coliforms	cfu/100ml	0/100 ml	0/100 ml
42	Fecal Coli forms (E.Coli)	cfu/ml	0/100 ml	0/100 ml

The SEQS (2016) for ambient air quality, noise, water, and wastewater are more stringent compared to USEPA and WHO/IFC standards, except for a few parameters of ambient air quality, noise, and water that have been considered for the proposed project. Based on the above comparison, only stringent national and international standards values shall apply to the proposed project.

Regarding regulations regarding other environmental parameters, such as acceptable effluent disposal parameters, the local regulations, i.e., SEQS 2016, are more stringent and would be preferred over other international regulations. In Pakistan, there are no standards for surface water (used for irrigation); therefore, Food and Agriculture Organization standards will be followed.

CHAPTER - 3: PROJECT DESCRIPTION

3.1 Introduction and Background

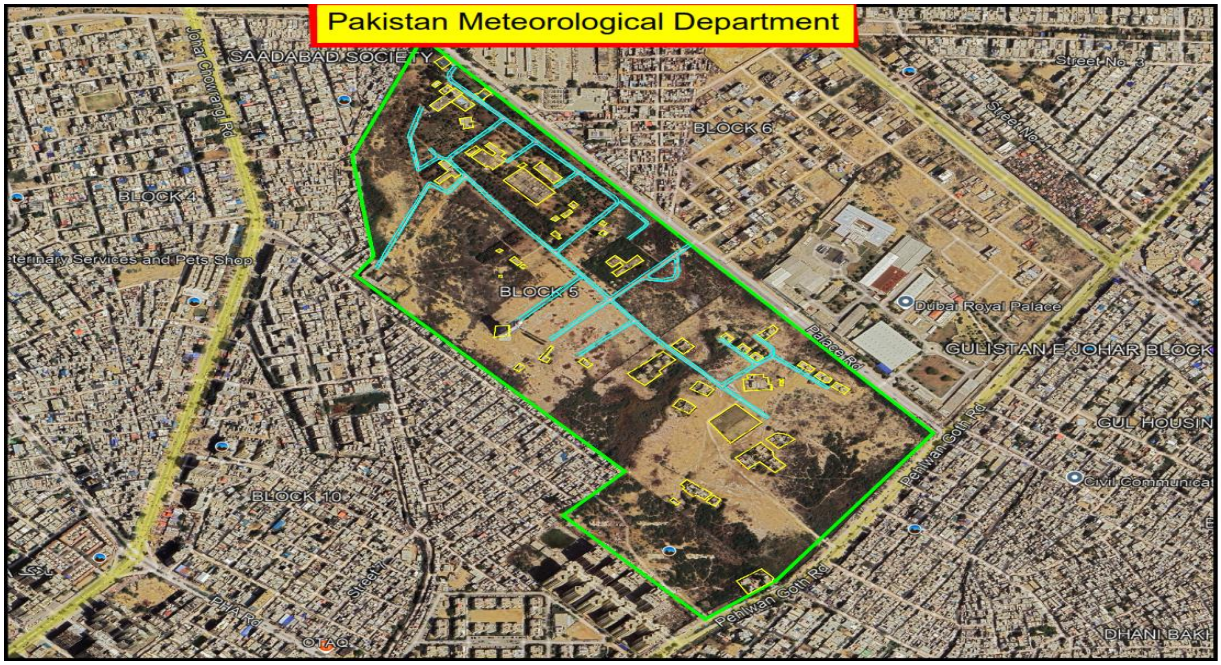
The Upgradation and Rehabilitation of the Institute of Meteorology & Geophysics (IMG) and the Meteorology Workshop at Karachi are key initiatives under the IFRAP, financed by the IDA through Loan No. IDA-73330. IFRAP is designed to strengthen Pakistan's resilience against climate-related disasters, particularly floods, by enhancing the country's hydrometeorological infrastructure and climate services.

Component-II of the project, implemented by the PMD, focuses on modernizing technical facilities and operational capabilities to support advanced meteorological services nationwide. Within this framework, the upgradation of the IMG and the Meteorology Workshop in Karachi will address critical gaps in civil infrastructure, utilities, and technical assets, thereby supporting essential operations such as calibration, equipment repair, and data processing.

3.2 Location of Proposed Project

The map in Figure 3.1 highlights the project site, situated within the Gulistan-e-Johar area. Key landmarks and access points are marked for reference:

- West: University Road is 330 meters from the site, providing a major access route.
- North: Karachi Race Course is located 330 meters away, and the Safora Goth bus stop is 1.5 kilometers from the site.
- East: The External boundary of Jinnah International Airport is approximately 2 kilometers (aerial distance) from the project site.
- Southwest: Johar Chowrangi, a significant intersection, is 696 meters away.



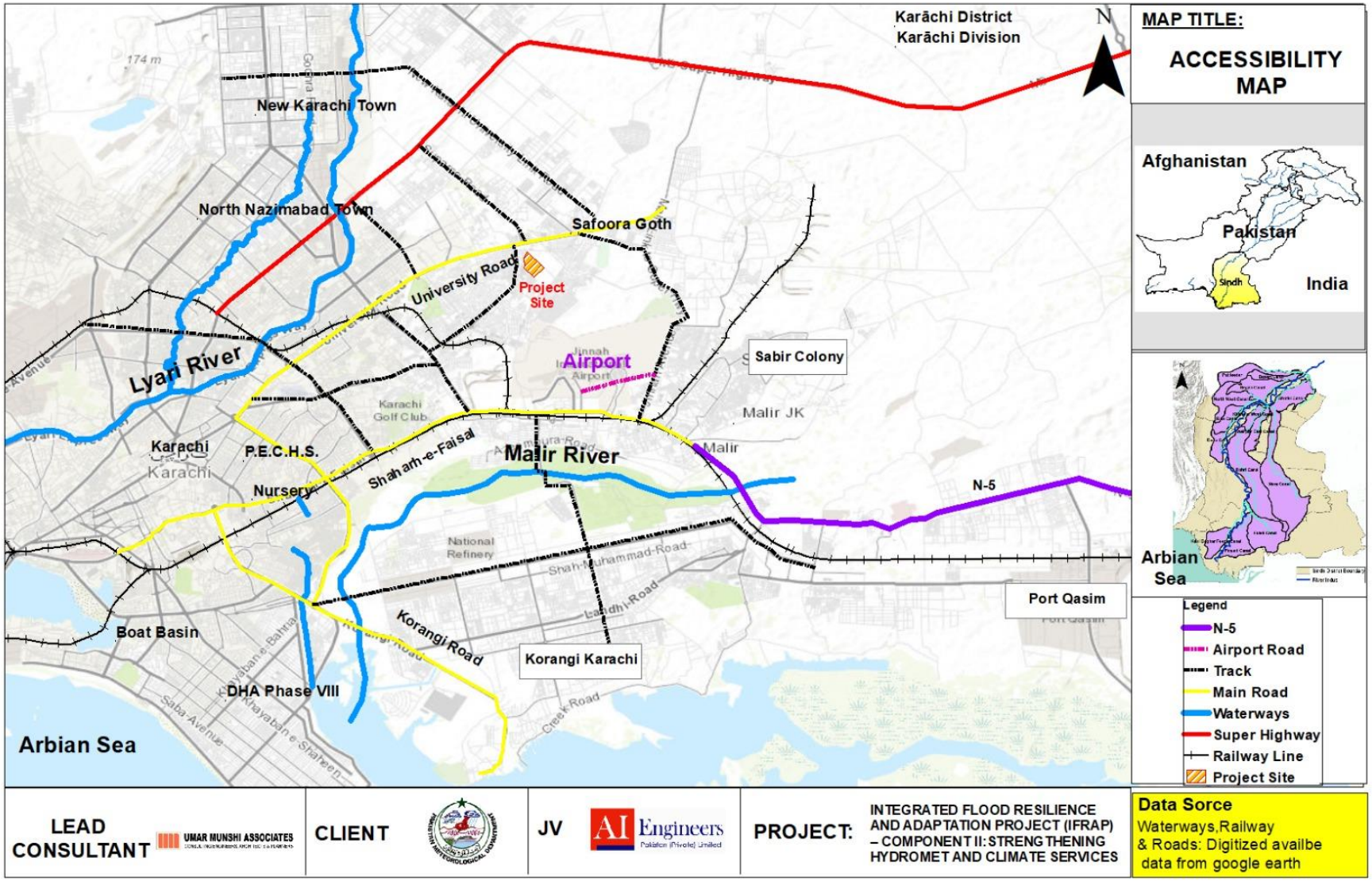


Figure 3.1: Accessibility Map of Proposed Project area

3.3 Scope of Work

3.3.1 Lot-1: Upgradation & Rehabilitation of Institute of Meteorology and Geophysics (IMG)

A. Upgradation & Rehabilitation of IMG Building and Auditorium

This component is focused on expanding and modernizing the academic and infrastructure facilities of the IMG. The scope includes comprehensive maintenance of the existing building (covering civil, electrical, painting, and plumbing works), construction and upgradation of sewerage lines, development of road and parking areas with effective drainage, construction of two security watch towers, strengthening and raising the boundary wall, and the extension and modernization of the auditorium with structural improvements, upgraded interiors, and advanced audio-visual systems. Additionally, classrooms will be digitalized to support contemporary teaching and learning environments.

B. Upgradation & Rehabilitation of Hostel, Playground, and Site Development

This segment aims to improve residential and recreational amenities for faculty, staff, and students. It encompasses internal maintenance of the hostel building including flooring, plumbing, painting, and fixtures along with upgraded water supply and electrical systems. Recreational infrastructure will be enhanced through the construction of a football ground, basketball, tennis, and volleyball courts, a jogging track, pathways, and an open gymnasium. The scope also includes the construction of a visiting faculty block, landscaping, plantation, and the installation of site lighting to create a vibrant and welcoming campus environment.

3.3.2 Lot-2: Upgradation & Rehabilitation of Meteorology Workshop at MET Office Karachi

The second lot focuses on ensuring the functional readiness of the Meteorology Workshop by upgrading supporting infrastructure and utilities. This includes structural repairs and internal refurbishment of the workshop building, provision of essential tools and equipment, construction of an underground water tank with a pumping system, and the installation of a main water supply line to serve the workshop and associated facilities efficiently.

Master Plan Drawings have been depicted in Figures 3.2 to 3.5, while the details Drawings have been annexed as Annexure-I.

3.4 Condition Survey & Proposed Upgrading & Rehabilitation Works

3.4.1 Existing Hostel Building

The existing hostel is a two-story structure that has been in service for over 40 years. Due to the age of the building, the original column layout plans, framing plans, and detailed structural drawings are no longer available. In light of these limitations and to ensure structural safety, the addition of any new floors on the roof of the existing building is strictly prohibited (Refer to Figure 3.6).

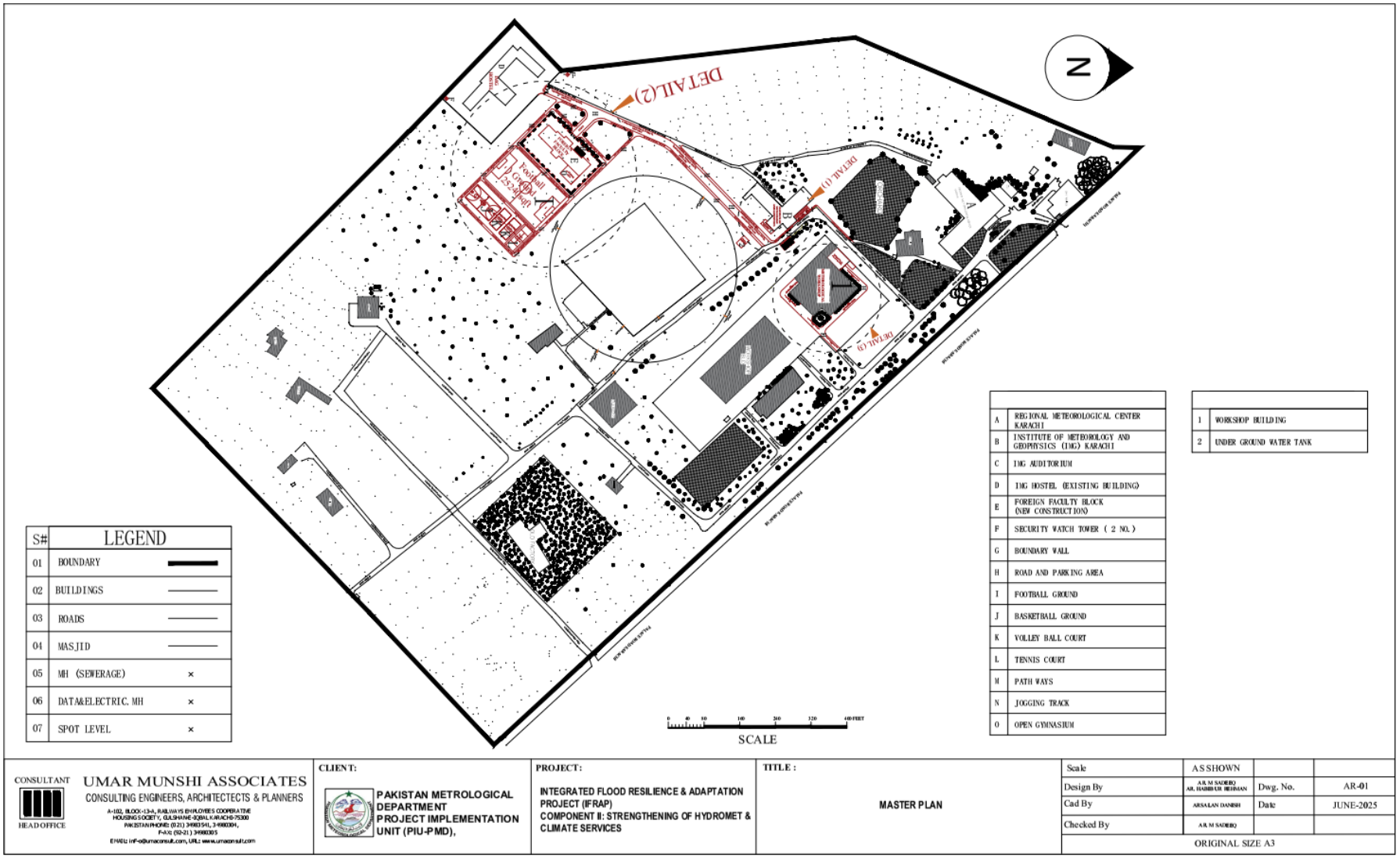


Figure 3.2: Master Plan

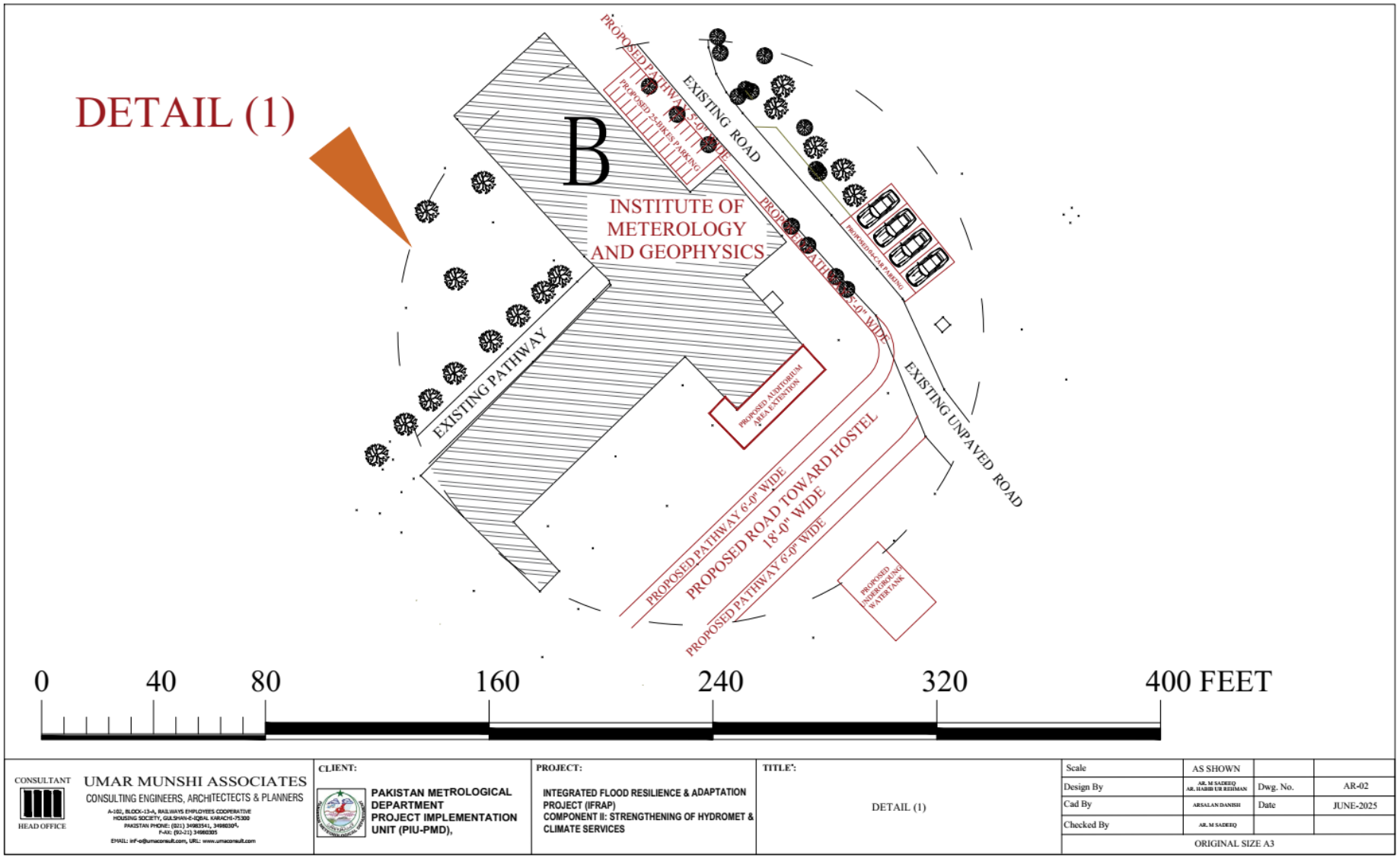


Figure 3.3: Master Plan Detail 1

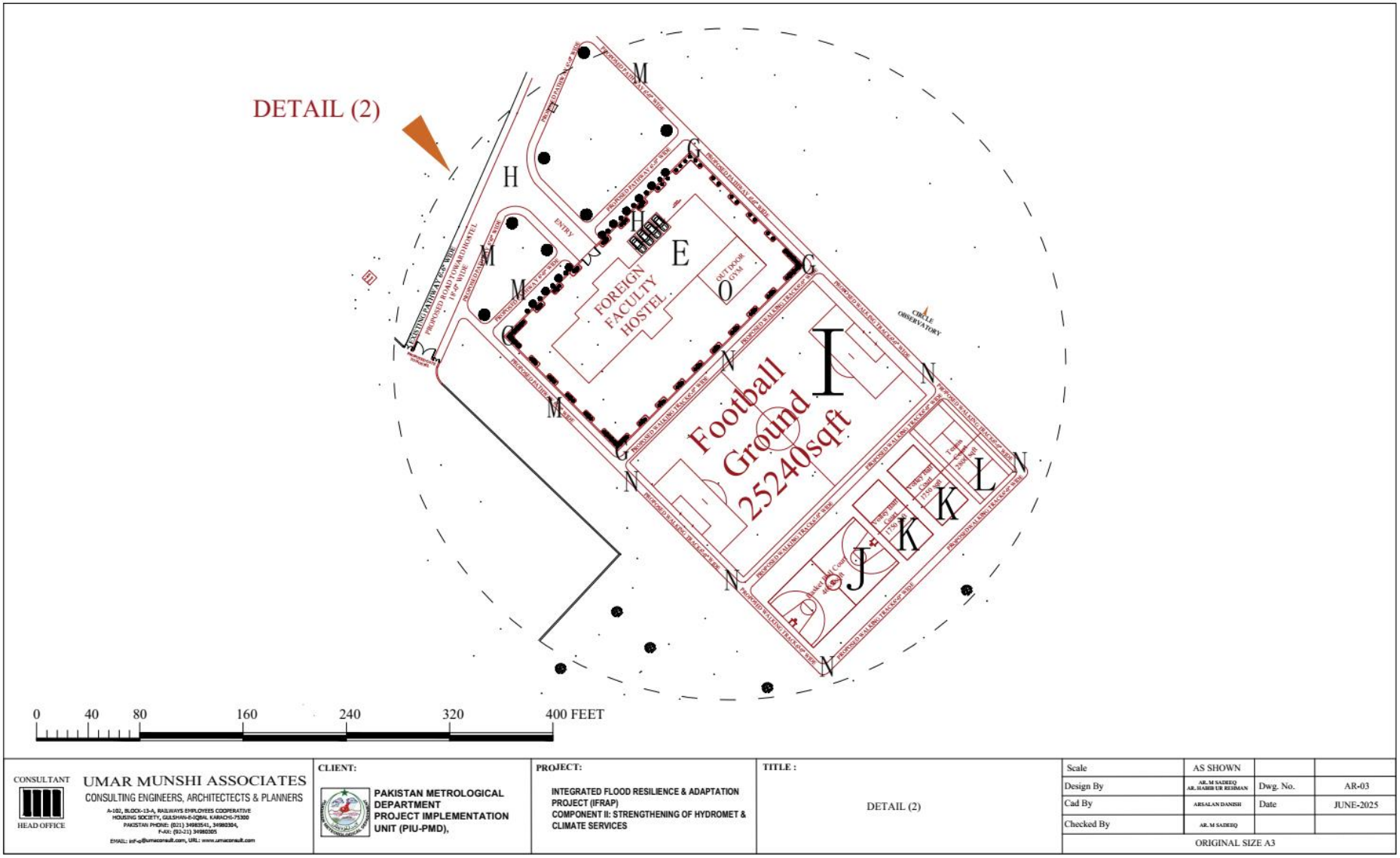


Figure 3.4: Master Plan Detail 2

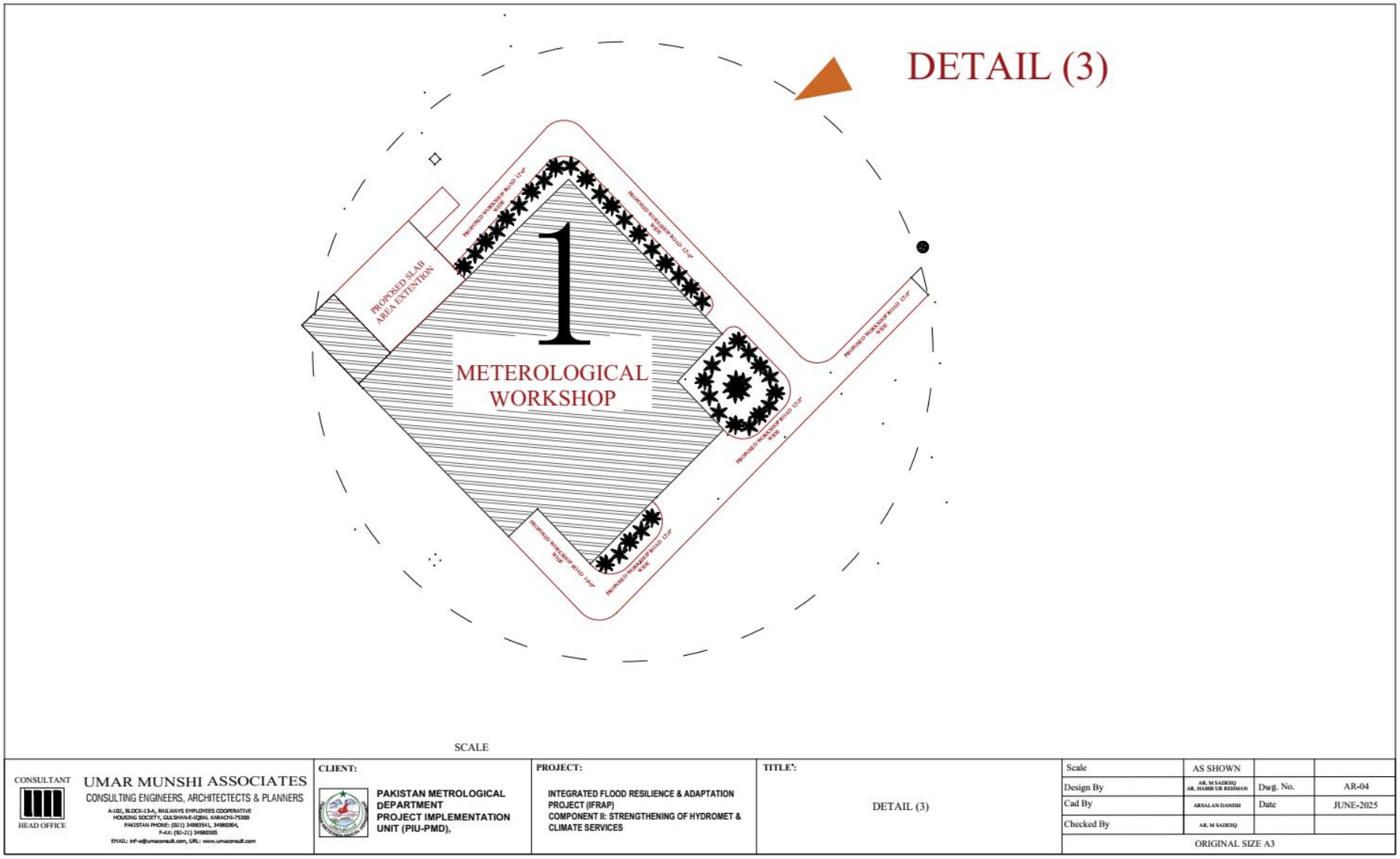


Figure 3.5: Master Plan Detail 3


Figure 3.6: Existing Hostel Building

3.4.2 Existing Institute Building

The existing institute building is a two-story structure that has been in use for over 45 years.[9] . Due to its age, there are no available records of the original column layout, framing plans, or detailed structural drawings. To maintain structural integrity and safety, the construction of any additional floors on the roof is not permitted. Furthermore, the existing roof slab has deteriorated to the point where it cannot be rehabilitated and must be completely replaced with a new one (Refer to Figure 3.7).


[9] In the initial survey, the consultant didn't find any asbestos to be removed. In upgradation phase if found, it will be removed by trained professionals using protective gear, keeping the material damp to avoid dust, and sealing it in labeled bags for disposal at government-approved sites. Also ECP-2 will be complied as per the E&S mitigation plan given in chapter# 8 point 8.7

Figure 3.7: Existing Institute Building

3.4.3 Auditorium Building

The existing auditorium, as depicted in Figure 3.8, is integrated within the institute building and is over 45 years old. Structural documentation, such as column layout plans, framing plans, and detailed structural drawings, is not available due to the building's age. To accommodate the need for increased seating capacity, it is recommended that a new auditorium structure be constructed rather than expanding or modifying the existing facility.

Figure 3.8:Auditorium Building

3.4.4 Workshop Building

The existing workshop is a single-story structure that has been in operation for over 45 years. Due to the building's age, the original structural documentation, including column layout plans, framing plans, and detailed drawings, is unavailable (Figure 3.9). The workshop faces significant issues with water seepage from the roof caused by inadequate drainage, making it extremely challenging to protect sensitive meteorological instruments from potential water damage. Additionally, the dowels extending from the existing columns at the roof level are corroded.

Figure 3.9:Existing Workshop Building

To address these concerns, it is recommended that the entire roof area be rehabilitated to provide effective drainage. The corroded dowels should be properly epoxy-coated and securely capped in concrete to prevent further deterioration. Furthermore, certain sections of the workshop are currently covered with corrugated G.I. sheets and precast slab panels, both of which have significantly deteriorated over time. These should be replaced with a new reinforced concrete (R.C.C.) slab to ensure durability and better protection of the workshop environment.

3.4.5 Office Building

The existing office building is a single-story structure that has been in service for over 45 years. Due to its age, the original structural documentation, including column layout plans, framing plans, and detailed structural drawings, is unavailable. The building has developed moderate to severe cracks in its R.C.C. beams, slab, and partition walls, indicating structural distress. To ensure safety and stability, the addition of any new floors above the existing roof is strictly prohibited, refer to Figure 3.10.

Figure 3.10:Existing Office Building

3.4.6 Warehouse Building

The existing warehouse is a single-story structure that has been in use for over 45 years. Due to the building's age, no column layout plans, framing plans, or detailed structural drawings are available; refer to Figure 3.11. The loading and unloading dock (platform) is in a deteriorated condition and requires replacement. It is recommended that a new, properly constructed platform be built to ensure safe and efficient loading and unloading operations.

Figure 3.11:Existing Warehouse Building

3.4.7 Toilets

The existing toilet facilities are in a state of disrepair, primarily due to inadequate drainage systems (Figure 3.12). Additionally, the current number of toilets is insufficient to meet the needs of building occupants. An increase in the number of toilet units is necessary to ensure proper sanitation and user convenience. Provision of separate hostels along with toilets, kitchen, and other amenities is part of the upgradation work scope.

Figure 3.12: Existing Toilets

3.4.8 Boundary Wall

The existing boundary wall is in a deteriorated condition, as depicted in Figure 3.13, and its current height is inadequate for effective security. To enhance protection against theft and unauthorized access, it is recommended that a new boundary wall be constructed with increased height and improved structural integrity.

Figure 3.13: Existing Boundary Wall

3.5 Design Specifications

3.5.1 Design Standards and Materials

All structural design and construction activities must adhere to ACI 318– 14, International Building Code 2009, and the Pakistan Building Code 2007. Construction must strictly follow the job specifications provided. The RCC columns require a minimum 28-day cylinder strength of 3,000 psi, while slabs require a minimum of 4,000 psi. Only Grade 60 steel, fully conforming to American Society for Testing and Materials Standards (ASTM), is permitted for reinforcement. The contractor is required to submit the proposed concrete mix for approval, along with test cubes and specimens prepared in accordance with ASTM C 39 and ASTM C

31, to verify the compressive strength before placement. All reinforcement bars of 3/8" diameter and above must comply with ASTM A–615, with a minimum yield strength of 60,000 psi and an ultimate strength of 90,000 psi.

3.5.2 Cement, Aggregates, and Water

Ordinary Portland cement (BS–12/PS–232) must be used for superstructure works, while sulphate-resistant cement is required for substructure works. Cement from different sources must not be mixed within the same structure. Only coarse sand and well-graded crushed stone from approved sources are permitted as aggregates, with a maximum nominal size of 3/4" for all R.C.C. work. Water used in concrete and mortar must be clean and free from organic or other impurities.

3.5.3 Concrete Blocks, Dimensions, and Cover

Precast concrete blocks should have a minimum strength of 6000 psi and dimensions of at least 2" x 2" x 2". These blocks must be spaced no more than 3 feet center-to-center and provide the required cover to main reinforcement. Unless otherwise indicated, all dimensions are in feet and inches. Standard concrete cover for reinforcement is specified as follows: 2 ½" for footings, ¾" for slabs, 2 ½" for beams, 1 ½" for columns, and 2" for walls.

3.5.4 Drawings, Approvals, and Site Verification

Construction drawings and bar bending schedules must be submitted to the engineer for approval prior to the commencement of work. All layout, configuration, and dimensions must be verified on site before proceeding. The contractor is responsible for understanding site conditions and must account for all specifications, drawings, and the Bill of Quantities in the tender.

3.5.5 Reinforcement Placement and Construction Practices

All reinforcement bars must be securely held in place with adequate supports before and during concreting. Construction joints must be properly planned and approved, typically located near the middle of spans and perpendicular to main reinforcement. Beam bars require laps of 60 times the bar diameter, while column bars require laps of 48 times the bar diameter, with laps staggered for improved performance. Stirrups should have hooks staggered and located in compression zones.

3.5.6 Quality Control and Safety

No concrete may be poured until formwork and reinforcement have been inspected and approved by the engineer. The sequence of formwork removal must also be approved. Test cubes must be cured under the same conditions as the concrete they represent. During construction, the safety and stability of the structure and all personnel are of prime importance, and utmost care must be exercised to prevent accidents.

3.5.7 Coordination, Excavation, and Services Protection

Structural drawings must be cross-checked with architectural drawings for layout and member levels. Existing underground services must be protected during excavation, which should be carried out by hand near existing structures or services. Adequate shoring and support must

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be provided to safeguard workers and adjacent structures. Backfilling for footings requires compaction in 8" layers. All conduits and pipes to be laid in concrete must be placed below main reinforcement and approved by the engineer.

3.5.8 Geotechnical and Loading Requirements

Excavation, dewatering, and bracing are the contractor's responsibility; a qualified geotechnical engineer may be appointed if necessary. Design loads include dead loads as per structural drawings and a roof live load of 20 psf. The allowable soil bearing capacity at the foundation base is 1.35 tons per square foot, and all recommendations from the geotechnical investigation report must be followed before foundation work begins.

3.6 Estimated Project Cost Summary

The total estimated cost for the upgradation and rehabilitation works at the Institute of Meteorology and Geophysics (IMG) and the Meteorology Workshop at the MET Office Karachi is as follows:

Lot-1: Upgradation of the Institute of Meteorology and Geophysics (IMG)

A. Upgradation of IMG Building and Auditorium:

Pakistani Rupee (PKR) 181,962,052

B. Hostel, Playground, and Site Development:

PKR 220,073,579

Subtotal (Lot-1): PKR 402,035,631

Lot-2: Upgradation of Meteorology Workshop

Total (Lot-2): PKR 146,385,757

Grand Total (Lot-1 + Lot-2):

PKR 548,421,388

This comprehensive budget covers all civil, electrical, and infrastructure improvements, as well as the procurement of necessary equipment and amenities, ensuring the successful modernization of both facilities.

3.7 Contractor's Residence/ Temporary Labour Rest Area

There is no requirement for a large-scale camp area, as local labor will be engaged for the project. These workers will return to their homes daily, minimizing the need for on-site accommodation. Only a small group of 10 to 15 skilled and semi-skilled personnel will reside in the meteorological office hostel, which will be specifically designated and secured for construction workers. This arrangement has been discussed and agreed upon with the Project Implementation Unit (PIU) and the client. This facility will offer spaces for dining, resting, and changing uniforms, thereby removing the need for a large-scale worker camp.

The proximity to essential services and a comfortable living environment will contribute significantly to worker well-being and overall efficiency, ensuring uninterrupted progress on the project. The contractor will prepare a workers' code of conduct plan, obtain approval from the Resident Engineer, Construction Supervision Consultant (CSC), and Project

Implementation Unit (PIU). The key aspects of Residence/ Temporary Labour Accommodation, as camp management and the facilities to be provided, include:

- Providing adequate and well-maintained accommodation with sufficient space, proper ventilation and lighting, temperature control, and regular cleaning to ensure comfort and hygiene.
- Ensure the availability of clean toilets, bathing facilities, and laundry facilities, and implement proper waste management systems.
- Establishing a kitchen to provide nutritious and hygienic meals and ensuring access to safe and potable drinking water.
- Setting up a first aid station, conducting regular health screenings, and providing isolation facilities to address infectious diseases.
- Offering spaces for relaxation, leisure activities, and religious practices, as well as communication facilities to allow workers to stay in touch with their families.
- Implementing 24/7 security measures, fire safety protocols, and a code of conduct to ensure worker safety and prevent conflicts or harassment.
- Establishing a robust and transparent process for workers to report concerns about living conditions, safety, and other issues.
- Appoint a dedicated manager to oversee daily operations, ensure compliance with standards, and address worker concerns with monthly compliance reports submitted to the project management team.

3.8 Manpower Requirement

Local operators/drivers will be preferred who hold a valid Computerized National Identity Card (CNIC) and possess licenses/permits, with experience driving vehicles such as trucks, dumpers, cement and steel carriers, etc. Local unskilled labor[10] will be engaged to support the upgradation and rehabilitation work. These workers will return to their adobes daily after tasks, simplifying logistics, minimizing accommodation expenses, and fostering community involvement through local employment opportunities. The contractor will determine the manpower required during the project's execution, which will be outlined in the contractor's ESMP (CESMP) and must be approved by the CSC.

3.9 Borrow Material

Earthwork materials can be sourced from borrow areas where suitable soil is available. The Contractors will identify borrow areas as per their arrangement and get approval from CSC and PIU and a formal agreement will be signed between the land owner and the contractor. The contractor will be required to procure materials from authorized or government-approved quarries and obtain approval from the CSC and PIU prior to commencing work.

3.10 Machinery & Equipment

The construction work includes mainly earthworks. These works will require earth-moving machinery, such as excavators, dump trucks, graders, and rollers, as well as transit mixers. There is no need for a batching plant as no major concrete work is involved. The contractor will determine the actual number of equipment, machinery, and vehicles required on-site to

[10] *During surveys and consultations, the major demand of the community was the provision of jobs during the construction phase. Sufficient labour, particularly unskilled, is available in the project area.*

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carry out the work. A valid fitness certificate is required for all equipment, machinery and vehicles. Additionally, all on-site vehicles must be equipped with properly functioning side mirrors. This is essential for enhancing driver visibility, reducing blind spots, and minimizing the risk of accidents.

3.11 Implementation Schedule

The entire scope of works and associated deliveries is planned to be completed within 12 months, subject to site conditions, procurement lead times, and the timely mobilization of the contractor. To minimize operational disruptions, the PMD will work closely with its regional offices, ensuring that project activities are executed in carefully coordinated phases. This approach will help maintain continuity of essential services throughout the implementation period.

CHAPTER - 4: PROJECT ALTERNATIVE CONSIDERED

4.1 General

The assessment of project alternatives for the upgradation of Pakistan's meteorological infrastructure specifically the Institute of Meteorology & Geophysics (IMG) and the Meteorology Workshop in Karachi demonstrates the strategic, social, and environmental importance of modernization, especially in the context of Pakistan's acute climate vulnerability and the country's ongoing push to strengthen hydromet services[11]. Below is an elaborated, referenced, and quantitative comparison of the main options:

4.2 No Project Option

If no intervention is made, all six key buildings (hostel, institute, auditorium, workshop, office, warehouse) would remain in their deteriorated state. Currently, fewer than 50% of the required toilet facilities are functional, and no improvements to drainage, security, or digital infrastructure are planned. This would perpetuate operational inefficiencies, with an estimated 20% annual increase in downtime due to building failures and a 10–15% annual rise in utility costs from outdated systems. Critically, the PMD would remain reliant on approximately 100 manual weather stations, far below the World Meteorological Organization's recommended density, which would limit forecast accuracy and disaster preparedness. No new employment or local economic benefits would be realized, and the PMD's capacity to respond to climate emergencies would stagnate, despite Pakistan's ranking as the fifth most climate-vulnerable country globally.

4.3 Upgradation & Rehabilitation of Existing Facilities Only

This scenario would address only the most critical repairs, patching cracks, fixing leaks, and basic maintenance, covering about 30% of the total needed interventions. The number of operational toilets might increase by 10 to 15%, but the facilities would still not meet international or local standards. The lifespan of buildings would be extended by only 3–5 years, and energy and water efficiency would improve by a modest 5–10%. Social benefits, such as improved capacity or comfort, would be limited, and the PMD would still fall short of international standards for meteorological infrastructure and climate resilience. The technological gap, especially in automated data collection and real-time monitoring, would persist, leaving much of the country's territory under-monitored.

4.4 Full Upgradation and Modernization (Preferred Option)

Comprehensive modernization entails the 100% rehabilitation and upgrading of all six key buildings, including at least 30% more toilet units, new recreational and security infrastructure, and the digitalization of academic and operational spaces. Energy and water efficiency gains are projected at 25–35%, with operational downtime expected to decrease by 40–50%. The project is expected to create approximately 100–150 temporary jobs during construction and 10–20 permanent positions upon completion. Over 500 staff, students, and visitors would benefit directly daily. Most importantly, the PMD's capacity for climate and disaster response would increase by at least 30%, supported by the installation of 300 new automated weather

[11] *https://ifrap.org.pk/modernization-hydromet-services-pakistan/*

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stations[12], five new radars, and high-performance computing for data integration, a leap forward from the current reliance on manual stations. These upgrades align with global best practices and Pakistan's international commitments on climate adaptation[13].

4.5 Alternative Site Development

Developing a new site would require 100% new construction, the acquisition of 5–10 acres of land, and a project timeline extended by 18–24 months compared to an upgrade. Initial costs would be at least 40–50% higher (PKR 770–820 million versus PKR 548 million for upgradation). Service disruption could last 12–18 months, and the environmental footprint would increase by up to 60% due to land clearance and the need for new infrastructure. While this option could offer design flexibility, it would delay urgently needed improvements and increase environmental and social disruption.

Table 4-1: Quantitative cum Comparative Analysis of Alternatives

Alternative	% Buildings Upgraded	Toilet Units Added	Efficiency Gain (Energy/ Water)	Operational Downtime	Cost Estimate (PKR Million)	Jobs Created	Service Disruption	Environmental Footprint Change
No Project Option	0%	0%	0%	20%	0	0	None	No change
Rehabilitation Only	30%	+10–15%	+5–10%	–10%	150–200	20–30	Minimal	–10% (less waste)
Full Upgradation & Modernization	100%	30%	+25–35%	–40–50%	548	100–150 (temp), 10–20 (perm)	None (phased)	–20% (sustainable design)
Alternative Site Development	100% (new)	40%	+35–40%	–50% (after completion)	770–820	150–200	12–18 months	+60% (new land, higher waste)

[12] *https://documents1.worldbank.org/curated/en/214851521170420480/pdf/ESMP-PHDSP-MCC-Islamabad.pdf*
[13] *https://thedocs.worldbank.org/en/doc/693591542124451200-0310022018/original/GhulamRasulPAKISTANModernizationofPMD.pdf*

CHAPTER - 5: BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

5.1 General

This section describes the existing environmental and socio-economic conditions of the project area. It provides the environmental and social baseline against which the project risks can be measured. The chapter focuses only on the key issues related to the upgradation work. Moreover, it identifies the socially sensitive receptors and the proposed road's AOI in the project areas.

5.2 Physical Resource

5.2.1 Geography

Karachi is situated on the southern coast of Pakistan, along the Arabian Sea, at a latitude of 24.8608° N and a longitude of 67.0104° E. It is situated on a coastal plain with scattered rocky outcroppings and hills. The city is situated on two small hill ranges, the Khasa Hills and Mulri Hills, which are part of the larger Kirthar Range. The district's geography is illustrated in Figure 5.1.

5.2.2 Soils

In Karachi, the types of soils vary significantly across different regions. The northern part of the city is predominantly composed of coarse-grained soils, which include medium to coarse sand and sandy gravel. These soils are well-suited for shallow foundations in medium-sized civil projects due to their well-graded and unimodal nature. In contrast, clayey soils are less common. Still, they are found in areas such as SITE, Baldia, Orangi, New Karachi, Jamshed Town, Gulshan-e-Iqbal, and Malir Town, where they serve as important foundation materials for civil structures. Additionally, loamy sandy and gravelly soils are present in river valleys and alluvial cones near the coastline, contributing to the city's diverse geological landscape.

5.2.3 Seismicity

The map illustrated in Figure 5.2 shows that the project area falls within Zone 2B, where the Peak Ground Acceleration ranges from 0.16 to 0.24g, as per the Pakistan Building Code (2007). This classification indicates a low-damage risk zone, suggesting that these areas have a reduced likelihood of experiencing significant earthquakes. Notably, the project area has not fallen within Zone 4, designated as the High Damage Risk Zone.

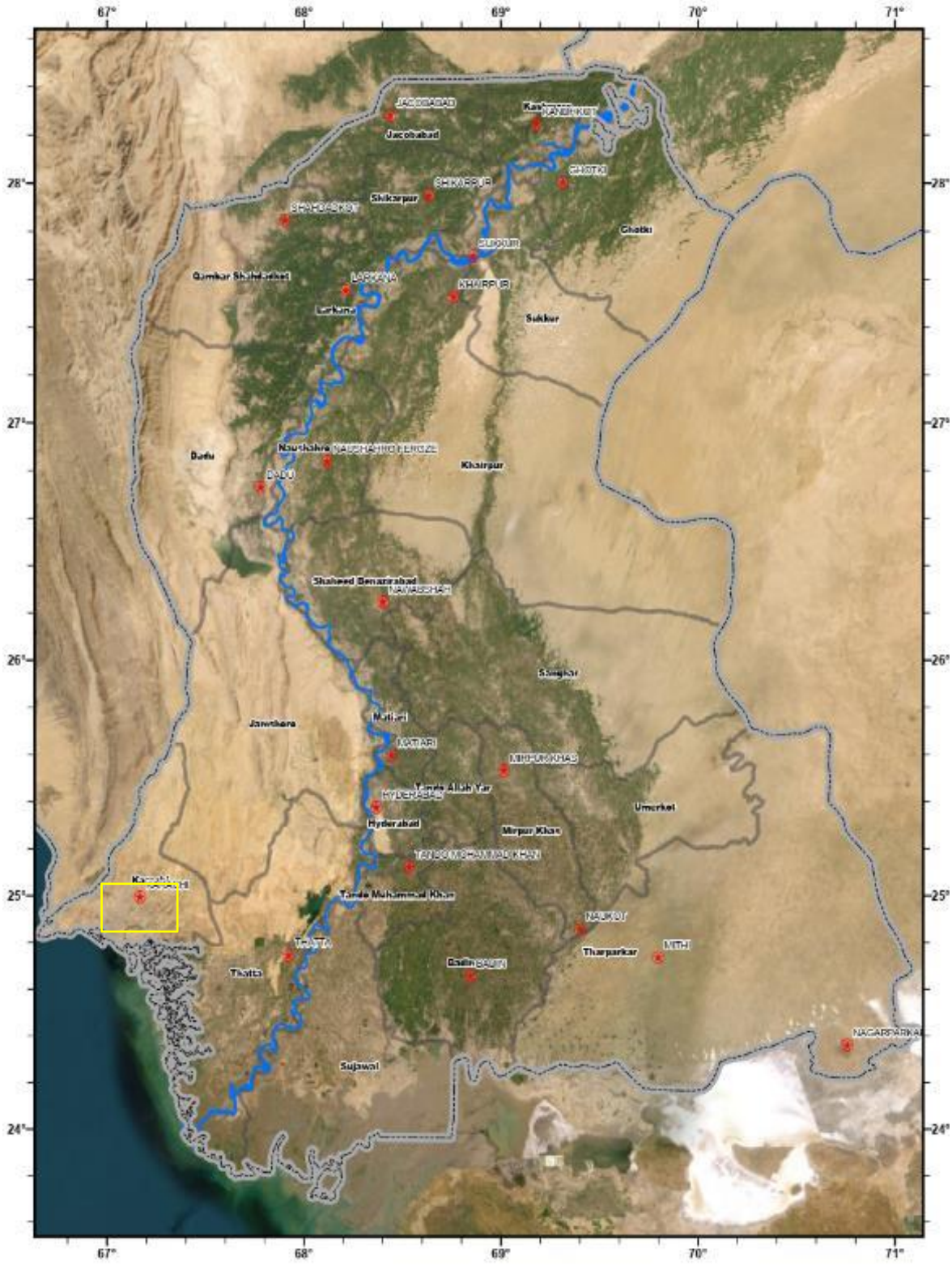


Figure 5.1: Geographic Map of Project Area

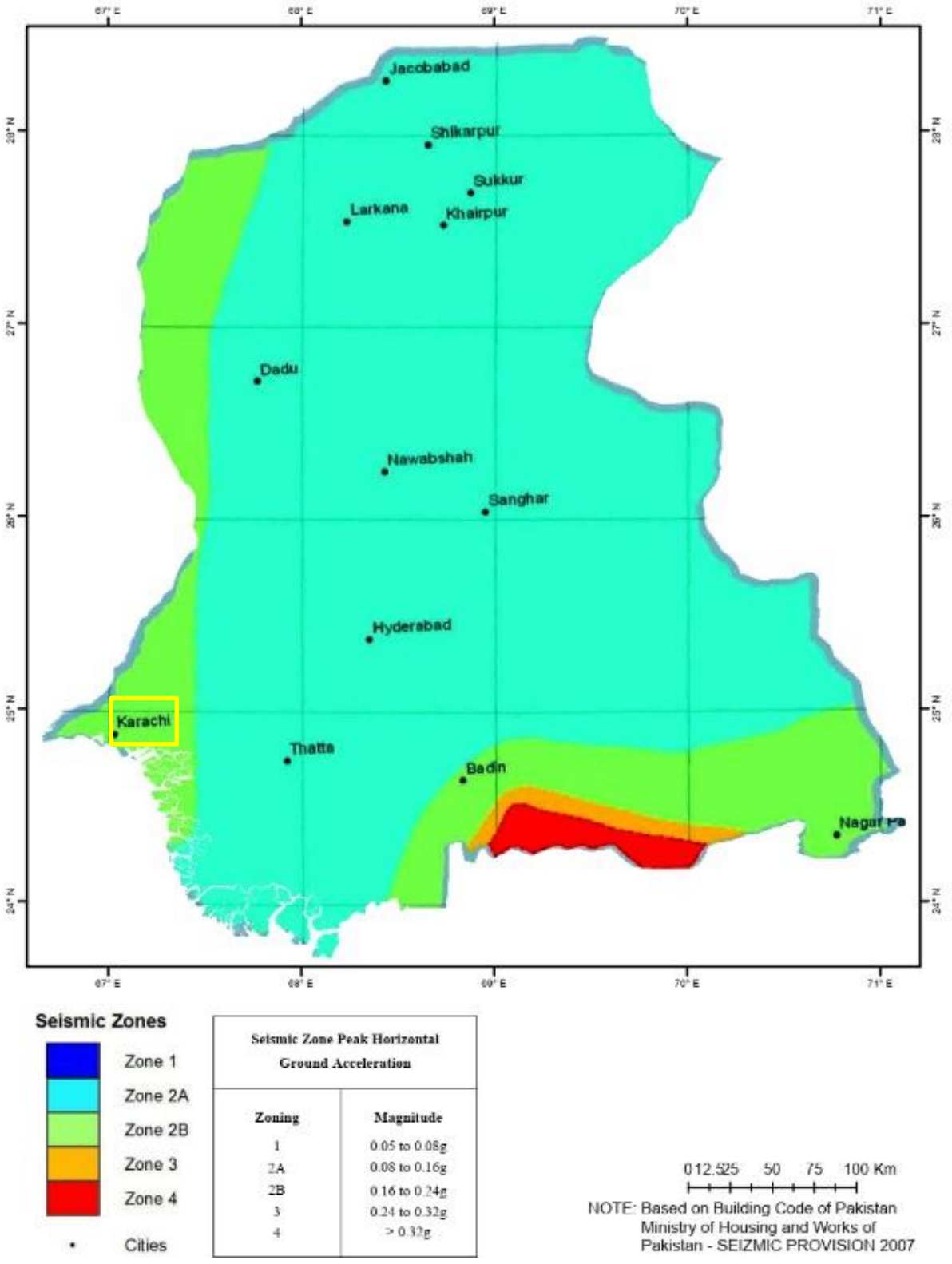


Figure 5.2: Seismic Zone Map of the Project Area

5.2.4 Climate

Karachi has a tropical semi-arid climate, characterized by long, hot summers and mild winters. The summer season extends from March to November, with May and June being the hottest months. Temperatures often reach up to 45°C (113°F) during heatwaves. In contrast, winters

are dry and cool, with January and February being the coolest months, sometimes dropping below 10°C (50°F).

The project area in Karachi experiences highly variable and generally unreliable rainfall, with the majority of precipitation occurring during the summer monsoon months from July to September. During this period, large and intense storms are common, sometimes resulting in daily rainfall amounts that surpass the city's annual average. This was especially evident in 2022, when extraordinary monsoon rains led to catastrophic flooding and caused unprecedented damage to road infrastructure. In terms of temperature, Karachi endures hot summers, with average maximum temperatures ranging from 32°C to 36°C, and humidity levels rise significantly during the monsoon season.

5.2.5 Rainfall & Temperature

The climate of Karachi East, as depicted in the provided chart, is characterized by warm to hot temperatures throughout the year, with a distinct seasonal variation pattern. The mean daily maximum temperature begins at around 24°C in January and gradually increases, reaching a peak of 34°C in June, before slightly declining and stabilizing at 31–33°C during the monsoon months of July and August. Afterward, temperatures decrease, reaching about 26°C by December. The mean daily minimum temperature follows a similar trend, starting at 15°C in January, rising to a high of 28°C in July, and then decreasing to 16°C in December.

Precipitation is relatively low for most of the year, with a significant increase during the monsoon season, particularly in July and August, when rainfall peaks. The highest precipitation levels mark this period, while the rest of the year remains mostly dry, with only occasional light showers. The chart also highlights the occurrence of hot days, especially from May to September, and cold nights, which are more common from November to February. Overall, Karachi East experiences a hot, semi-arid climate with a pronounced monsoon season, mild winters, and very warm summers.(Refer to Figure 5.3).

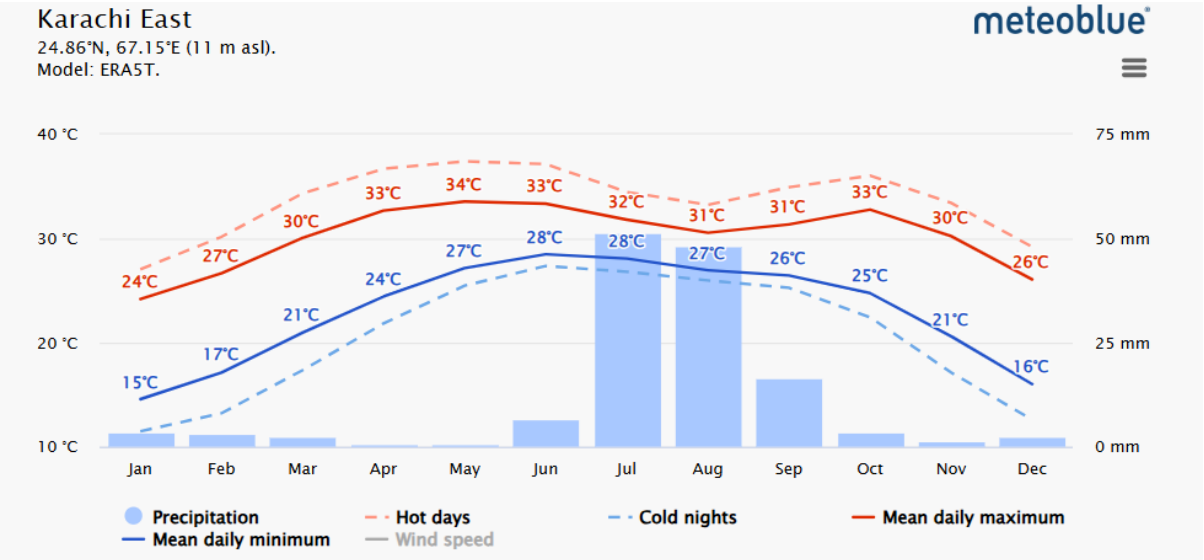


Figure 5.3: Mean Monthly Max. & Mini. Temperature & Rainfall at Karachi East

5.2.6 Wind

This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on

local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages, as shown in Figure 5.4. The average hourly wind speed in Karachi exhibits significant seasonal variation throughout the year.

The windier part of the year lasts for 5.1 months, from April 14 to September 18, with average wind speeds exceeding 17.4 kilometers per hour. The windiest month of the year in Karachi is June, with an average hourly wind speed of 23.3 km/h.

The calmer time of year lasts for 6.9 months, from September 18 to April 14. The calmest month of the year in Karachi is November, with an average hourly wind speed of 11.2 km/h.

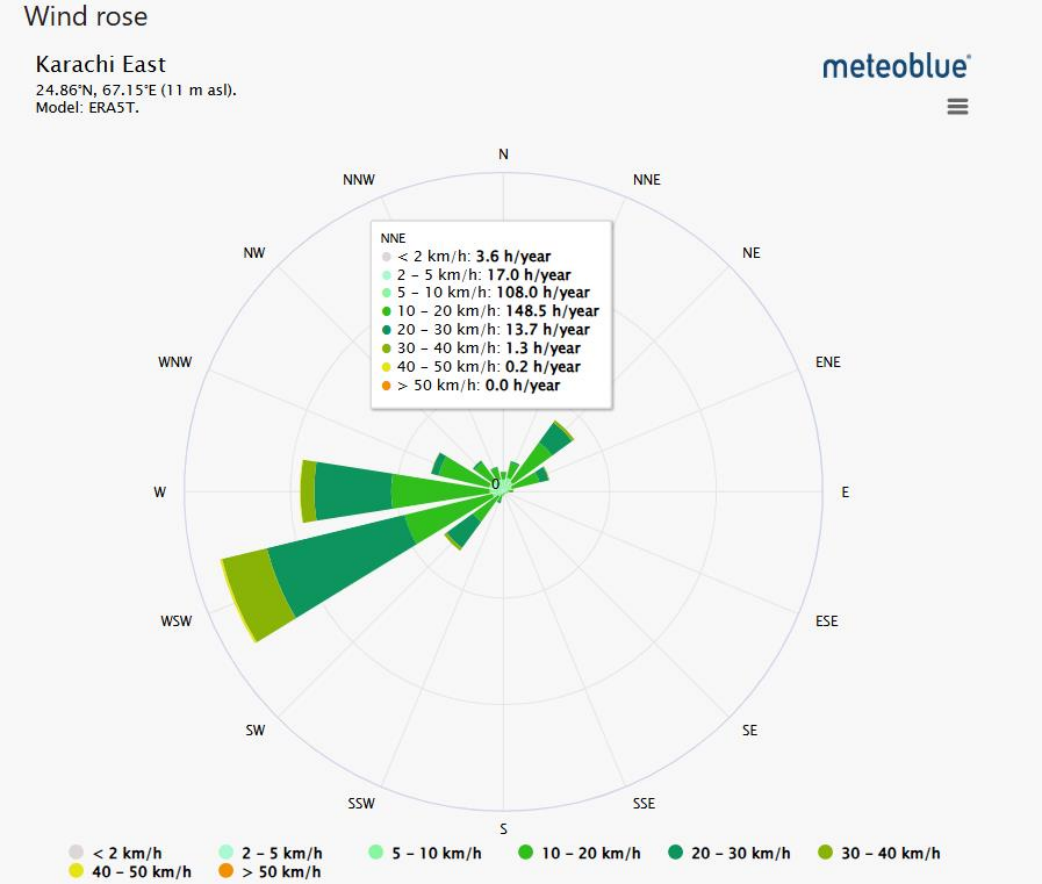


Figure 5.4: Wind Rose for Karachi East

5.2.7 Solar Energy

The average daily incident shortwave solar energy experiences significant seasonal variations throughout the year. The brighter period of the year lasts for 3.0 months, from April 1 to July 2, with an average daily incident shortwave energy per square meter above 6.8 kWh. The brightest month of the year in Karachi is May, with an average of 7.3 kWh. (Refer to Figure 5.5)[14].

[14] *https://weatherspark.com/y/106467/Average-Weather-in-Karachi-Pakistan-Year-Round#Figures-SolarEnergy*

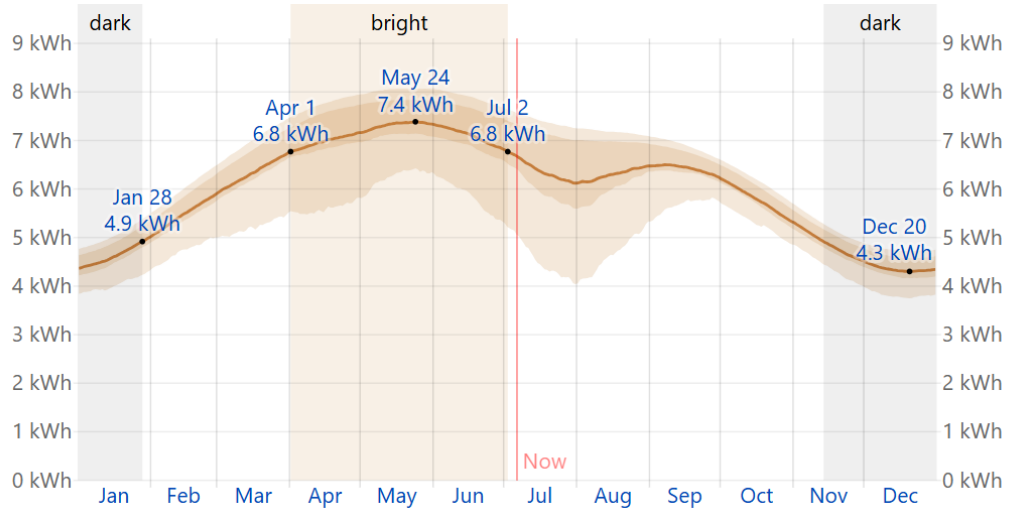


Figure 5.5: Average Daily Incident Shortwave Solar Energy in Karachi

The darker period of the year lasts for 2.5 months, from November 14 to January 28, with an average daily incident shortwave energy per square meter of less than 4.9 kWh. The darkest month of the year in Karachi is December, with an average of 4.4 kWh.

5.3 Water Resources

Karachi's water resources are a combination of surface water and groundwater, both of which are critical for meeting the city's domestic, industrial, and agricultural needs. The sub-division of Gulshan-e-Iqbal, being a densely populated urban area, faces unique challenges related to both the quantity and quality of available water.

5.3.1 Surface Water Resources

Karachi's main surface water sources are Lake Keenjhar, Lake Haleji, and Hub Dam. These reservoirs supply the majority of the city's potable water through an extensive pipeline network managed by the Karachi Water and Sewerage Corporation[15].

Water from these sources is treated and distributed across the city, including Gulshan-e-Iqbal. However, supply is often inconsistent due to infrastructure issues, pipeline ruptures, and periodic shortages, especially during periods of peak demand or maintenance events. The Malir and Lyari rivers, while present in Karachi, are not significant sources of potable water due to pollution and seasonal flow variability.

5.3.2 Groundwater Resources

Groundwater in Karachi, including Gulshan-e-Iqbal, is accessed through wells and boreholes. However, the contribution of groundwater to the city's overall supply is minimal estimated at less than 2% due to over-extraction, declining water tables, and salinity issues.

Studies in Gulshan-e-Iqbal have shown that groundwater is often highly saline and hard, with elevated levels of TDS and hardness. The main causes are seawater intrusion, unplanned urbanization, and poor waste management, which have led to contamination and reduced suitability for drinking[16].

[15] *https://d2ouvy59p0dg6k.cloudfront.net/downloads/report___situational_analysis_of_water_resources_of_karachi.pdf*
[16] *https://www.econ-environ-geol.org/index.php/ojs/article/view/305*

Groundwater samples from Gulshan-e-Iqbal frequently exceed World Health Organization (WHO) guidelines for drinking water, particularly in terms of salinity and microbial contamination. The water is generally not considered fit for direct consumption without treatment.

5.4 Baseline Monitoring Locations

5.4.1 Water Quality

The water sample test report issued by the Pakistan Council of Scientific & Industrial Research (PCSIR) provides a comprehensive analysis of drinking water collected from M/s Umar Munshi Associates in Islamabad. The report, dated April 22, 2025, evaluates several key parameters to determine the water's suitability for human consumption according to WHO standards. The pH level of the sample is 7.72, which falls within the acceptable range of 6.5 to 8.5, indicating the water is neither too acidic nor too alkaline. The color and turbidity are well below the maximum permissible limits, suggesting the water is clear and free from visible impurities. However, the notable concentrations include chloride (438.7 mg/L), sulfate (226.1 mg/L), total hardness (538.2 mg/L), total alkalinity (286.8 mg/L), and total dissolved solids (1530.0 mg/L). While chloride and sulfate are within or close to WHO limits, the total dissolved solids and total hardness exceed the recommended thresholds of 1000 mg/L and 500 mg/L, respectively. This indicates the water is quite hard and contains a high concentration of dissolved minerals, which may affect taste and could have long-term health implications if consumed regularly.

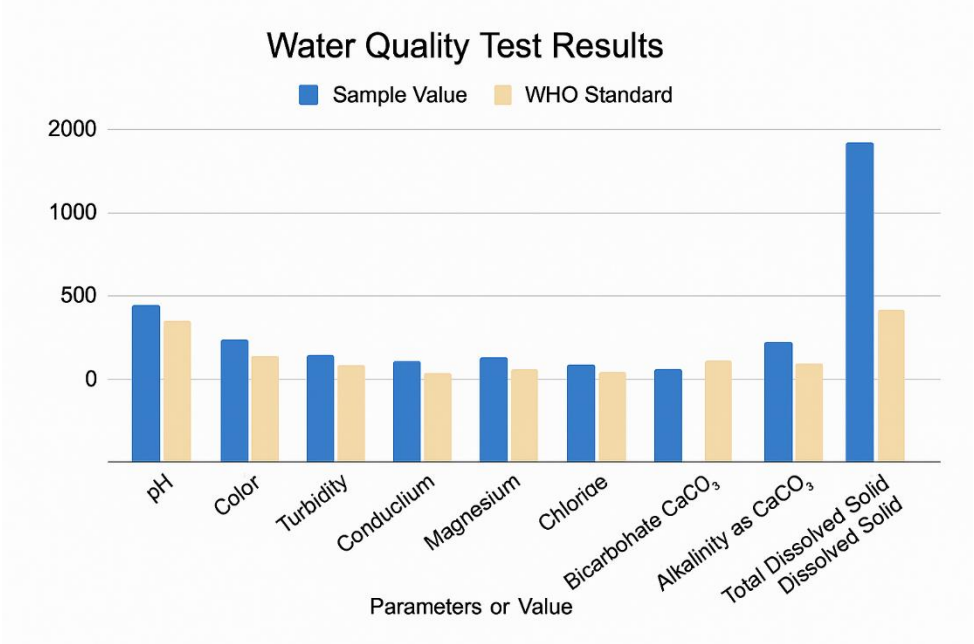
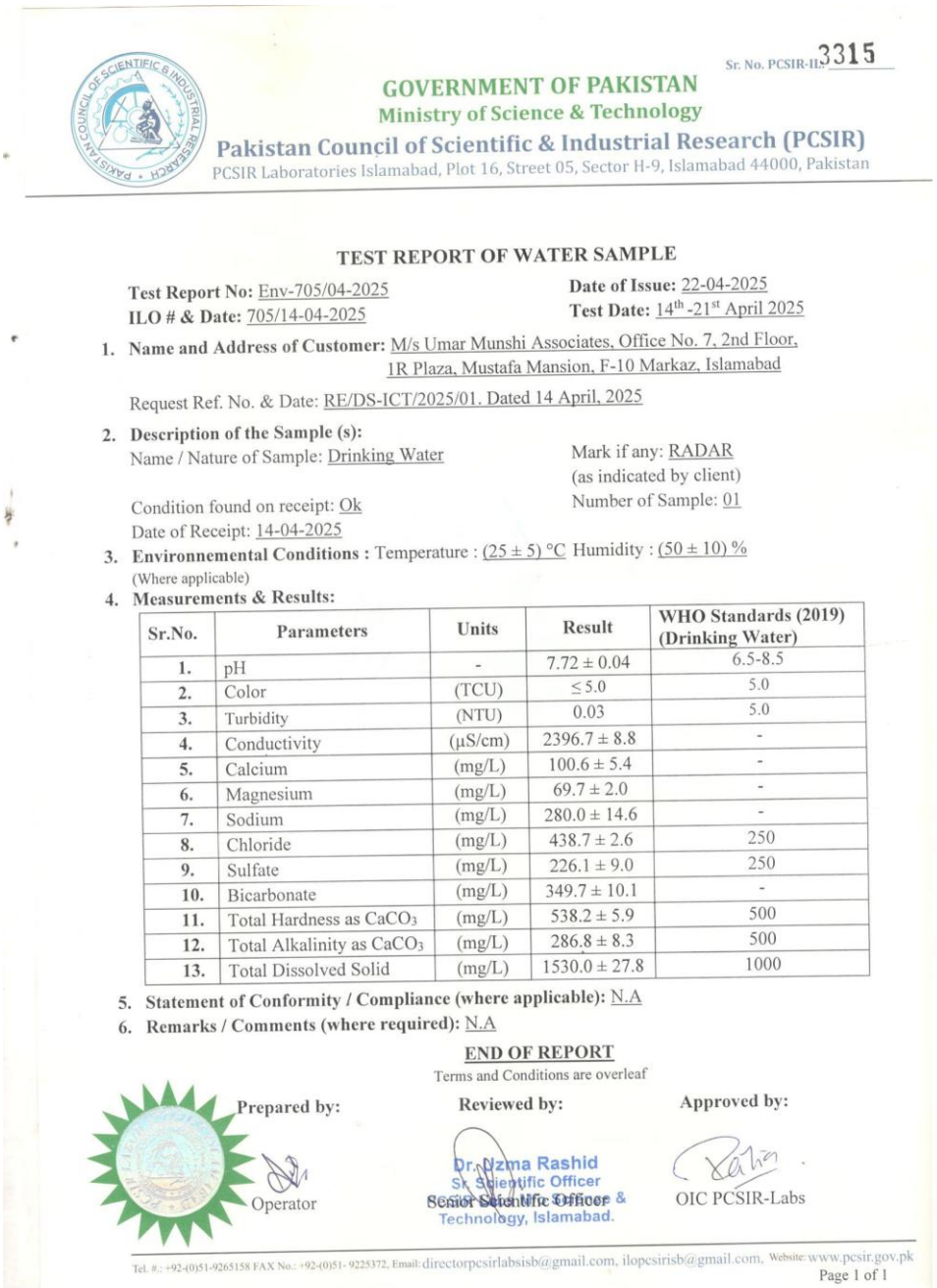


Figure 5.6: Water Quality Analysis

Furthermore, regarding the Bacteriological analysis, the results show that the Total Plate Count at 35°C is 2.3 x 10^2 CFU/mL, which exceeds the standard limit of less than 100 CFU/mL, indicating a higher than acceptable level of general bacterial presence. More concerning is the Total Coliform count, recorded at 12 MPN/100 mL, which is significantly above the permissible limit of less than 2 MPN/100 mL. This suggests possible contamination from environmental or fecal sources, raising concerns about the water's safety for drinking without further treatment. However, the Fecal Coliform and Escherichia coli (E. coli) results are within safe limits, with both being below detection thresholds, indicating no direct evidence of recent fecal contamination. The scan report has been attached below.



Sr. No. PCSIR-IL: 3315

GOVERNMENT OF PAKISTAN
Ministry of Science & Technology
Pakistan Council of Scientific & Industrial Research (PCSIR)
PCSIR Laboratories Islamabad, Plot 16, Street 05, Sector H-9, Islamabad 44000, Pakistan

TEST REPORT OF WATER SAMPLE

Test Report No: Env-705/04-2025 **Date of Issue:** 22-04-2025
ILO # & Date: 705/14-04-2025 **Test Date:** 14th -21st April 2025

1. **Name and Address of Customer:** M/s Umar Munshi Associates, Office No. 7, 2nd Floor, 1R Plaza, Mustafa Mansion, F-10 Markaz, Islamabad

   Request Ref. No. & Date: RE/DS-ICT/2025/01. Dated 14 April, 2025

2. **Description of the Sample (s):**
   Name / Nature of Sample: Drinking Water
   Mark if any: RADAR (as indicated by client)
   Condition found on receipt: Ok
   Number of Sample: 01
   Date of Receipt: 14-04-2025
3. **Environnemental Conditions :** Temperature : (25 ± 5) °C Humidity : (50 ± 10) %
   (Where applicable)
4. **Measurements & Results:**

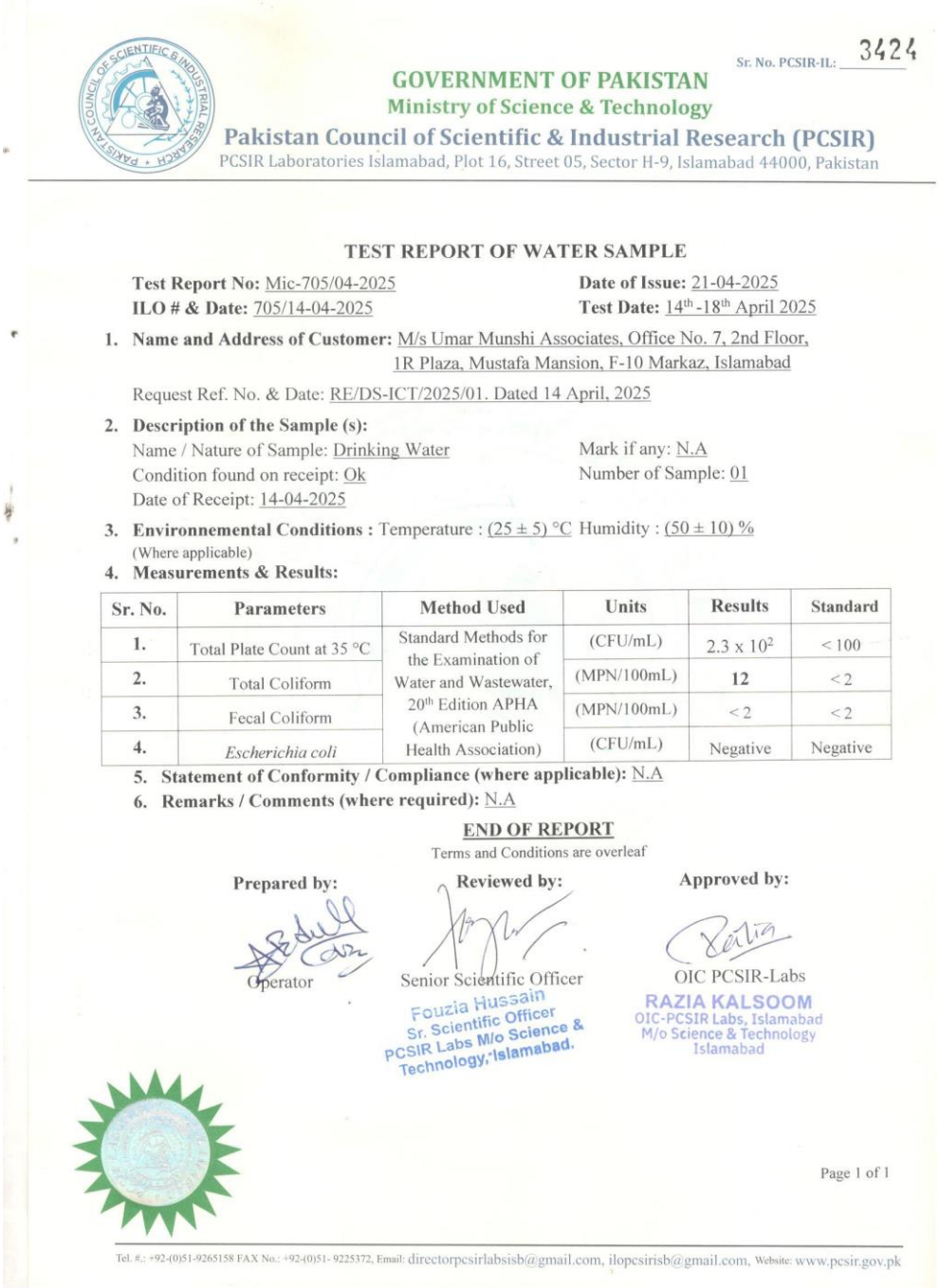
Sr.No.	Parameters	Units	Result	WHO Standards (2019) (Drinking Water)
1.	pH	-	7.72 ± 0.04	6.5-8.5
2.	Color	(TCU)	≤ 5.0	5.0
3.	Turbidity	(NTU)	0.03	5.0
4.	Conductivity	(µS/cm)	2396.7 ± 8.8	-
5.	Calcium	(mg/L)	100.6 ± 5.4	-
6.	Magnesium	(mg/L)	69.7 ± 2.0	-
7.	Sodium	(mg/L)	280.0 ± 14.6	-
8.	Chloride	(mg/L)	438.7 ± 2.6	250
9.	Sulfate	(mg/L)	226.1 ± 9.0	250
10.	Bicarbonate	(mg/L)	349.7 ± 10.1	-
11.	Total Hardness as $CaCO_3$	(mg/L)	538.2 ± 5.9	500
12.	Total Alkalinity as $CaCO_3$	(mg/L)	286.8 ± 8.3	500
13.	Total Dissolved Solid	(mg/L)	1530.0 ± 27.8	1000

5. **Statement of Conformity / Compliance (where applicable):** N.A
6. **Remarks / Comments (where required):** N.A

END OF REPORT
Terms and Conditions are overleaf

Prepared by: Operator
Reviewed by: Dr. Uzma Rashid, Sr. Scientific Officer, Senior Scientific Officer
Approved by: OIC PCSIR-Labs

Tel. #: +92-(0)51-9265158 FAX No.: +92-(0)51- 9225372, Email: directorpcsirlabsisb@gmail.com, ilopcsirisb@gmail.com, Website: www.pcsir.gov.pk
Page 1 of 1



Sr. No. PCSIR-IL: 3424

GOVERNMENT OF PAKISTAN
Ministry of Science & Technology
Pakistan Council of Scientific & Industrial Research (PCSIR)
PCSIR Laboratories Islamabad, Plot 16, Street 05, Sector H-9, Islamabad 44000, Pakistan

TEST REPORT OF WATER SAMPLE

Test Report No: Mic-705/04-2025 **Date of Issue:** 21-04-2025
ILO # & Date: 705/14-04-2025 **Test Date:** 14th-18th April 2025

1. **Name and Address of Customer:** M/s Umar Munshi Associates, Office No. 7, 2nd Floor, 1R Plaza, Mustafa Mansion, F-10 Markaz, Islamabad
   Request Ref. No. & Date: RE/DS-ICT/2025/01. Dated 14 April, 2025
2. **Description of the Sample (s):**
   Name / Nature of Sample: Drinking Water Mark if any: N.A
   Condition found on receipt: Ok Number of Sample: 01
   Date of Receipt: 14-04-2025
3. **Environnemental Conditions :** Temperature : (25 ± 5) °C Humidity : (50 ± 10) %
   (Where applicable)
4. **Measurements & Results:**

Sr. No.	Parameters	Method Used	Units	Results	Standard
1.	Total Plate Count at 35 °C	Standard Methods for the Examination of Water and Wastewater, 20th Edition APHA (American Public Health Association)	(CFU/mL)	2.3 x 10^2	< 100
2.	Total Coliform		(MPN/100mL)	**12**	< 2
3.	Fecal Coliform		(MPN/100mL)	< 2	< 2
4.	*Escherichia coli*		(CFU/mL)	Negative	Negative

5. **Statement of Conformity / Compliance (where applicable):** N.A
6. **Remarks / Comments (where required):** N.A

END OF REPORT
Terms and Conditions are overleaf

Prepared by: Operator
Reviewed by: Senior Scientific Officer
Fouzia Hussain
Sr. Scientific Officer
PCSIR Labs M/o Science & Technology, Islamabad.
Approved by: OIC PCSIR-Labs
RAZIA KALSOOM
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Page 1 of 1

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5.4.2 Ambient Air and Noise Levels

Recent quantitative studies have revealed that Karachi, including the densely populated Gulshan-e-Iqbal area, faces significant challenges in terms of air quality and noise pollution. Air quality monitoring in Karachi during winter months, such as January and February 2024, recorded $PM_{2.5}$ concentrations ranging from 70.1 to 260.5 µg/m³ before rainfall events, with Air Quality Index values between 158.1 and 310.5 levels classified as “unhealthy” to “very unhealthy” and far exceeding both World Health Organization (WHO) and Sindh Environmental Quality Standards[17]. Even after rainfall, which temporarily reduces pollutant levels, $PM_{2.5}$ concentrations remained elevated (48.3–136.8 µg/m³), still exceeding the WHO

[17] *https://pecongress.org.pk/wp-content/uploads/2025/05/Paper-No.-373.pdf*

annual guideline of 5 µg/m³. Long-term studies confirm that the annual mean $PM_{2.5}$ concentration in Karachi ranges from 54.7 to 88 µg/m³, making it one of the most polluted cities globally and exposing residents to sustained health risks. The primary sources of pollution in Gulshan-e-Iqbal are vehicular emissions, industrial activities, open waste burning, and unregulated construction, all of which are prevalent in the Area.

The health impacts are substantial. Research from major hospitals in Karachi and public health studies shows a 25–30% increase in hospital admissions for respiratory illnesses during periods of high pollution, with children, the elderly, and those with pre-existing conditions being most affected. Gaseous pollutants, such as sulfur dioxide (SO_2), have also been recorded at levels of up to 120 parts per billion by volume (ppbv) in the fall, exceeding WHO guidelines by more than 15 times and contributing to increased mortality and morbidity. These pollutants have been linked to higher rates of asthma, chronic bronchitis, pneumonia, and cardiovascular complications.

Noise pollution in Karachi's urban districts, including Gulshan-e-Iqbal, is also a significant concern. Daytime noise levels in commercial and high-traffic areas regularly reach 80–110 decibels (dB), far above the recommended safe limit of 55 dB for residential zones. Even quieter residential streets often register 50–65 dB, exposing residents to chronic stress, sleep disturbances, and increased risk of cardiovascular disease. Peak noise levels, especially near busy intersections and during rush hours, can exceed 85 dB, making relief difficult for those living in these environments[18].

5.5 Biological Environment

The screening process for the project area revealed that a limited, diverse habitat emerges as the human population has increased, supporting a few faunal and floral species. The following broad categories have been identified for this report, which focuses on the project area.

5.5.1 Fauna of the Study Area

Gulshan-e-Iqbal, a bustling urban locality in Karachi, supports a surprisingly diverse array of fauna, particularly within its prominent green spaces, such as the Safari Park and Aziz Bhatti Park.

The Karachi Safari Park, situated in the heart of Gulshan-e-Iqbal and spanning 148 acres, is home to a diverse array of animals, including lions, deer, zebras, and peacocks, providing visitors with a close-to-nature wildlife experience within the city. The park also features a natural lake, which attracts a variety of waterfowl, including swans and other bird species[19].

Beyond the confines of Safari Park, the general avifauna of Gulshan-e-Iqbal and urban Karachi includes common species such as house crows, sparrows, mynas, pigeons, cuckoos, and both domesticated and wild pigeons. These birds thrive in the area's parks, gardens, and even residential neighborhoods. Small mammals, such as street cats and rodents, are abundant and often seen in both public spaces and around homes. Reptiles, including various species of snakes and lizards, are occasionally observed, particularly in less developed or green areas.

[18] *https://www.aku.edu/news/Pages/News_Details.aspx?nid=NEWS-003404*
[19] *https://www.ke.com.pk/download/downloads/Environmental-Monitoring-Karachi-Flora-Fauana.pdf*

While the broader Karachi region supports a rich diversity of over 400 bird species and a variety of invertebrates, the fauna within Gulshan-e-Iqbal reflects the adaptability of certain species to urban environments and the importance of maintained green spaces for wildlife conservation. The continued development of animal enclosures, aviaries, and awareness projects within the Safari Park further contributes to the preservation and public appreciation of both native and exotic fauna in this urban setting. (Refer to Figure 5.7)

Street Dog

Cat

Roaster

Figure 5.7: Fauna of the Study Area

5.5.2 Flora of Study Area

Gulshan-e-Iqbal, particularly in and around Safari Park and the University of Karachi campus, is characterized by a rich and diverse urban flora that includes both native and exotic plant species.

Notable native trees commonly found in the area include *Acacia nilotica* (Babul), *Azadirachta indica* (Neem), *Ficus benghalensis* (Banyan tree), *Ziziphus mauritiana* (Ber), *Prosopis*

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cineraria (Kandi), *Calotropis procera* (Madar), *Tamarix aphylla* (Athel Pine), and *Cyperus rotundus* (Nutgrass). These species are well adapted to Karachi's arid climate and play a crucial role in providing shade, reducing heat stress, and supporting local biodiversity[20].

Exotic and ornamental trees such as *Cocos nucifera* (Coconut), *Delonix regia* (Gulmohar), *Washingtonia robusta* (Mexican Fan Palm), *Guaiacum officinale*, and *Polyalthia longifolia* are also prevalent, especially in parks and along major roads, contributing to the city's greenery and aesthetic appeal.

Shrubs like Euphorbia caducifolia and flowering plants such as Hibiscus rosa-sinensis and Bougainvillea glabra add further diversity to the landscape. The flora in these urban green spaces not only enhances recreational and ecological value but also provides essential ecosystem services, including carbon sequestration, nutrient regulation, and pollution mitigation[21].

However, ongoing urbanization and pollution pose significant threats to the survival of many native plant species, some of which are now considered rare or endangered in Karachi's rapidly changing environment[22]**.** Figure 5.8 illustrates the key floral species of the project area.

Acacia arabica

Nim (Azadirachta indica)

Peepal

Babul (Acacia nilotica)

Figure 5.8: Floral Species of the Study Area

[20] *https://www.alliedacademies.org/articles/study-of-avifauna-in-safari-park-and-university-ofkarachi-pakistan.pdf*
[21] *https://www.academia.edu/12688032*
[22] *https://corescholar.libraries.wright.edu/cgi/viewcontent.cgi?article=1591&context=jbm*

5.5.3 Endemic and Endangered Species

In the context of the project area, no endemic or endangered species of flora or fauna have been identified. Furthermore, there are no protected forests near the proposed project site. (refer to Figure 5.9[23]).

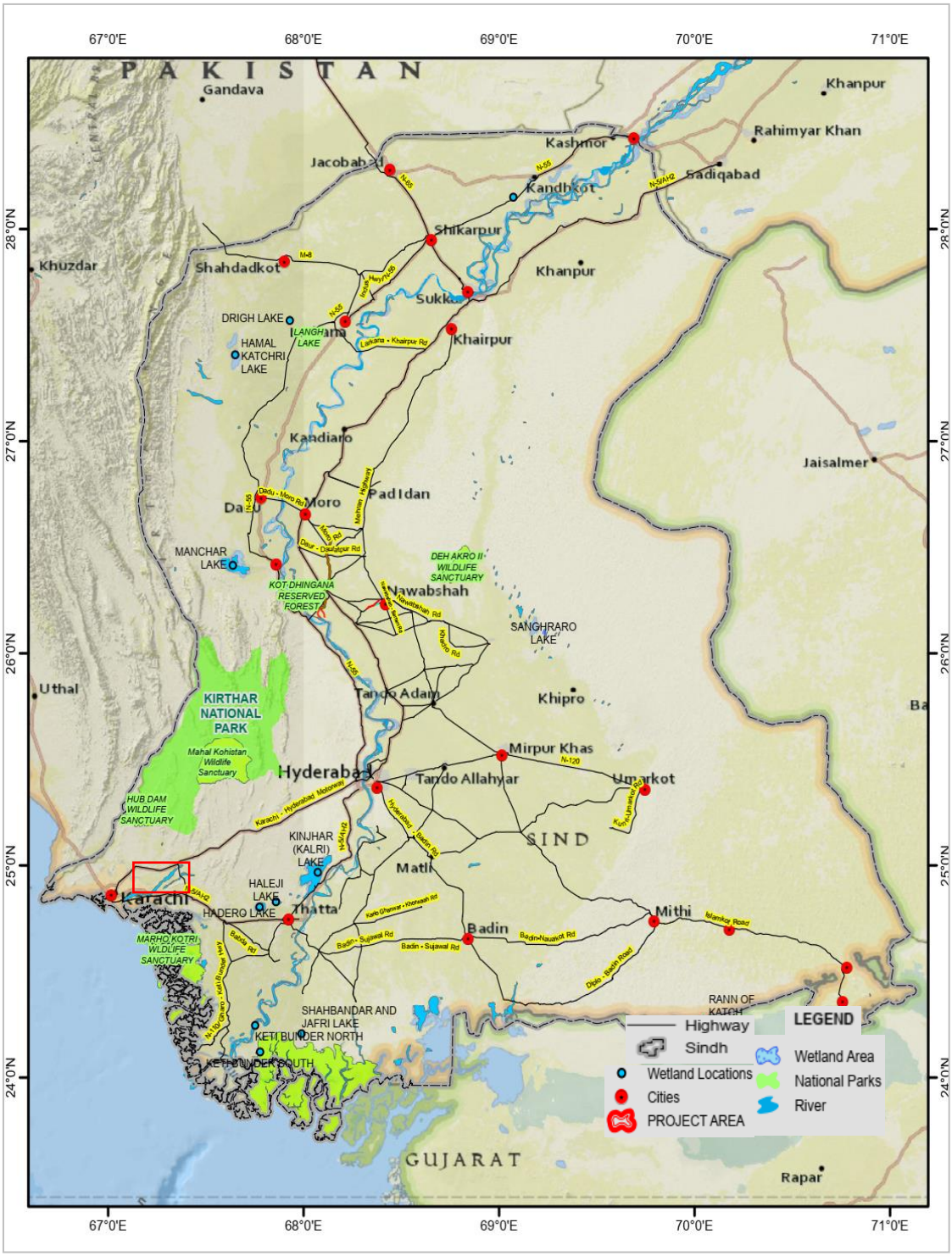

Figure 5.9: Protected Areas of with respect to Project Area

[23] *https://wwf.org.pk/foreverindus/ie_protectedareas.php*

5.6 Socio-Economic Environment

5.6.1 Demography

Gulshan-e-Iqbal, one of Karachi's largest and most densely populated urban subdivisions, had a population of approximately 979,500 residents in 2023, spread over an area of 29 square kilometers, resulting in a population density of about 33,776 people per square kilometer.

5.6.2 Language Spoken

The area is entirely urbanized and exhibits a diverse demographic profile, with a majority of Urdu-speaking Muhajirs, alongside significant communities of Sindhi, Punjabi, Saraiki, Pashto, Balochi, and other ethnic groups. Urdu is the most widely spoken mother tongue, with over 589,000 speakers, followed by Sindhi, Punjabi, and Saraiki.

5.6.3 Gender and Age Structure

The gender distribution is relatively balanced, with 508,770 males, 470,605 females, and a small transgender population. The age structure is youthful, with nearly 30% of residents under 15 years old and a substantial working-age population between 15 and 64 years.

5.6.4 Literacy Rate

The district is home to some of Karachi's most prestigious higher education institutions, including the University of Karachi and NED University of Engineering and Technology, both of which contribute significantly to its academic reputation. In addition to these universities, Karachi East offers a diverse range of educational facilities, encompassing primary and secondary schools, vocational training centers, and professional colleges, thereby catering to a wide spectrum of educational needs. Vocational institutes in the district provide specialized training in trades such as computer operations, electrical work, and dressmaking, with dedicated centers for girls that further promote female skill development. Despite these strengths, challenges persist in ensuring equitable access to quality education and adequate infrastructure at all levels. Efforts are still needed to narrow the literacy gender gap and to increase female participation in the workforce.

The literacy statistics for Karachi East reveal a notably high overall literacy rate of 80.07%, with male literacy at 81.31% and female literacy at 78.65%. This narrow gender gap, just 2.66 percentage points, reflects significant progress toward educational equity in the district, especially when compared to broader national and provincial trends, where gender disparities are often much wider. Karachi East's literacy rate is among the highest in Pakistan, substantially exceeding the national average of 60.7% reported in 2023. The literacy rate in Gulshan-e-Iqbal is notably high at 89% for individuals aged 10 and above, reflecting the area's strong educational infrastructure and urban character.

5.6.5 Industry

Karachi East District, encompassing prominent neighborhoods such as Gulshan-e-Iqbal, Gulistan-e-Johar, and Shahrah-e-Faisal, is primarily a residential and commercial area with a relatively limited industrial base. While the district features a variety of small-scale enterprises, workshops, and service-oriented businesses, major industrial activities and large

manufacturing units are predominantly located in neighboring districts such as Landhi, Korangi, and SITE. As a result, Karachi East's economic landscape is shaped more by its vibrant residential communities and commercial hubs than by heavy industry, distinguishing it from Karachi's traditional industrial centers

5.6.6 Health Facilities

Karachi, Pakistan's largest city, offers a diverse range of healthcare facilities, including both public and private hospitals, catering to the medical needs of its residents and visitors from across the country. Major hospitals include Liaquat National Hospital, a tertiary care facility with over 700 beds and more than 30 specialties, and the Aga Khan University Hospital, an ISO 9002-certified institution with over 550 beds. Indus Hospital, Pakistan's first paperless hospital, provides free healthcare with 300+ beds, while Civil Hospital Karachi, established in 1898, is one of the oldest and largest public hospitals with 1900+ beds. Specialized facilities, such as the Tabba Heart Institute, focus on cardiovascular care, while the Sindh Institute of Urology and Transplantation is renowned for its expertise in kidney and liver transplants. Public healthcare, managed by the Sindh Ministry of Health, is often criticized for inefficiency, while private healthcare dominates, accounting for 80% of outpatient visits. Karachi also hosts specialized services in eye care, pediatrics, and urology, making it a potential hub for medical tourism.

Karachi East District is recognized for its comprehensive healthcare system, which is anchored by leading institutions such as the Aga Khan University Hospital and Liaquat National Hospital. These facilities offer advanced medical care and specialized services, making the district a central hub for quality healthcare in Karachi. The district's health network is further strengthened by public sector facilities, including basic health units, maternal and child health centers, and extended dispensaries[24], which provide essential primary and preventive care to the community.

5.6.7 Sanitation

Sanitation in Karachi faces significant challenges due to rapid urbanization and population growth, leading to inadequate waste management and limited access to clean water. The city generates approximately 13,000 tons of solid waste daily, with only a small percentage properly collected, resulting in environmental pollution and unsanitary conditions. Contaminated water supplies contribute to waterborne diseases, while the outdated sewage system is insufficient for the growing population, often leading to untreated wastewater being discharged into open drains. Government efforts, primarily through the Karachi Water and Sewerage Board, are hindered by resource constraints and inefficiencies. Meanwhile, various Non-Governmental Organizations work to improve sanitation conditions through community education and advocacy. Community involvement is essential, as residents can engage in local clean-up initiatives and promote hygiene practices. Overall, addressing sanitation issues in Karachi requires a comprehensive approach that includes improved infrastructure, effective waste management, and active community participation to create a healthier environment for its residents.

5.6.8 Occupations, Sources of Livelihood and Income Levels

The occupational distribution in Karachi East District highlights its distinctly urban and service-oriented economy. A significant portion of the workforce, 16.1%, is employed in community,

[24] *Pakistan Bureau of Statistics, "District Wise Health Facilities*

social, and personal services, reflecting the district's strong presence in education, healthcare, and public administration. Wholesale, retail, hotel, and restaurant activities account for 14.4%, underscoring the importance of commerce and hospitality in local livelihoods. Manufacturing also plays a notable role, engaging 14.9% of the workforce, while construction employs 9.5%, driven by ongoing urban development. In contrast, agriculture, forestry, fishing, and hunting represent a minimal 0.4%, consistent with the district's highly urbanized environment. The remaining 44.7% fall under the "Others" category, encompassing a wide range of occupations in finance, transport, communication, and informal sectors[25]. This breakdown clearly illustrates the district's reliance on diverse, predominantly non-agricultural economic activities, with a strong emphasis on services and trade.

5.6.9 Energy Sources

The main energy source in Karachi is primarily derived from natural gas, which plays a crucial role in the city's electricity generation and industrial activities. K-Electric Limited, the primary electricity provider in Karachi, relies heavily on natural gas for its power generation, supplemented by other sources, including coal and hydropower.

While there is a growing interest in renewable energy, with policies aimed at increasing the share of green energy, fossil fuels, particularly natural gas, currently dominate the energy landscape in Karachi. The reliance on these traditional energy sources poses challenges, including environmental concerns and the need for sustainable energy solutions to meet the city's increasing demand.

5.6.10 Archaeological and Cultural Property/ Places of Interest

Karachi East District is home to a range of cultural, historical, and recreational landmarks that reflect its vibrant heritage and community spirit.

Among its cultural gems is TDF Ghar, a restored 1930s heritage house and vibrant cultural center, located approximately 12.28 km from the Met Office Karachi, offering a unique glimpse into the city's multicultural roots through exhibitions and community events. Originally owned by a Hindu woman and later acquired by the Dawood family, it now functions as a public cultural space featuring exhibitions and community events.

Another historically significant area is Gulshan-e-Johar, named after Maulana Mohammad Ali Jauhar, a key figure in the Pakistan Movement, underscoring the district's connection to national history.

For recreation, Safari Park, a major recreational and wildlife attraction established in 1970, is about 3.96 km from the Met Office Karachi, providing families with ample green space and leisure activities.

Similarly, Aziz Bhatti Park, a popular green retreat in Gulshan-e-Iqbal, is situated 6.03 km from the Met Office Karachi, serving as a vital recreational space for local residents.

The iconic National Stadium, a premier cricket venue hosting national and international matches, is located 8.17 km from the Met Office Karachi, reinforcing the district's sporting and cultural significance.

[25] *https://www.pbs.gov.pk/sites/default/files/labour_force/publications/Report_of_4_Dists%20_Employment_Trends2009-10.pdf*

CHAPTER - 6: STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

6.1 Overview of Consultation

This section outlines the consultations conducted with stakeholders in the project area to inform them about the project components and activities and to gather their views and opinions. The consultations involved engaging directly with communities and households that are both affected by and beneficiaries of the project. This includes residential households and owners of commercial entities that may experience positive or negative impacts from the project.

Additionally, institutional consultations were held with relevant government agencies to ensure comprehensive disclosure of information regarding environmental and social safeguard measures. These discussions aimed to foster transparency and collaboration, ensuring that stakeholder insights are integrated into the planning and implementation of the project.

6.2 Objectives of Stakeholder Consultation

The purpose of stakeholder consultations is to ensure meaningful and adequate consultation with all stakeholders who are affected or interested in project planning processes. The ESMP preparation followed a participatory planning process with local input on decision-making and mitigation measures to ensure that stakeholders' concerns were addressed at the project design stage. In accordance with the World Bank Guidelines, public consultations are essential to fulfil the following objectives:

- Exchange of information related to the project and its possible utilization in the project designing/planning and implementation.
- Ascertaining the most acceptable solutions and mitigation measures for possible issues that could arise during the implementation of the project activities.
- Eliciting community comments and feedback on the proposed project.
- Facilitate and maintain dialogue with the stakeholders to gain consent on carrying out project activities in the area.
- Encourage transparency and inculcate trust among various stakeholders to gain cooperation and partnership from the communities, local leadership, and NGOs.
- Record concerns regarding the various aspects of the project, including the existing situation, project area/area of influence, construction works and the potential impacts of the construction-related activities and operation of the project.
- Incorporate mitigation measures to address concerns raised with project design and implementation.

6.3 Identification of Stakeholders

Stakeholders are individuals or organizations with an interest in the proposed project or a relevant understanding that would provide insight into concerns or affect decision-making

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related to the proposed project. Based on interest and role criteria, two types of stakeholders for the proposed project have been identified;

The IFRAP – Component II: Strengthening Hydromet and Climate Services, Karachi East will be constructed on the existing land of the observatory. The communities residing in the surrounding area may face environmental and social impacts, hence becoming part of the stakeholders. The beneficiary community, which utilizes improved meteorological services, is the primary stakeholder. Pakistan Meteorological Department is also one of the primary stakeholders. Other prospective stakeholders include the Civil Aviation Authority (CAA), and the Sindh Environment Protection Department. The identification of these stakeholders is based on their potential stake in the project and the likely impacts of project interventions. Stakeholder mapping for potential stakeholders is presented in Table 6.1 below.

Table 6-1: Stakeholder Mapping for Proposed Project

Stakeholder	Relevance	Significance	Interest	Potential Engagement
Pakistan Meteorological Department	Core data provider and standard-setting body	Very high – essential for forecasting and monitoring	High – ensures effective weather/climate data usage	Lead role in system development, calibration, and long-term monitoring support
Civil Aviation Authority (CAA)	Uses weather data for flight operations	High – safety-critical information	High – needs real-time data for operations	Real-time data access, integration with airport meteorology systems
Environment Protection and Climate Change Dept., Govt. of Sindh	Policy-level stakeholder for climate and environmental risks	High – key in climate action planning	Medium – uses data for impact assessments	Collaboration on environmental reporting, climate resilience strategies
Community Residing Around Project Area	Potentially affected by noise, dust, and minor disturbances during construction of the project.	Medium – may experience temporary inconvenience but no direct access disruption.	High – keen on effective implementation of environmental and social safeguards to minimize nuisance.	Ensure strict adherence to environmental and social safeguards, timely communication of work schedules, and prompt response to concerns.
Project Beneficiaries	Direct receivers of project services/benefits	High – improved facilities and services benefit their safety	High – require reliable, timely information for planning and disaster risk reduction.	Provide user-friendly climate services, regular updates on project progress, and training on new systems or services.

6.4 Need for Consultation

ESS 10 of the ESS of the World Bank focuses on identifying and engaging stakeholders, especially those affected by project activities. It necessitates building and maintaining a constructive relationship to increase their interest and support for the project. ESS 10 provides stakeholders with sufficient opportunity to record their concerns, allowing the borrower to address their apprehensions satisfactorily. ESS-10 is relevant to the project setting as communities and government departments will be consulted during planning and implementation. It will be done through the inclusion of relevant Governmental Departments, Authorities, civic bodies, and, most importantly, the public for whom this project is built and

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those who will be negatively affected by it. ESS 10 aims to provide an opportunity for the general public to contact us, inform them about the project, and record their views. It helps build a constructive relationship with the community on one hand, and also fosters a proactive approach to pre-empt any unpleasant incidents on the other.

6.5 Consultation Methodology

A one-to-one meeting was conducted with the stakeholders. Sessions were informal to encourage a friendly environment, allowing participants to express their concerns, questions, and opinions about the project activities, as well as seek clarification on the project. The survey team highlighted the potential benefits of project implementation and documented any aspects that require detailed coverage during the execution stage. The meetings progressed in the following manner:

- A brief sub-project description was provided to the stakeholders.
- Stakeholders were allowed to raise queries or concerns regarding the project.
- Queries were responded to, and concerns were documented.

6.6 Consultation Findings/ Concerns

Consultations were carried out with primary stakeholders in Karachi East. As the construction activities will be carried out on government-owned land, stakeholders did not express any major concerns. The project site in Karachi East is located on Main University Road, Block 5, Gulistan-e-Iqbal, Karachi, and already has other observation instruments in place. The area is predominantly residential and commercial, and therefore, the project does not pose any major environmental or social implications. Houses and businesses residing within 200 meters of the PMD office and the Airport observatory were consulted. They were briefed about the proposed development and asked about their concerns, views and suggestions. The findings of these consultations are presented in Table 6.2, and the attendance sheets from the community consultations are included in Annexure II.

6.7 Information Disclosure

An executive summary of the ESMP for the reported project will be translated into Sindhi and Urdu after approval from the World Bank and uploaded to the relevant websites. In addition, the ESMP document will be made available at the construction site.

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Table 6.2 Stakeholder Consultation and Concerns

Stakeholders Consulted	Discussion points	Concerns	Mitigation
Mr. Ameer Hyder Laghari Chief Meteorological Department (PMD)	Project Overview: construction and upgradation of hostel building, institute and workshop	This project presents an opportunity to enhance capacity building while addressing the challenges posed by existing infrastructure. Design of functional and safe hostel infrastructure. Space optimization for maximum occupancy with comfort. Plumbing, sanitation, and ventilation upgrades. Fire safety and emergency system installations. Inclusive facilities for differently abled individuals. Careful consideration of environmental and social impacts should be essential to ensure the project's success and community acceptance. The hiring of local expertise and labor needs to be ensured. The dumping of waste material will be an issue.	Hiring Local Expertise: It is recommended to prioritize hiring local experts for various components of the project to support the local economy and ensure a deeper understanding of regional contexts. Worker Engagement: Local workers should be hired during the construction phase to ensure a more inclusive and sustainable project. Material Management: Potential material dumping areas are available, which will facilitate the management of construction waste and minimize environmental impact.
Dr. M Hasan Ali Baig – Director **Institute of Metrology & Geophysics**	Safety Compliances: The proposed project, which includes the construction of the faculty hostel, the Institute of MET hostel, and workshop upgrade, as well as all construction work, necessitates strict adherence to all Standard Operating Procedures (SOPs) to ensure safety and compliance.	The proposed project within the premises of PMD Karachi encompasses all work related to construction on government-owned land in a guarded locality, designed to protect the equipment from potential damage and ensure operational integrity. A NOC is required. Consider the New building planning and structural design. Focus on Modernization and retrofitting of existing structures. Compliance with local building codes and sustainability standards, as well as energy-efficient design consultation. Material specification and procurement support	During construction, all SOPs will be implemented to enhance operational efficiency while ensuring safety. NOC Requirements: A NOC from the relevant local authorities must be secured before commencing construction work to ensure compliance with local regulations.
Ms. Humaira Hafeez **Director**	The proposed project will support the foreign faculty, upgrade the workshop,	The maintenance schedule after the project implementation must be included.	Coordination for the project implementation will be improved with timely information dissemination. High-resolution output systems

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Stakeholders Consulted	Discussion points	Concerns	Mitigation
NMCC (Communication Centre) Metrological Department (PMD)	enhance the work quality and protect it from flood conditions.	Concerned with Technical layout planning for mechanical, electrical, and workshop upgrades and construction. Equipment and machinery placement for workflow efficiency. Ventilation, dust control, and industrial safety compliance. Retrofitting of workshops to meet modern training and operational standards. Integration of green building practices	will be used. The maintenance schedule following project implementation will be established.
Community Members Residing Near, Main University Rd, Block 5 Gulistan-e-Johar, Karachi	Consultations with the local community regarding the proposed construction at the Gulistan-e-Johar Observatory revealed that the project site is surrounded by dense residential and commercial areas, as well as educational and healthcare institutions. The construction activities will be confined within the premises of the Pakistan Meteorological Department, significantly reducing direct health and safety concerns for neighboring residents. The nearest residential community is located adjacent to the site, and initial feedback indicates that, given the enclosed nature of the project area, there is minimal risk to public health, safety, and community mobility. Nonetheless, it was observed that the main road to the university runs directly in front of the observatory, flanked by numerous shops and commercial establishments. During discussions with local shop owners and other community members, the following concerns and discussion points were raised:	• Job Opportunities: • One of the key concerns raised by the community was the potential for local employment opportunities associated with the proposed project and its ongoing operations. • Local shop owners and residents emphasized the importance of providing job opportunities to those living near the project site. • Residents and shopkeepers expressed concerns about potential traffic congestion and access issues during the construction phase, especially during peak hours. • Community members highlighted the potential for increased noise and dust, which could impact nearby schools, clinics, and businesses. • With a high volume of pedestrian movement, particularly students and patients, there is a need for clear signage and safety barriers to prevent accidents. • Shop owners requested that construction activities be scheduled to minimize disruption to business operations and customer access.	• Maintain ongoing consultation and transparent communication with residents throughout the installation and operational phases to address concerns and foster collaboration. • Prioritize hiring from the local community for all phases of the proposed project and operation to maximize local employment opportunities. • Continue employing staff from the nearby Pakistan Metrological Department Observatory, who are already sourced from the local area, ensuring community involvement and continuity. • Communicate employment opportunities and hiring processes to the local community to ensure awareness and equitable access to these opportunities. • Implement construction and operational practices that minimize disruption and safety risks to the surrounding community. • Since construction is confined within the boundary wall, external traffic disruption will be minimal. However, coordinate deliveries and worker movements during off-peak hours and ensure that entry and exit points do not block public roads.

Stakeholders Consulted	Discussion points	Concerns	Mitigation
		• The community emphasized the importance of regular updates regarding construction schedules, duration, and any changes that may affect daily routines. • Concerns were raised about ensuring that emergency vehicles can access the area at all times during the construction period. • Some residents suggested measures to manage construction waste and control air quality, especially given the proximity to healthcare facilities.	• Limit noisy and dusty activities to daytime hours. Use dust suppression (e.g., water spraying) and maintain machinery to minimize emissions, especially given the proximity to sensitive receptors outside the boundary. • Ensure that construction vehicles enter and exit the site safely. Place clear signage at site entrances to alert pedestrians and motorists, and restrict all construction activities to within the boundary wall. • As access to shops and commercial establishments will not be directly affected, maintain clear access to all neighboring businesses and communicate any temporary changes in site access. • Appoint a community liaison to provide regular updates on construction schedules and any potential impacts, using flyers, community meetings, or local media as needed. • Keep site gates unobstructed and ensure emergency vehicles can access the site if needed. Inform local emergency services about the construction schedule and site layout. • Manage waste on-site through regular collection and proper disposal. Monitor air quality and use dust control measures, particularly during material handling and disposal, to minimize off-site impacts.

Consultation Photolog

Community Consultation

Community Consultation

Consultation with IMG team

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Consultation with Met Workshop team.

Consultation with the airport Observatory team

CHAPTER - 7: PROJECT IMPACTS AND MITIGATION ACTIONS

7.1 General

A reconnaissance visit was conducted to assess the potential social and environmental impacts of the planned upgrade works to the buildings. A screening checklist indicated that the project activities would not have a significant impact on the local community or environment. Identified impacts are limited to the construction phase, are minor to moderate in severity, and can be mitigated through proper planning and management.

Social impacts, such as sourcing borrow pit areas, hiring labor, and renting accommodations for the contractor, will be addressed following applicable procedures. Local labor recruitment will be prioritized, contributing to economic opportunities in the area. Proposed project activities will be managed with appropriate guidance and monitored to ensure compliance with mitigation measures.

7.2 Impact Characteristics[26] (Assessment of Significance)

The assessment of effects and identification of residual significance take into account any incorporated mitigation measures adopted due to the impact of Project activities, and are largely dependent on the extent and duration of the change, the number of people or size of the resource affected, and their sensitivity to the change. Impacts can be both adverse and beneficial, and the methodology defined below has been applied to identify both the beneficial and adverse impacts of the Project.

The criteria for determining significance are specific for each environmental and social aspect; however, the magnitude of each impact is generally defined in conjunction with the sensitivity of the receptor. Generic criteria for defining magnitude and sensitivity are summarized below:

7.2.1 Magnitude

The assessment of magnitude will be undertaken in two steps. Firstly, the key issues associated with the Project are categorized as beneficial or adverse. Secondly, impacts will be categorized as major, moderate, minor or negligible based on consideration of the parameters such as:

- Duration of the impact;
- Spatial extent of the impact;
- Reversibility;
- Likelihood (something probable)

The magnitude of impacts will generally be identified according to the categories outlined in Table 7.1.

Table 7-1: Parameters for Determining Magnitude

Parameter	Major	Moderate	Minor	Minimal
Duration of the potential impact.	Long-term, beyond the project's lifespan.	Medium Term The lifespan of the project.	Limited to the construction period.	Temporary with no detectable potential impact.

[26]Source: Handbook of Environmental Impact Assessment, Volume II, Judith Petts, 1999. Blackwell Science Ltd.

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Parameter	Major	Moderate	Minor	Minimal
The spatial extent of the potential impact.	Widespread far beyond the project's area of influence.	Beyond immediate project components, the project's area of influence.	Within the project's area of influence.	A specific location within the project's area of influence with no detectable potential impact.
Reversibility of potential impacts.	The potential impact is effectively permanent, requiring considerable intervention to return to baseline	The baseline requires a year or so with some interventions to return to the baseline.	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant.
Legal standards and established professional criteria.	Breaches national standards and or international guidelines/ obligations.	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters.	Meets minimum national standard limits or international guidelines.	Not applicable
Likelihood of potential impacts occurring.	Occurs under typical operating or construction conditions (Certain)	Occurs under worst-case (negative impact) or best-case (positive impact) operating conditions (Likely).	Occurs under abnormal, exceptional or emergency conditions (occasional).	Unlikely to occur.

7.2.2 Sensitivity

The sensitivity of a receptor will be determined based on a review of the population (including proximity, numbers, and vulnerability) and the presence of strategic or sensitive features on the site or in the surrounding area. The criteria for determining receptor sensitivity are outlined in Table 7.2. Each assessment will define sensitivity about its topic.

Table 7-2:Criteria for Determining Sensitivity

Sensitivity Determination	Definition
Very High	The vulnerable receptor with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.
High	The vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation.
Medium	The vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	The vulnerable receptor with a good capacity to absorb proposed changes and/or good opportunities for mitigation

7.3 Rapid Environment Assessment (REA) Checklists

328. A rapid environmental assessment of the project area was conducted, as outlined in Table 7. 3.

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Table 7-3: Rapid Environmental Assessment (REA) Checklist

SCREENING QUESTION	YES	NO	REMARKS
A. Project Planning Is the project area adjacent to or within any of the following environmentally sensitive area?			
❖ Protected area		✔	There are no documented Protected areas within a 500-meter radius of the proposed project area.
❖ Wetland		✔	No wetland is present near the proposed project site. Kaka Pir is the nearest, which is 28 km from the proposed project area.
❖ Mangrove		✔	Mangroves in Pakistan are found exclusively along the southern coastline, particularly in the Indus River Delta region of Sindh Province, which is 25 kilometers south of the Project area.
❖ Estuarine		✔	There are no estuarine areas near Gulshan-e-Iqbal. Karachi East is an inland district, far from the coastal zone where estuaries typically occur.
❖ Buffer Zone of the protected area		✔	Based on available environmental and official documentation, there are currently no formally designated buffer zones for protected areas specifically within or adjacent to Karachi East district.
❖ Special area for protecting biodiversity		✔	There are no documented Protected areas within a 500-meter radius of the proposed project area.
B. Potential Environmental Impacts Will the project cause.			
❖ Loss of precious ecological valves (e.g. rules of encroachment into forests / swamplands or historical / cultural buildings / areas, disruption of hydrology of natural waterways, Regional flooding and drainage hazards.		✔	Wetlands are important for migratory birds, waterfowl, and other wildlife, providing seasonal habitats and supporting regional biodiversity. But these are about 30 kilometers away from the proposed project area.
❖ Loss of archaeological, historical or cultural monuments?		✔	Wazir Mansion, a 19th-century mansion, is the birthplace of Muhammad Ali Jinnah, Pakistan's founder, and is located approximately 12 km from Gulshan-e-Iqbal.
❖ Dislocation or involuntary resettlement of people?		✔	No land Acquisition is involved as upgradation work will be done on the Met Department-owned land.
❖ Disruption/ destruction of tribal groups/ indigenous peoples?		✔	No indigenous people have been identified in the project area.
❖ Environmental degradation from increased pressure on land?	✔		Only during the construction phase for the short term.
❖ Conflicts on water supply rights and related social conflicts?		✔	The Construction Contractor will make his arrangements for water during construction.
❖ Air pollution resulting from emissions of hydrocarbons from process equipment,	✔		Air pollution stems from hydrocarbon emissions caused by process equipment leaks, accidental releases,

SCREENING QUESTION	YES	NO	REMARKS
accidents, inadequate equipment maintenance, and poor planning?			inadequate maintenance practices, and insufficient operational planning. During operations, scrubbers will be installed to regulate emissions within permissible SEQS, with regular maintenance to ensure their effectiveness. Third-party, EPA-certified monitoring will be conducted on a routine basis.
❖ Increased incidence of waterborne or water-related Diseases?	✔		During the construction phase, particularly in monsoon seasons. Water testing will be ensured, medical facilities for workers will be established to mitigate waterborne diseases.
❖ Noise and dust from construction activities?	✔		The ambient noise level is expected to rise between 80-90 dB (A) due to construction activities, maintenance workshops, and the use of earthmoving equipment. To mitigate this, all stationary noise-producing equipment will be equipped with acoustic enclosures. During construction, a brief increase in dust pollution may occur, which will be mitigated through the use of environmentally friendly equipment and water sprinkling.
❖ Deterioration of water quality?	✔		Discharge of Untreated Sewage and Wastewater from work yard and camp areas.Leak Detection and Repair Programs & Develop and regularly update response plans for accidental releases. Train staff, communities, and workers in best practices for pollution control, resource management, and emergency response.
❖ Salinization of floodplain lands?		✔	No floodplain exists near the proposed project area.
❖ Environmental problems arising from uncontrolled human migration into the area, made possible by access roads and transmission lines?		✔	Not envisaged that locals would be preferred for on-site non-skilled & semi-skilled jobs.
❖ Impediments to the movements of people and animals?	✔		During construction, diversion and precautionary measures will be made.
❖ Labor–related social problems, especially when workers from different areas are hired?	✔		The construction contractor will prepare the CESMP which will include the labour-related mitigation as per LMP. Water testing will be ensured, and medical facilities for workers will be established to mitigate waterborne diseases.

SCREENING QUESTION	YES	NO	REMARKS
❖ Public health and safety hazards due to air pollution and possible groundwater contamination	✔		Implementing scheduled water spraying and restricting heavy equipment movement to designated times effectively reduces dust emissions during construction.

A –Impacts and Mitigations during the Design and Construction Stage

7.4 Topsoil Erosion

a) Impact

Excavation will expose bare soils that may be prone to erosion. Construction activities, such as grading, excavation, and the movement of heavy machinery, disturb the soil structure, increase compaction, and reduce porosity. This makes the soil less able to absorb water, which increases surface runoff and further accelerates erosion. (Impact magnitude is Minor)

b) Mitigation Measures for Erosion

Excavation of earth fill will be limited to an appropriate depth of 15cm. Where the priority will be given to obtaining earth fill material from licensed contractors. Furthermore, the top 15 cm of topsoil will be stripped, stored, and replaced after removing the borrowed material. Where deep ditching is carried out, the top half-meter layer will be stripped and stockpiled. Initially, the ditch will be filled with debris and scrap material from old construction and leveled with stockpiled topsoil later.

The provision for vegetation, including fast-growing native plants and a native seed mix, has been made immediately after fill placement to prevent scour and encourage stabilization in the design. Side slopes will be adjusted to a gradient necessary to reduce erosion potential, or, if steeper, they will be stabilized, covered with riprap, or other material to prevent soil erosion.

7.5 Air Pollution

a) Impacts of Air Pollution

During the construction phase of the proposed project, some adverse impacts on the ambient air caused by suspended dust and noise are foreseen. According to ESS3 of ESF 2018, the contractor must comply with resource efficiency requirements, pollution management, and prevention measures. To meet this requirement, the contractor will prepare a Pollution Prevention and Management Plan (focusing on dust) before the start of construction activities and implement it during the construction phase.

For the upgradation works, the small batch plant will require cement and dry sand gravel to be fed into a mixing chamber and water to be added to make concrete. Considerable fine dust

will be emitted when bagged cement is manually loaded into the batch plant hopper and when the conveyor system transports the materials to the plant.

Air quality would be disturbed during the construction stage due to vehicular movement and the release of particulate matter $PM_{2.5}$ from vehicular emissions. Construction activities will generate dust PM_{10} and pollute the surrounding area. The emission from the machinery used in earthwork activities will also degrade the site's air quality. The exhaust of noxious gases from the operation of heavy machinery will further pollute the air, adversely affecting the health and vigor of plants. (Impact magnitude is Moderate)

b) Air Pollution Mitigation Measures

Dust from the cement work will be avoided using bulk cement brought to the plants in large tanker trucks and transferred to the plant hoppers via a closed system. The batch plant will need to be equipped with dust suppression equipment, which is now standard on most such facilities or can be easily retrofitted.

Air pollution has to be effectively mitigated by adopting the following preventive measures. Per ESS3 of ESF 2018, the contractor must adhere to resource efficiency and, pollution management and prevention guidelines;

- The Contractor will be required to have approval (from The Construction Supervision Consultant) for the dust abatement plan/Pollution Prevention Plan.
- Regular spraying of water should be undertaken to minimize dust pollution. The water would be obtained from tanker water.
- All vehicles, machinery, equipment, and generators used during construction activities will be maintained in good working condition to minimize exhaust emissions. Additionally, the idling time of construction vehicles will be limited to 2 minutes to minimize local air pollution. PPE will be used and communication during machinery operation will be on a two-way radio system
- Enforce the maximum speed limit to 10km/h for vehicles to reduce dust emissions.
- Native species trees shall be planted, and rapidly growing trees, shrubs, and grasses in the project area shall be allowed during the operation stage of the project in collaboration with the Forest department.
- Conduct ambient air quality monitoring as per the SEQS, periodically, as outlined in the Environmental & social Management Plan (ESMP).

7.6 Water Pollution

a) Water-Related Impacts

Different activities, such as cutting, earthwork, and concrete work, alternately deteriorate the surface water quality during construction. A secondary adverse impact is the potential spillage of chemicals, hydrocarbons, and other pollutants as part of the construction process, as well as contamination arising from the improper disposal of wastes (organic and inorganic) at the work sites.

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b) Water-Related Mitigations

A contractor will make arrangements for water used for construction, with the preferred option being a Water Tanker. They will not rely on existing community resources and will not extract water from sources currently used by the community. To ensure the contractor does not use the community tube well, a comprehensive monitoring plan will be implemented to prevent unauthorized use. Daily site inspections will be conducted to check the water sources used by the contractor, ensuring compliance with project guidelines. Additionally, a weekly review of the contractor's logbook will track recorded water usage, helping to identify any unauthorized extraction or consumption. A grievance mechanism will be in place to allow community members to report any suspected misuse, with concerns addressed as they arise.

Furthermore, twice a week, random on-site water sampling will be carried out to verify the source of the water being used. The contractor will be responsible for implementation, while the site supervisor, project engineer, and environmental/social safeguard officer will oversee supervision and compliance. Moreover, the Contractor must provide the following facilities at the contractor's residence / resting area[27]: Latrines, lined washing areas, septic tanks, and soaking pits for toilet waste. Key mitigation measures are listed below.

- To provide safe drinking water to the construction crew, the contractor shall install a solar-operated domestic water filter/150GDP with Ultraviolet (UV) to ensure that subcontractors, if hired, have safe drinking water for the workforce.
- The E & S team of PIU shall regularly monitor water quality. Data on water quality will be shared on weekly basis.
- Water consumption will be closely monitored during construction, and detailed records will be maintained to minimize waste.
- Diesel, oil, and lubricants should be stored in accordance with applicable petroleum regulations. This will be the contractor's responsibility.
- It has been further proposed that, before the start of construction, the contractor will establish an updated baseline for environmental monitoring of air, water, and noise for comparison during the construction phase. Permissible limits and standards set by SEQS for Air, Water, and noise will be followed as the standards for comparison.
- Avoid stockpiling of earth fill, especially during the monsoon season, unless covered by tarpaulins or plastic sheets.
- Dispose of any waste generated by construction activities in designated sites.
- A community liaison will be maintained, and a GRM will be established to address complaints related to waste disposal. (Impact magnitude is Minor)

7.7 Noise Pollution

[27] *There is no requirement for a large-scale camp area, as local labor will be engaged for the project. These workers will return to their homes daily, minimizing the need for on-site accommodation. Only a small group of 10 to 15 skilled and semi-skilled personnel will reside in the meteorological office hostel, which will be specifically designated and secured for construction workers. This arrangement has been discussed and agreed upon with the Project Implementation Unit (PIU) and the client.*

a) Impacts of Noise Pollution

An increase in ambient noise and vibration is expected due to the use of construction machinery, such as excavators and pneumatic machinery. Noise pollution generated by the activities will likely impact sensitive receptors within 850 ft of the construction area. High ambient noise can have adverse psychological and physiological effects (increased blood pressure, sleep disturbance, etc.) on communities near construction sites and cause disturbance to local fauna. (Impact magnitude is Moderate)

b) Noise-Related Mitigation

Fitness certificates have to be provided by the contractor. Construction vehicles and machinery will be maintained in good working condition and tuned adequately throughout the construction work to minimize excessive noise and vibration. Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach. The mitigations shall limit working hours to 9:00 a.m. and 5:00 p.m., six days a week. Noisy construction work will be limited to regular working hours to minimize disturbance to nearby communities. Construction schedules will be disclosed to communities within a buffer zone vicinity of proposed project intervention sites before beginning construction. Ambient noise will be regularly measured to ensure that the thresholds set in the SEQS are not exceeded.

Despite this, the affected communities will also demand the right to monitor noise in case of any complaints. A community liaison will be maintained by the HSE officer of the Contractor to ensure that complaints and grievances are addressed as soon as possible.

7.8 Waste Management

a) Impacts of Waste

There will also be unused construction materials (such as sand and crushed rock), empty drums, concrete waste, and waste from work rest areas. Proper waste management is also essential due to the risks that improper waste handling and disposal pose to human health and environmental degradation. Careless and indiscriminate open dumping of waste can create unsightly and unsanitary conditions within the project area.

The total quantity of domestic waste generated will vary depending on the labor force the contractor has to utilize. Most laborers will be locals returning home at the end of the working day. A maximum of approximately 25% of the labor force, comprising mainly skilled labor, will reside at the contractor-provided residence during the peak of the works.

b) Mitigation for Waste

The waste dumping locations will be designated for construction debris and non-hazardous solid waste, following consultation with the respective Municipal Office or Sindh Solid Waste Management Board (SSWMB).

The hazardous waste will be managed as part of the Waste Management Plan and disposed of through a Sindh EPA-approved waste contractor under Section 13 of the Sindh Environment Protection Act, 2014.

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For solid wastes, the following mitigation measures are recommended:

- No waste will be disposed of in the field. All waste will be disposed of in a segregated manner within the designated working area.
- Combustible, noncombustible, and hazardous waste will be temporarily stored on-site in the designated locations and handed over to approved waste contractors for recycling and safe disposal.
- The labour (skilled and unskilled) will be provided with relevant training and encouraged to reduce and reuse waste wherever possible.
- The waste from camps will be collected regularly and transferred to the designated storage area at the project site. This waste will then be transferred for final disposal with the cooperation of the local administration.
- The Waste Management Plan (WMP) will be drafted and approved by PIU. This will include detailed procedures for the collection and disposal of wastes, with each waste stream separately.
- A certified vendor shall dispose of the waste generated from the rehabilitation works. (Impact magnitude is Moderate)

7.9 Traffic Management

a) Traffic diversion and/or road closure.

The upgrade of the building moderately impacts traffic movement. This should be avoided as far as possible by proper planning of construction works. Hauling of construction materials and operation of equipment on-site can cause traffic problems. If traffic diversion and/or road closure is required for the proposed works, prior consent from the department and prior information to affected areas and the public should be disseminated through consultations by PIU. The potential impact is negative but short-term and reversible by mitigation measures.

b) Traffic/Access-Related Mitigations

The construction contractor will be required to:

- Plan all work to minimize traffic disturbances and blockades; arrange for diversions on adjacent, connected, or linked roads and streets. Work planning is crucial to minimize the inconvenience to the public due to the construction works.
- Prepare and implement a Traffic Management Plan, including the diversion.
- Identify entry and exit points in areas with low potential for traffic congestion.
- Keep the site free from all unnecessary obstructions.
- Coordinate with Traffic/Local Police for temporary road diversions and provision of traffic aids if transportation activities cannot be avoided during peak hours;
- Use all necessary safety precautions, including signboards, temporary signals, skilled traffic guides, traffic diversions, electric lights, demarcation of construction work lanes/worksites/excavation areas, construction equipment/plant/machinery, separate active/live traffic lane from the active construction work sites, with night and fog reflector signages.

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- Proactively update the signage well in advance based on planned construction activity.
- Notify socially sensitive receptors by providing signboards that inform them of the nature and duration of construction works, along with contact numbers for concerns or complaints.
- Increase the workforce in areas with predominantly institutions, places of worship, business establishments, hospitals, and schools. Consult with businesses and institutions regarding their operating hours and factor this into work schedules.
- Outreach to nearby communities, informing them of road closures and construction schedules. Conduct an awareness program on the nature of work, likely disturbances and risks, construction work, mitigation measures in place, entry restrictions, and do's and don'ts; and to the communities. (Impact magnitude is Moderate)

7.10 Biodiversity

a) Impacts on Biodiversity

The following mitigation measures will adhere to comply ESS6. No tree cutting has been involved, and no rare or endangered aquatic faunal or floral species are known to occur in the project area. Furthermore, the upgradation work is in an urban area, so no wild animals or critical habitats will be impacted. (Impact magnitude is Minor)

b) Mitigations for Biodiversity

During the baseline survey of the project area, no endemic or rare species were observed in the AOI. All species recorded during the field survey have a wide distribution range. Since the campsite will occupy small areas and be located inside the boundary of Met Department Land, the impacts are reversible and localized by adopting mitigation measures. Use of local vegetation as fuel by labor will be prohibited.

The site for construction and storage areas will be chosen to minimize vegetation removal and land clearing. No hunting, harassment, or netting of local fauna will be permitted. No clearing of bushes will be allowed during the nesting/breeding season of birds. Maximum effort will be made to save rodent colonies during the construction process.

7.11 Occupational Health & Safety

a) Impacts on Construction Workers

The health and safety risks that could impact construction workers are primarily associated with the project's construction activities. In particular, the various risks of injuries and accidents for workers are related to the upgradation of building and associated activities. The typical risks include exposure to the physical hazards of using the construction equipment, working near running traffic, operating equipment, working on and near scaffolding, tripping and falling, exposure to noise and dust, falling objects, traffic hazards associated with the operation of project-related vehicles, exposure to hazardous materials and exposure to electrical hazards related to the use of tools and machines as well as the prevalence of the incidence of respiratory diseases as a result of dust and emissions.(Impact magnitude is Moderate)

b) Health and Safety-Related Mitigations

The following steps are suggested for the proper management of occupational health & Safety within the project area:

- The specific Labour Management Plan, Occupational Health & Safety Plan, and Community Health & Safety Plan will be developed in accordance with the Sindh Occupational Safety and Health Act 2017, while adhering to ESS2 – Labour and Working Conditions and Labour Management Procedure (LMP). It will be submitted to the PIU for review and approval. When approved, the contractor will implement the plan during the construction period. This plan must describe all jobs, their risks, and the controls that will reduce risks; these controls include PPEs, restrictions on activities or locations, and other measures. The plan also needs to describe the type of training that will be provided to the workers. Those who work at heights and with heavy equipment will need special training to manage and minimise hazards.
- All relevant PPE will be provided to the labour on the job, and their use will be ensured during construction activities.
- The contractor will train his crews on the aspects covered in the above-described Plan;
- The contractor shall fence the working area and unauthorized personnel shall not be allowed to enter the area.
- The contractor will hire a Health Safety and Environment (HSE) officer with adequate experience to address the above impacts.
- The Contractor will maintain the hygienic conditions of workers in labour camps. Briefed on communicable diseases or risk of contamination and food safety and storage in high temperatures.
- The Contractor shall make the first aid kit and bandages available at all times and on all sites. Moreover, paramedic staff will be available on-site, and hiring costs will be a part of the BOQ item. The location of these kits shall be marked and easily accessible to all.
- Drivers will secure the net on containers while transporting stones, sand, and other materials.
- A community liaison will be maintained during the construction stage, and a GRM will be established to address complaints related to safety hazards.
- The contractor will also prepare an emergency response plan to address events such as urban flooding, fires, earthquakes, heatwaves, smog, injuries, and fatalities.

7.12 Community Health & Safety

a) Impacts Due to Project Activities

The potential impacts shall be direct, such as being struck by moving vehicles within and outside the project area, and indirect, through the decrease in air quality surrounding the project area. The air quality will be reduced due to increased dust generated from construction and transportation, as well as emissions from plants and vehicles. The impact will continue for the duration of the work.(Impact magnitude is Moderate)

b) Potential Mitigation Measures

- Ensure that the site is restricted from the entry of irrelevant people, particularly children;
- Timely public notification on planned construction works;
- Seeking cooperation with local educational facilities (school teachers) for road safety campaigns, primarily when/if a school is located in the indirect impact area; Hazard training in schools and safety and GBV training can be incorporated if possible
- Provision of proper safety and diversion signage, particularly at socially sensitive receptor areas;
- Setting up speed limits in close consultation with the traffic police and
- During construction work, pedestrian and vehicular passages shall be provided for crossing near the settlement;
- Ensure a proper fence or barricade is in place around culverts, bridges, causeways, and excavation pits to safeguard the community and labor, and prevent accidents.
- Construction machinery and vehicles will not be operated during school off time / after school hours to minimize the risk of accidents and incidents.

7.13 Physical/Community Infrastructure

a) Damage to Physical Infrastructure

Construction works can damage existing infrastructure, including roads, culverts, and electricity lines. Some of this infrastructure may need to be relocated to accommodate the proposed works. (Impact magnitude is Minor)

b) Mitigations to Physical Infrastructure

Currently, no public infrastructure is available, which creates hindrances to the execution of the work. All damaged or removed infrastructures will be repaired and restored to their original or better condition. Liaison with the community will be maintained, and a site-based GRM will be established to address any related complaints.

7.14 Cultural Heritage

There is little likelihood of buried archaeological sites, as no archaeological or cultural heritage has been identified within a minimum of 850 ft of the project area. Cultural events and political rallies can cause work delays, so advance notification and information should be disseminated. (Impact magnitude is Minimal)

a) Chance Find Strategy

Heritage sites or items of significance could be discovered during development work. The “chance finds” procedure outlines the actions to be taken from the discovery of a heritage site or item to its investigation and assessment for siting and designing a project to minimize significant adverse impacts on the culture for which the client is responsible for heritage. It would be ensured that any opportunity to find further information is not disturbed until an assessment by competent professionals and actions consistent with ESS8 – Cultural Heritage

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requirements are taken. This standard outlines measures to protect cultural heritage throughout the project's lifecycle.

i. In the case of a chance find, the contractor will secure the site and report immediately to CSC and PIU. Works may not recommence until the Engineer approves.

ii. Meanwhile, the contractor will cease its operations, and due caution will be taken to ensure the protection of archaeological remains.

iii. The contractor will facilitate site visits by the Antiquities and Archaeological Department. Further works will be carried out on such sites only after obtaining (PIU will get clearance) from the Archeological Department.

7.15 Labour Influx

a) Impacts of Labor Employed from Outside

Some social impacts could arise due to labor influx. There shall also be a risk to community health from HIV/AIDS/communicable diseases or other transmitted infections as a result of the presence of migrant construction labour. There could be a risk of gender-based violence from migrant labourers, who often remain away from home on the site. This may lead to inappropriate behavior, including sexual harassment of women, girls, and boys in the local community. This is especially relevant if the nearby population belongs to a marginalised group, such as the Hindu community. (Impact magnitude is Minor)

b) Mitigation Labour Influx

A large-scale labor influx is not expected due to the local availability of unskilled labor in the project area and the anticipated scale of work under the project. Except for a limited number of managers, supervisors and skilled workers, most workers will be sourced locally or from nearby areas within the Karachi East District. The priority for local labour (dependent on skill and experience capacity) is expected to minimize the risk of labour influx.

While the contractor shall also include proposals for awareness of communicable diseases and the spread of sexually transmitted diseases in the training plan, the contractor will train the workers regarding (Gender Based Violence - GBV) and also train workers about sexual harassment, child abuse, and human trafficking to reduce the risk of GBV and the code of conduct. All labor should also sign a code of conduct that is approved by the PIU.

7.16 Gender Base Violence (GBV), Sexual Exploitation & Abuse (SEA)/Sexual Harassment (SH)

a) Impacts related to GBV/SEA/SH

Although the influx of workers will be minimal, as discussed earlier, new workers (outside their social spheres) may form close social relationships with local communities. This can lead to unacceptable and/or illegal behaviour, ranging from unwanted aggressive advances to SEA/SH against women and children. (Impact magnitude is Moderate)

b) Mitigations related to GBV/SEA/SH

Training and orientation sessions will be conducted to sensitize the PIU and the Contractor's staff and workers on the importance of addressing GBV, SEA, and SH risks at the project level as part of the mitigation strategy. The contractor will be required to have a written contract with

their workers that is materially consistent with the objective of ESS2, following the procedures specified in the World Bank's Procurement Regulations. The workers must sign a Code of Conduct prepared by the Contractors and reviewed and approved by PIU. In addition, the CSC and CCs will provide a safe workplace and fulfil all essential needs of women workers (socially appropriate working conditions, separate toilets, etc.). They will also ensure the safety of GBV-prevention-focused workplace and campsite infrastructure for Project-affected communities and their staff. They will regularly conduct safety audits throughout the Project lifecycle to gather information and identify potential safety risks, project-induced GBV, or any other potential risks related to WB SEA/SH.

7.17 Child Labour

a) Impacts Related to Child Labour

Although the risks of child labor are anticipated on the lower side, there may be instances when Contractors hire persons below the age of 18 years. Children hired at labour sites are susceptible to unfair treatment, exploitation and violence because their hiring may be depicted as a favour to them, and they may be talked into not raising complaints for fear of losing a much-needed source of income.(Impact magnitude is Minor)

b) Mitigations Related to Child Labour

Only individuals aged 18 and above will be hired at construction sites, and their age will be confirmed by verifying their government-issued CNIC, which is only issued to individuals aged 18 and above. Moreover, for child labour in hazardous work, the Sindh Prohibition of Employment of Children Act 2017 will be followed, which states that the minimum age for hazardous work is 18 years and above. However, if other labor-related risks arise during project implementation, the PIU will develop procedures to prevent other impacts. This will include awareness-raising sessions, which will be conducted regularly in the communities to sensitise on prohibition and the negative impacts of child and forced Labor.

CHAPTER - 8: ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING PLAN

8.1 General

The purpose of the ESMP for the upgradation & rehabilitation works is to ensure that all necessary measures identified have been adopted to protect the environment and social aspects, and to comply with the country's environmental and social legislation, as well as applicable World Bank standards.

8.2 Institutional Arrangements

8.2.1 Project Management Responsibilities

Implementation of the ESMP will be a contractual obligation between the Contractor and the MHSP- IFRAP's PIU. To fulfil the contractual obligation, full-time technical staff capable of monitoring activities as proposed in the ESMP shall be engaged. The Environment & Social (E&S) team, to be established within the PIU, will support the CSC during ESMP implementation.

8.2.2 Construction Supervision Consultant

The project proponent will engage the CSC and will be responsible for monitoring the ESMP on behalf of the PIU during the execution of the civil works for the projects. The project proponent shall submit periodic progress reports. In general, the CSC has the following responsibilities regarding the environmental and social aspects of the project:

- Review the documents prepared by the Contractor regarding E&S implementation.
- Monitor the implementation of ESMP regularly during the Contractor's execution of civil works. The CSC must have the following key positions:
  a) Environmental Specialist
  b) Social Safeguard Specialist
  c) HSE expert

8.2.3 Contractor Responsibilities

The Contractor will be responsible for the on-site implementation of the ESMP, as well as maintaining responsibility for environmental protection liabilities under the Sindh Environmental Protection Act 2014, the World Bank ESF 2018, and other applicable national and provincial policies and regulations. Furthermore, the contractor must fill in the employment particulars in Annexure III. The Contractor will also be responsible for training their crews on all aspects and implementation of the ESMP. The bid should include an environmental and social mitigation budget as part of the engineering costs of the respective works. The key positions to be filled within the contractor's staff for the implementation of the ESMP include: Environmental Coordinator(s), Occupational Health and Safety (OHS) Officers, and Community Liaison Officers.

8.3 Contractor's Environmental & Social Management Plan (CESMP).

This ESMP was prepared before the Contract award. Therefore, certain mitigations, dependent upon the methodology chosen by any Contractor to deliver the project, could not

be specified. For example, haulage routes depend upon the exact campsite locations chosen by the Contractor. Therefore, it is required that the Contractor prepare site-specific plans before mobilization and implement the plans described below, incorporating mitigation measures as necessary. Once approved by the CSC Environment Specialist & PIU, these documents will become part of CSEMP.

8.3.1 Labour Management Plan

The contractor shall prepare and obtain approval from the PIU for the LMP, which includes a temporary residence agreement and SOPs. The LMP will adhere to the Labour Management Procedure. These procedures have been developed to manage risks associated with the proposed project, which the World Bank funds. The LMP will outline the project's approach, consistent with national requirements and the objectives of the World Bank's Environmental and Social Standards on Labor and Working Conditions (ESS2).

8.3.2 Pollution (air, land, and water) Control Plan

The Contractor shall provide details of the proposed principal pollution control facilities and contingency plans in the event of failure of these facilities. The contractor must follow ESS3 – Resource Efficiency and Pollution Prevention and Management when formulating the plan prior to the commencement of civil work.

The plan shall include details of the designated and licensed tip, oil treatment facilities, and hazardous waste disposal sites used for waste disposal. The plan shall also include Environmental effects monitoring.

8.3.3 Waste Management Plan

The Contractor shall include details of the procedures for collecting and disposing of waste. The Plan shall deal with each waste stream separately. The contractor will prepare and implement a Waste management plan based on the mitigation plans given in the report. The Plan will include the camp layout and details of various facilities, including supplies, storage, and disposal.

8.3.4 Traffic Management Plan

The basis of the Contractor's Site-Specific Traffic Management Plan (TMP) and further information is to be provided. The Contractor is required to provide further details once camp/worksite locations and material sources are finalized. The Traffic Management Plan must include details of the proposed access routes to the project area and haulage and access routes throughout the project area (including access to and from borrow pits).

8.3.5 Emergency Preparedness & Response Plan

The contractor will prepare an emergency plan to address emergencies and events such as fires, floods, earthquakes, accidents, and incidents involving death or injury. The Plan will include the following details:

- Contacting the relevant agency (e.g., Fire Brigade)
- Procedure for the shutdown of the site;
- Indicators on-site that shall prompt the shutdown of areas of work (linked to natural events)
- Shutdown procedures and emergency evacuation procedures for staff and members of the public within the range of likely impact.)

8.3.6 Training Plan

A comprehensive training plan is essential for implementing environmental and social safeguards effectively. The training plan focuses on enhancing awareness, building capacity, and ensuring compliance with the project's environmental and social safeguards. Below is an elaboration on the key training areas, their relevance, target groups, frequency, and budget considerations. Details are given in Table 8-1 given below.

a) **Areas of Training and Key Aspects to Be Covered**

i. **Environmental and Social Safeguards (ESS) Awareness**: Training sessions will educate participants on the importance of ESS, including the environmental and social considerations crucial for the project and its projects. This ensures adherence to international and national standards during project implementation.
ii. **Environmental and Social Management Plans (ESMP)**: The training will cover findings from the ESMP, emphasizing key environmental and social issues associated with project activities. Participants will be trained in monitoring and reporting mechanisms to ensure the effective and transparent implementation of ESMP.
iii. **Occupational Health and Safety (OHS)**: This module addresses health and safety risks associated with construction activities. Participants will learn to identify hazards, adopt safety measures, and implement protocols to mitigate risks at construction sites.
iv. **Grievance Redress Mechanism (GRM)**: Training on the GRM will focus on its implementation to ensure that affected communities can effectively report their concerns. This includes addressing grievances effectively and fostering trust between stakeholders and project implementers.
v. **Gender-Based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH)**: Awareness sessions on GBV/SEA/SH will educate participants on identifying, preventing, and addressing such incidents, ensuring a safe working and living environment for all stakeholders, especially vulnerable groups.
vi. **Child Labor Prevention**: Training will focus on raising awareness about child labor laws and ensuring compliance with legal and ethical standards to protect children from exploitation.
vii. **Communicable Disease Management**: A key component of the training is managing and monitoring communicable diseases, particularly in construction camps or densely populated project areas.
viii. **Resource Efficiency and Conservation**: This module will train participants in the optimal use of resources, with a focus on water conservation and sustainable practices. Awareness campaigns will address issues like open defecation and promote better Water, Sanitation, and Hygiene (WASH) practices.
ix. **Wildlife Conservation**: Training will also include identifying, conserving, and protecting local fauna & flora. This ensures that precautionary measures are taken to prevent harm to biodiversity.

b) **Target Groups**

The training will target diverse groups, including:

- **Project Implementation Unit (PIU)**: Ensures project managers and decision-makers are fully equipped to oversee and implement safeguards.
- **Contractor Staff**: Workers and supervisors involved in physical work will gain awareness of safeguard measures, OHS practices, and GRM protocols.

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- **Relevant Communities**: Local populations will be trained in relevant areas, including WASH practices, GBV prevention, and resource conservation.

Table 8-1: Environmental and Social Awareness Training Plan

Areas of Training	Key Aspects to be Covered	Target Group	Frequency	Budget.
Environment, Social Safeguards	a. Environmental and social awareness on ESS. b. Key environmental and social issues associated with the project and projects ESMP and findings. c. project monitoring and reporting. d. Occupational Health and Safety Issues Associated with Construction. e. Grievance Redress Mechanism Implementation f. Gender-Based Violence (GBV)/SEA/SH g. Child Labor h. Communicable Disease Management and Monitoring i. Resource Efficiency and Conservation j. Water conservation and optimal resource use, Awareness regarding open defecation and better WASH practices for the relevant community k. Identification, conservation, and precautionary measures of wildlife.	PIU, Contractor staff, and relevant communities.	Before physical work commences, during construction, and after construction.	Different types of training will be conducted for the proposed project.

8.4 Compliance and Effects on Monitoring

PIU shall carry out monitoring within the project area using the monitoring checklists to be prepared based on this mitigation and monitoring plan to aid the monitoring process; the Contractor will complete the following:

- The construction staff will be trained to implement the ESMP and safety measures.
- Periodic progress reports will be submitted to PIU's Environmental and Social Specialists.
- Progress Reports will include the various issues related to the HSE, including but not limited to the following:
    - HSE Measures adopted (HSE statistics)
    - Fuel and hazardous material consumption
    - Workforce statistics (employment/deployment, etc.)
    - Compliance monitoring to verify whether the actions outlined in the ESMMP are being implemented.
    - Effects monitoring to record the impacts of mitigation measures.

CSC shall be responsible for effects monitoring. Examples of compliance and effects monitoring parameters are included in Box -1 below. Both approaches will be conducted using the monitoring parameters, visual observation, photographic documentation, and measurement, where necessary. A record of events and surveys will be maintained.

8.5 Environmental Non-compliances and Corrective Measures

The Contractor will be notified of any ESMP violations and required corrective actions. Below are some steps relating to the increasing severity of environmental problems that will be implemented. The principle is to keep as many issues within the first few steps as possible.

Step 1. PIU and the Contractor will work out mitigations and record the facts and decisions implemented.

Step 2. A more serious infringement will be observed, and PIU will notify the Contractor in writing, specifying a deadline by which the issue must be rectified. The contractor will bear all costs.

Step 3. The suspension will be enforced until the offending parties, procedure, or equipment are corrected and/or remedial measures are put in place if required. No extension of time will be granted for such delays; the Contractor will bear all associated costs.

Step 4. Breach of contract—One possible consequence is the removal of a Contractor and/or equipment and/or the termination of the contract. Such measures will not replace any legal proceedings PIU may institute against the Contractor.

8.6 Communication, Reporting and Documentation

The following environmental meetings are proposed:

- Primary meetings between the E&S team of PIU and the Contractor to establish the format for regular meetings shall be held prior to the commencement of the project.
- Scheduled Environmental and Social Progress Review meetings between the team PIU and the Contractor shall be held regularly.

The Contractor and CSC must produce monthly, quarterly, and work completion reports on the project based on social and environmental issues. The reports will be distributed to PIU and the World Bank.

A photographic record of the project area shall be kept. The contractor, E&S-PIU, will conduct a walkthrough survey at key locations in the project area, taking photographs using a digital camera. The following data shall be recorded for each photograph:

- Shot number
- All the photographs will be referenced with GPS Coordinates
- Title of photograph
- Date and Time, and
- Photographic features.

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Box 1

(i) Compliance Monitoring:

- Frequency of anti-dust water sprays during the construction period;
- Installation of signage regarding community health and safety
- Safety at workplaces and working hours during construction;
- Incidence of liquid/solid waste in the vicinity of work camps (type and amount of waste, amount, interference with local residents, fauna, flora and crops);
- Plantation of saplings of new trees
- Arrangements made at construction sites for protection of floral and faunal resources
- Assurance of installation of signage regarding community health and safety

(ii) Environmental Effects Monitoring

- Ambient air quality (Particulate matter) during construction phase;
- Water quality at residance sites;
- Ground water table at construction sites;
- Number of patients suffering from malaria, cholera, diarrhea, respiratory ailments during construction phase
- Noise levels (in dBA), monitored at fixed locations and planned schedule during construction

(iii) Social Effects Monitoring

- Number of local people recruited for project works.
- Incidence of child labour and disproportionate wages
- Conflict at community level
- Chance find an archaeological site
- Grievance redressal mechanism is in place
- Health screening of labour at the site
- Contractor's staff sensitized on Gender based violence (GBV)

The photographic record shall be incorporated into the monthly reports.

Complaints Register. The Contractor will maintain a complaint register at the campsite and workplaces to document all complaints from the local communities. The register will also record the measures taken to mitigate the reported concerns. The final report will be communicated to the PIU E&S team. All community complaints/ issues will be reported in the monthly progress report of the following month, along with the status of last month's complaints, and will be reviewed by the E&S team of PIU.

Moreover, the telephone numbers and addresses of all concerned tiers within the GRM would be displayed in Sindhi and Urdu at all sites, and these would be distributed at community training meetings.

Change Record Register. A review of this ESMP will be triggered in two scenarios:

- A change to the design deviates from the parameters safeguarded in this ESMP.
- A discovery in the baseline socio-environmental conditions, which is not recognized or covered by this ESMP.

In either scenario, the ESMP shall be updated and reissued accordingly. When documenting any project design or operational change, the Contractor and PIU shall maintain a record of the design change.

To ensure a safe and compliant working environment, contractors will be required to submit comprehensive monthly compliance reports that detail worker behavior, health, and safety measures implemented on-site. These reports should include specific metrics related to worker conduct, adherence to safety protocols, and the effectiveness of health measures in place.

The reports must cover incidents of workplace injuries or near misses, outlining the circumstances and corrective actions taken to prevent future occurrences. Additionally, contractors should document any health and safety training provided to workers, including

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attendance records and topics covered, to demonstrate an ongoing commitment to workforce education and awareness.

Furthermore, the reports should assess the implementation of PPE usage, ensuring that all workers are equipped with the necessary gear and that compliance with PPE protocols is monitored regularly. Contractors should also evaluate the effectiveness of health measures, such as regular health screenings and mental health support initiatives, to promote overall worker well-being.

8.7 Environmental and Social Codes of Practice for Construction

The Environmental and Social Codes of Practice (ECPs) will guide best operational practices and environmental management protocols to be followed by contractors for the sustainable management of all environmental and social concerns. These ECPs draw on lessons learned from the construction of similar projects, including those funded by donor agencies in Pakistan, and align with international industry practices. The list of ECPs prepared for the Project includes:

ECP 1: Waste Management

ECP 2: Fuels and Hazardous Goods Management

ECP 3: Water Resources Management

ECP 4: Drainage Management

ECP 5: Soil Quality Management

ECP 6: Erosion and Sediment Control

ECP 7: Topsoil Management

ECP 8: Topography and Landscaping

ECP 9: Quarry Areas Development and Operation

ECP 10: Air Quality Management

ECP 11: Noise and Vibration Management

ECP 12: Protection of Flora

ECP 13: Protection of Fauna

ECP 14: Protection of Fish (if any)

ECP 15: Road Transport and Road Traffic Management

ECP 16: Labour Influx Management and Construction Camp Management

ECP 17: Cultural and Religious Issues

ECP 18: Workers Health and Safety

8.8 Bills of Quantities (BOQs) & Bidding Documents

The following items will be included in the BOQs of the bidding documents.

- Allocation of PPE quantities for all project personnel, including contractors, PIU members, and Engineer/Project Implementation Consultant (PIC), alongside provisions for first-aid boxes, ambulance services, and healthcare facilities staffed with doctors and nurses licensed by the Pakistan Medical Commission.
- Deployment of OHS staff throughout the construction duration.

- Provision and upkeep of Dust Measurement Meters for on-the-spot measurements (3 units).
- Spot monitoring of atmospheric parameters (O_2, CO, H_2S, CO, CH_4, and Crystalline Silica) at an active construction site.
- Quarterly 24-hour Ambient Air Quality Monitoring will be conducted at different locations, measuring PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO levels.
- Continuous 15-minute noise monitoring will be conducted near settlements during construction activities.

8.8.1 Payment Milestones

Contractor payments will be tied to their environmental, health, and safety performance and evaluated based on the completion of prescribed mitigation measures in the CESMP and control measures outlined in the plan. In instances of non-compliance resulting in damage or significant harm to the environment, workers, public or private property, or resources, the Contractor will be obligated to either rectify the damages within a specified timeframe agreed upon with the engineer (PIC), or reimburse the expenses.

Repeated non-compliance will result in penalties for the Contractor. The penalty for non-compliance with the CESMP and OHS Plan requirements will amount to 3% of the total Civil Works Value as stated in the Interim Payment Certificate. This penalty will be enforced after all contractual measures have been applied and upon issuance of a Non-Compliance Report by the Engineer.

Table 8-2: Environmental & Social Management Plan

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
A. DESIGN PHASE									
A.1. Design / pre-construction considerations									
A.1.1	pre-construction considerations	A.1.1.1	Slope Instability	Excavated Material Disposal Plan to include sitting and detailed assessment of the suitability of the proposed excavated materials disposal site	PIU	MHSP-IFRAP	All excavated surplus materials are to be disposed of at designated sites.	Once, at the end of the design stage	PIU Office
		A.1.1.2	Compliance with ESMP	Consideration of EMP in preparation for the detailed design and bid documents.	PIU	MHSP-IFRAP	Added ESMP in contract documents	Before the tendering	PIU Office
		A.1.1.3	Baseline Environmental Monitoring	As per the monitoring plan given in ESMP, before the start of the civil works, as per SEQS	CC	CSC	Compliance with ESMP	Once before the start of the works	
		A.1.1.4	Geology and seismology	Stone pitching of the degraded reaches	PIU	MHSP-IFRAP	Emergency Preparedness and Response Plan in place before the commencement of construction.	Once, at the end of the design stage	PIU Office
B. CONSTRUCTION PHASE									
B.1. Site Preparation and Clearance									
B.1.1	Site preparation	B.1.1.1	Topsoil Erosion	The contractor will prepare an earthworks checklist and get approval from CSC. The checklist will define excavation limits during reconditioning works and provide instructions for topsoil management. Soil from private land will be minimized only after consultation and payment of compensation to landowners.	CC	PIU & CSC	Approved Plans and comply with ESS1	During the Planning phase, in parallel with the preparation of bid documents	At any location, borrow pits and quarries will be operated.
				use of existing accessing tracks	CC	PIU & CSC	No tree-cutting on temporary haul routes	Weekly	Same as above

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Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
B.1.2	Disposal of Excavated Material	B.1.2.1	Identification of re-use of excavated material on site to reduce off-site effects	All excavated materials must be disposed of in designated sites per the approved waste management plan. The Plan shall deal with each waste stream separately.	CC	PIU & CSC	Comply with approved WMP as per ESS1 – ESS3 –& and Community complaints; Monitoring record	Monthly	at approved disposal sites of road Rain/Flood Affected road
		B.1.2.2	Community Disturbance	Community liaison will be maintained during construction, and GRM will be established to address complaints.	CC	PIU & CSC		Monthly	Same as above
			Noise	Limiting working hours to 9 am and 5 pm, six days a week. The campsite/s shall be situated at least 500m from any settlement. The affected communities will monitor on-demand noise in case of any complaint or request. Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits of SEQS. Community liaison will be maintained to ensure that complaints and grievances are addressed as soon as possible.	CC	PIU & CSC		Monthly	at approved disposal sites
B.2. Construction and Labor Camps									
B.2.1	Locating temporary labour residence	B.2.1.1	Community disturbance	Community consultations will be carried out and liaison will be maintained. GRM to be established to address related complaints.	CC	PIU & CSC	Review of residance agreement	Once	At the proposed labour residence
B.2.2	Supply of Drinking Water	B.2.2.1	Depletion of local drinking water resources	The contractor shall make arrangements for the water supply, ensuring that water supply and availability to local communities are unaffected.	CC	PIU & CSC	The contractor will not be entitled to use public water resources	Monthly	Near the community water resources.

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
		B.2.2.2	Spread of the disease through the unsuitable water supply	Provision of safe drinking water and monthly testing according to the SEQS-16	CC	PIU & CSC	Comply with SEQS	Monthly	At the labour residence site
B.2.3	Surface Water contaminations	B.2.3.1	Construction of impermeable layer	Suitable latrines (septic tanks etc.) and washing facilities are provided in the camps	CC	PIU & CSC	Latrines are provided at each camp	Once	At the Construction Camp area
				Lined washing facilities, including a shower, are available near each latrine, including clean running water, soap, and drying facilities.	CC	PIU & CSC	Suitable washing facilities are provided at each camp	Once	Same as above
B.2.4	Accidents and Emergencies	B.2.4.1	Emergency Response	The contractor shall prepare a shutdown procedure and evacuation plan	CC	PIU & CSC	Approved Plan as per Construction Management.	Once after the completion of the proposed work.	At the Construction area
				Emergency Response Plan to man-made and natural disasters (including rains, urban floods, fire, etc.)	CC	PIU & CSC	Annual evacuation drill	Quarterly	Same as above
				Emergency access routes shall be signed and maintained	CC	PIU & CSC	Emergency access routes are clear and signed	Monthly	Same as above
				Fire extinguishers are to be provided throughout the camp	CC	PIU & CSC	Fire extinguishers provided	Monthly	Same as above
B.2.5	Security	B.2.5.1	Conflict with local communities, attack on staff	Security for avoiding any conflict with local communities. All the actities of construction and operation will be inside the boundry wall. all.	CC	PIU & CSC	Fencing and security. The entrance to the working site shall be monitored and restricted.	Monthly	Same as above
				Preparation and Implementation of a communication strategy, which the contractor will develop. Under the guidance of CSC and get approval from PIU before the start of civil work.	CC	PIU & CSC	Approval of Communication Strategy by PIU	Once	
				The contractor shall provide all staff with Identity Cards showing their association with the project.	CC	PIU & CSC		Monthly	All active work sites

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
				Sindh-speaking staff (Preferably the supervisors) are to be available at all active work sites to communicate with the local community.	CC	PIU & CSC	Sindhi staff available at all active work sites	Monthly	Same as above
				The Contractor shall include in the Emergency Plan a procedure for emergency evacuation of camp and practice this procedure.	CC	PIU & CSC	Plan submitted and approved	Once before the start of civil work	Camp area
B.2.6	Restoration	B.2.6.1	Change in Landscape after the closure of works	The Contractor shall remove all temporary facilities after the completion of the works	CC	PIU & CSC	before and after Pictorial evidence.	Once at the time of completion of the project.	Same as above
B.3. Storage of Material									
B.3.1	Stockpile Storage of Materials	B.3.1.1	Increase in particulate matter	Proper covered storage. Water sprinkling of any uncovered stockpile where dust is generated	CC	PIU & CSC	No dust generated from stockpiles	Monthly	Stockpiles
B.3.2	Storage of Hazardous Materials	B.3.2.1	Health and safety due to improper use of hazardous material	Fuel tanks (if required) and other hazardous material storage containers will be properly marked to highlight their contents.	CC	PIU & CSC	Comply with the approved WM Plan for Handling of Hazardous Materials	Monthly	Hazardous material storage areas.
				Hazardous areas to be secure and access limited to trained personnel only	CC	PIU & CSC		Monthly	Hazardous material storage areas
				Provide fire extinguishers	CC	PIU & CSC	Fire extinguishers are provided	Monthly	
				Provide and enforce the use of PPEs as per the Contractor's Health and Safety Plan.	CC	PIU & CSC	Proper implementation of PPEs	Monthly	
		B.3.2.3	Health and Safety and Pollution	An oil-designated storage area used	CC	PIU & CSC	Stockpiles only in storage areas identified in the camp layout plan	Monthly	Hazardous material storage area
				Training on handling, use and disposal of hazardous material must be given to all those with access to the hazardous material area.	CC	PIU & CSC	Training as per the Contractor's approved training plan	Monthly	Hazardous material storage area

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
B.4. Waste Management									
B.4.1	Disposal of sanitary wastes using the municipal system (if available)	B.4.1.1	Introduction of Inappropriate Contaminants or Waste Volume to Municipal System	Testing of wastes and submission of results to the Engineer.	CC	PIU & CSC	Test results show waste is within SEQS limit for pre-treatment	Quarterly	Construction camp/s
				Written consent from the operator of the municipal system submitted to the Engineer	CC	PIU & CSC	Consent/ agreement submitted	Once before the start of civil works	
		B.4.1.2	Use of municipal system which falls below SEQS standards	Only the government-approved system can be approved	CC	PIU & CSC	Agreement with the certified waste collectors	Once before the start of civil works	
B.4.2	Collection of domestic wastes	B.4.2.1	Surface and groundwater pollution	Provide garbage bins within all camps for domestic wastes	CC	PIU & CSC	Provision of bins	Monthly	
B.4.3	Disposal of domestic wastes using Municipal facilities.	B.4.3.1	Ground and groundwater pollution, the spread of disease	Domestic waste shall be collected from waste bins on alternate days and transported by tractor trolley to be disposed of in a nearby municipal facility. A written agreement shall be made between the Municipal operator and contractor to dispose of domestic waste.	CC	PIU & CSC	The license or written agreement between the municipal operator and contractor was checked.	Monthly	Licensed site.
B.4.4	Disposal of medical wastes	B.4.4.1	Surface water pollution, health and safety of staff and public.	Medical wastes will be stored on-site The contractor will engage a third-party contractor for the treatment and ultimate disposal of medical waste in a controlled manner.	CC	PIU & CSC	There is no medical waste in the municipal facility. Waste receiving receipt.	Monthly	Collection points/waste bin at the first aid center
B.4.5	Disposal of hazardous wastes	B.4.5.1	Ground, groundwater and surface water pollution, health and safety	Hazardous wastes are to be passed to licensed contractors, or available wastes are to be stored in long-term storage facilities meeting the requirement of a hazardous material storage area to be taken on clients following construction. Details are to be provided to the engineer in the pollution plan.	CC	PIU & CSC	As per approval of the Plan and guidelines set by Waste Management plan to meet the ESS1 & 3	Once	Collection point

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
B.4.6	Closure of works	B.4.6.1	Ground, groundwater and surface water pollution, health and safety.	All solid wastes shall be removed from the project area on completion of works	CC	PIU & CSC	All solid wastes disposed of or removed from the site and comply with the restoration plan	after the completion of civil work	At the Construction area
B.5. Construction Plant and Vehicles									
B.5.1	Movement/ operation of vehicles on-site	B.5.1.1	Air pollution	All vehicles are regular services as per manufacturers' requirements	CC	PIU & CSC	Black smoke was not observed emitting from Vehicles/plant	Quarterly	At the Construction area
		B.5.1.2	Generation of dust	The access road must be adequately compacted or regularly sprinkled to prevent dust generation during use.	CC	PIU & CSC	Dust is not reaching the settlements in the project area		Settlement in the project area
			Soil and Groundwater pollution	Vehicles/plants will be checked daily for fuel oils and leaks and fixed as required.	CC	PIU & CSC	No fuel oil leaks were observed from the plant/vehicle		At the Construction area
		B.5.1.3	Safety of the community, other road users, fauna and staff	Vehicle speed is limited to 10km/hr.	CC	PIU & CSC	Submittal and approval of the plan	Once before the start of civil work	Same as above
				Safe driving practices are included in Contractor's training plan	CC	PIU & CSC	Training of the drivers as per the approved plan	Monthly	same as above
				Flag persons to be provided where cross/meet the residential road	CC	PIU & CSC	Flag persons provided	Monthly	approaching and crossing the road
				The contractor's Community Liaison Officer collaborates with communities to identify sensitive areas and inform communities before the movement of machinery.	CC	PIU & CSC	No complaints were received from the communities	Monthly	Settlement in the project area
				Vehicles with restricted rear visibility to be fitted with an audible backup alarm or provided with banks men	CC	PIU & CSC	Back-up alarms	Monthly	At all active construction sites
				Driving in the project area after nightfall is prohibited except on public highways	CC	PIU & CSC	No driving after dark	Monthly	Public roads

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
			Damage to public infrastructure	Damage to road, utilities pipe lines, infrastructure and property was immediately repaired/compensated by the Contractor	CC	PIU & CSC	No damage to road/infrastructure	Monthly	Settlement along the project area
				Use of horns is prohibited near the settlement	CC	PIU & CSC	Nor horns were heard at the settlement	Monthly	Same as above
			Disturbance of Fauna	Biodiversity monitoring of impacts on fauna	CC	PIU & CSC	Status and behaviour of terrestrial and avian-fauna	Quarterly	Same as above
			Reduction in access to women and girls	Avoid routes used by women and girls as far as possible, if unavoidable, identify alternate routes for women and girls	CC	PIU & CSC	No complaints were received from women and girls	Monthly	Public road which are crossing or connected to the work
B.5.2	Deliveries to Site	B.5.2.1	Dust	Covered transportation of loose materials	CC	PIU & CSC	No dust generation from delivered materials	Monthly	Public road that are crossing
		B.5.2.3	Community disturbance increases in traffic.	The traffic management plan is to be submitted to the Engineer for approval and to include routes for delivery vehicles.	CC	PIU & CSC	Submittal and approval of the plan TMP	Once	Same as the above
				Deliveries should be carried out during normal working hours and are prohibited at night. If unavoidable, then follow the nighttime working protocols.	CC	PIU & CSC	No deliveries were carried out at night.	Monthly	Storage areas at the Construction campsite
				Delivery vehicles are prohibited from queuing on public roads	CC	PIU & CSC	No queuing delivery vehicles on public roads	Monthly	Same as the above
B.5.3	Road/access Closure	B.5.3.1	Community disturbance increases in traffic	Flag persons are to be provided where the plant crosses/meets the village road.	CC	PIU & CSC	Flag persons provided	Weekly	At road partial closure
				The contractor's Community Liaison Officer collaborates with communities to identify sensitive areas and inform communities before movement.	CC	PIU & CSC	No complaint received	Monthly	Settlement in the project area

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
				A request for road closure must be approved by the relevant authority	CC	PIU & CSC	As per Approved TMP	Once for each closure	Throughout the construction period
B.6. Health and Safety of The Workforce									
B.6.1	General construction works	B.6.1.1	Health and safety provisions	The contractor shall prepare and submit an occupational health and safety plan. This plan must describe all jobs, their risks, and the controls that will reduce risks; these controls may include PPE, restrictions on activities or locations, and other measures. The contractor will ensure the use of PPE for his labours during the construction period; To overcome the drinking water contamination issue, at each construction camp, the contractor shall install a solar-operated domestic water filter/150GDP with Ultraviolet (UV) to ensure safe and healthy drinking water for the workforce. The Contractor will display sign boards and banners about traffic diversion at places on detour routes; Community liaison will be maintained during the construction stage and GRM will be established to address complaints related to safety hazards.	CC	PIU & CSC	Submittal and approval of Labour Management plan. As per the guidelines provided in ESS2 The number of reported accidents. The number of reported near-misses. Non-compliance observed. Community complaints.	Regularly as specified in the monitoring plan	At the Construction area
		B.6.2.1	Health and safety of Staff	The contractor will submit an accident report to the Engineer following an on-site accident. The report must detail actions to be taken to reduce the risk of occurrence.	CC	PIU & CSC	Submittal of the accident report	Monthly	Same as above
				The Contractor will appoint a qualified health and safety manager	CC	PIU & CSC	Qualified health & safety manager present on-site	Monthly	Same as above

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
				The contractor shall engage a full-time first-aider on-site Contractor to have the on-call doctor.	CC	PIU & CSC	On-site Presence of qualified medical practitioners and first aid facilities	Monthly	First aid camp
				Provision of the dispensary for the treatment of staff. The dispensary is to be stocked with appropriate medicines for likely incidents, diseases, and ailments on site. Stock is to be replenished as necessary.	CC	PIU & CSC	Dispensary available on-site and regularly restocked	Monthly	Same as above
B.7 Archaeology and Cultural Sites									
B.7.1	Chance find	B. 7.1.1	No PCR exists near the projectarea	If a chance of this occurs, the contractor will secure the site and report immediately to PIU. Works may not recommence until the Engineer approves. Site visits to the Culture Tourism & Antiquities Department of the Govt of Sindh will be facilitated. Further works will be carried out on such sites only after obtaining clearance from the Department	CC, CSC	PIU & Culture Tourism & Antiquities Department, Govt of Sindh	Chance find	As or when depends on chance, find	Same as above
B8. Safety/Health Measures for The Local Population									
B 8.1	The local population living within/near the project, especially women, children and elderly people	B 8.1.1	Accident risks, particularly for the local population living within/near the project, especially women, children and elderly people; Public awareness campaigns through displaying signboards at the site and haulage routes; Vulnerability to accidents;	Restriction on the movement of machinery on the designated haulage routes for the transportation of materials. Public awareness campaigns through displaying signboards at the site and haulage routes. Interaction with the community; Setting up speed limits (not more than 10 Km/h in work areas); Availability of first aid box for locals; Strict enforcement keeping non-working persons, particularly children, away from work sites; Adequate signage to manage traffic	CC	PIU & CSC	Number of complaints to ensure compliance with ESS4 – Community Health and Safety	regularly	Same as above

Sr. No.	Project Activities	Section	Environmental Impacts/Entity	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location
					Execution	Monitoring			
			Deterioration of health due to dust	at sites, haulage and access roads; Ensure water sprinkling. For Community Female Members: • Awareness should be created among the local community, including females, about the construction work. • Workers should not be allowed to crowd into the residential communities within the site. • Alternative pedestrian routes should be provided to avoid mixing women with workers. • Raise awareness among the communities of the potential risks of GBV, SEA, and SH and establish links with response services in the nearby communities that can respond to instances of GBV (particularly those related to issues of labour influx). • Contractor should take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially against women. • Measures to prevent GBV, SEA, and SH: the Contractor must include relevant clauses in the workers' code of conduct. • Develop and implement procedures for grievance redressal and stakeholder response mechanisms to ensure the timely handling of grievances.					

Table 8-3: Environmental & Social Monitoring Plan

Sr. No.	Parameters	Means of Monitoring	Frequency	Responsibility	
				Implementation	Supervision
1	Vegetation clearance	Visual inspection of loss of vegetation, soil erosion & instability, surface water pollution and occupational health of workers and community	Weekly	CC	CSC/PIU
2	Top Soil	Visual inspection of topsoil at a depth of 20 cm to 30 cm should be conducted, and the excavated material should be stored appropriately.	Beginning of earthworks	CC	CSC/PIU
3	Erosion	Visual inspection of the occurrence of erosion and erosion prevention measures	At the end of the filling activity	CC	CSC/PIU
4	Operation of the burrow and quarry site	Visual inspections of quarry sites/burrows	Monthly	CC	CSC/PIU
5	Storage and handling of materials	Visual inspection of storage facilities	Monthly	CC	CSC/PIU
6	Local roads	Visual inspection to ensure local roads are not damaged	Monthly	CC	CSC/PIU
7	Traffic safety	Visual inspection to see whether proper traffic signs are placed and safety barriers for traffic management are occupied	Monthly	CC	CSC/PIU
8	Air Quality	Air quality monitoring mobile lab(Certified laboratory from the relevant agency)	Quarterly	CC	CSC/PIU
9		Visual inspection to ensure water sprinkling is being implemented	Daily	CC	CSC/PIU
10.	Air quality & noise Surface & groundwater quality	Visual inspection to ensure the concrete plant is located greater than 500 m from residential areas	Monthly	CC	CSC/PIU
		Visual inspection of the conditions of the equipment in use	Quarterly	CC	CSC/PIU
		Sampling and analysis of surface water quality (Certified laboratory from the relevant agency)	Quarterly	CC	CSC/PIU
10	Solid waste	The visual inspection confirms that solid waste is disposed of at the designated site	Weekly	CC	CSC/PIU
11	Floral and faunal monitoring	Visual inspection	Daily	CC	CSC/PIU
12	Cultural and archeological sites	Visual inspection	Daily	CC	CSC/PIU
13	Visual check for exhaust emissions from equipment and vehicles	Visual inspection	Daily	CC	CSC/PIU
14	Grievances of the local communities	Visual inspection	Daily	CC	CSC/PIU
15	Gender Responsive Capacity Enhancement	GBV-focused Trainings, Visual inspections, Weekly meetings by CLOs with the community, ensuring the inclusion of men, women, trans sex, minorities, and disabled persons (if any), reporting monthly to the PIU concerned specialist.	Monthly	CC	CSC/PIU
18	Reinstatement of the work site	Visual Inspection	After the completion of all works	CC	CSC/PIU

8.9 Grievance Redress Mechanism

A three-tier Grievance Redressal Mechanism (GRM) has been established to ensure the timely, transparent, and equitable resolution of grievances from the local /nearby community, as no Project Affected Persons have been identified, and other stakeholders regarding the environmental and social management of each project.

All complaints, whether verbal or written, will be meticulously documented and recorded in the Complaint Management Register(s). Every effort will be made to address complaints through the project-specific GRM, and complainants will be encouraged to utilize this mechanism for redressal. Should the complainant remain dissatisfied with the resolution, they reserve the right to escalate their complaint to higher government administration or relevant courts.

The GRM has been designed to accommodate anonymous complaints and all grievances will be treated with utmost confidentiality. Personal data revealing the identity of complainants will not be disclosed without their consent. In cases where the complainant chooses not to remain anonymous, contact details may be provided upon request.

Additionally, the contractor will be required to establish a worker GRM on-site in accordance with their HR policy, as stipulated in the contractor's bidding documents.

8.9.1 First Tier of GRM

The project site office will serve as the initial tier of the Grievance Redress Mechanism (GRM), offering a swift and accessible avenue for resolving grievances at the local level. A local Grievance Redressal Committee (GRC), chaired by the Project Manager and comprising relevant stakeholders and community members from the surrounding area, will be established for this purpose. The designated E&S staff at the PIU site office will strive to resolve complaints within two to 10 working days, depending on the nature of the grievance.

The Project Manager will convene informal meetings of the local GRC to facilitate amicable settlements between the parties involved within 10 days of receiving a complaint, whether verbal or written. Proceedings of the GRM meetings will be documented, and copies will be provided to the concerned parties. Grievances will be recorded with personal details unless anonymity is requested, and a tracking number will be assigned to each complaint. Should the grievance remain unresolved or the affected person remain unsatisfied with the decision, they may escalate the grievance to the Program-level grievance redress committee, led by the head of the PIU.

8.9.2 Second Tier of GRM:

Unresolved grievances or issues will be referred to the second tier of the GRM, the PIU central level Grievance Redress Committee (GRC), by the E&S staff at the PIU. This central level GRC will comprise senior management representatives, the head of the PIU as secretary, Project Directors, representatives from PMD, PICs, Resident Engineers of the Consultants.

The GRC will convene as necessary to address grievances and suggest corrective measures within 15 working days, depending on the nature of the grievance. Despite efforts to resolve complaints through the project-specific GRM, complainants will retain the option to seek redressal through government administrative or judicial remedies if they remain unsatisfied with the decision.

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8.9.3 Third Tier of GRM

If the second-tier GRC cannot resolve a grievance or if the complainant remains dissatisfied with the decision, they may pursue alternative redress through higher level GRC headed by PD-FPMU-IFRAP higher-level administrative authorities, the Pakistan Citizen Portal, or the court of law, as appropriate.

Grievance Redressal Committee: PD will establish the central-level Grievance Redress Committee (GRC) as a continuous and functional structure, involving personnel from the PIU and other relevant parties.

Monitoring and Reporting: Monitoring reports on ESMP implementation will include progress on grievance resolution, including the number of cases registered, the level of jurisdiction (first, second, and third tiers), the number of hearings held, decisions made, and the status of pending cases. Lists of cases in process and already decided upon will also be prepared, detailing information such as complainant names, complaint numbers, application dates, hearing dates, decisions, remarks, and actions taken to resolve grievances.

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CHAPTER - 9: ESTIMATED ENVIRONMENTAL COST

9.1 General

This chapter addresses the costs associated with the environmental aspects of the ESMP Implementation of the Project. This also includes the cost of additional works incorporated in the design to minimize the socio–environmental risks.

Environmental cost comprises four main components, which are:

a) Baseline Environmental Monitoring

b) Construction Phase Monitoring

c) EHS Management

d) EHS Administrative Cost

The total estimated cost for environmental monitoring and EHS management throughout the construction project is Rs. 4,477,000.

9.2 Baseline Environmental Monitoring Before Construction

Before any civil works begin, it is crucial to establish the existing environmental conditions. This involves monitoring surface water near construction sites, analyzing both groundwater and potable water samples, assessing air quality at key locations such as batching plants and camps, and measuring ambient noise levels at sensitive receptors. These activities ensure that the project starts with a clear understanding of the local environment, with a total allocation of Rs. 149,000 for this phase.

9.3 Environmental Monitoring During Construction

Ongoing monitoring during construction phase is essential to maintain compliance with environmental standards and to address any emerging issues promptly. Surface water is tested quarterly, while drinking water and ambient air are sampled multiple times each year to ensure safety and quality. Noise levels are regularly checked at sensitive locations, and a lump sum is set aside for monitoring emissions from machinery and stacks. The total cost for these activities is Rs. 896,000.

9.4 EHS Management

To maintain a safe and healthy work environment, the project includes provisions for personal protective equipment, fire-fighting gear, and camp management. Additional funds are allocated for preparing a restoration report after construction and for landscaping and plantation efforts to restore and enhance the site. These measures collectively support the well-being of workers and the surrounding community, with a budget of Rs. 1,292,000.

9.5 EHS Administrative Costs

Effective implementation of EHS measures requires robust administrative support. This includes training and capacity building for staff, salaries for social and environmental experts, and resources for project dissemination, safety signage, and site protection. These administrative efforts ensure that EHS standards are upheld throughout the project, with a total allocation of Rs. 5,140,000. Details of all these costs, along with their unit rates, are given in Table 9-1.

Table 9-1: Environmental Mitigation/ ESMP Implementation Cost

Item No.	Item	Rational	Frequency	Average Rate (Rs.)/unit*	Quantity/year	no of units	Total Quantity	Estimated Amount (Rs.)
A. Baseline Environmental Monitoring Before Start of Civil Works								
1	Surface Water	Construction near water body	Once Before Start of Civil Works	25,000	1	1	1	25,000
2	Drinking Water	one from the groundwater and the others from potable water as per SEQS		25,000	1	2	2	50,000
3	Ambient Air	One from the batching plant area, the other from the camp area as per SEQS		35,000	1	2	2	70,000
4	Ambient Noise	3 from the nearby sensitive receptors and as per SEQS		1,000	1	4	4	4,000
							Sub Total - A	**149,000**
B. Environmental Monitoring Cost During Construction Phase (12 months)								
5	Surface Water	Construction near water body	Once every in four months	25,000	4	1	4	100,000
6	Drinking Water	one from the groundwater and the others from potable water as per SEQS		25,000	4	2	8	200,000
7	Ambient Air	One from the batching plant area, the other from the camp area as per SEQS		35,000	4	2	8	280,000
8	Ambient Noise	3 from the nearby sensitive receptors and as per SEQS		1,000	4	4	16	16,000
9	Machinery/Stack emissions						Lump sum	300,000
							Sub Total - B	**896,000**
C. EHS Management								
10	Personal Protective Equipment		Bi annual	5,700	30	2	60	342,000
11	Fire Fighting Equipment purchase and refilling						Lump sum	150,000
12	Camp Management						Lump sum	500,000
13	Restoration Report						Lump sum	100,000
14	Soft and Hard Landscaping - Plantation						Lump sum	200,000
							Sub Total - C	**1,292,000**
D. EHS Administrative Cost								

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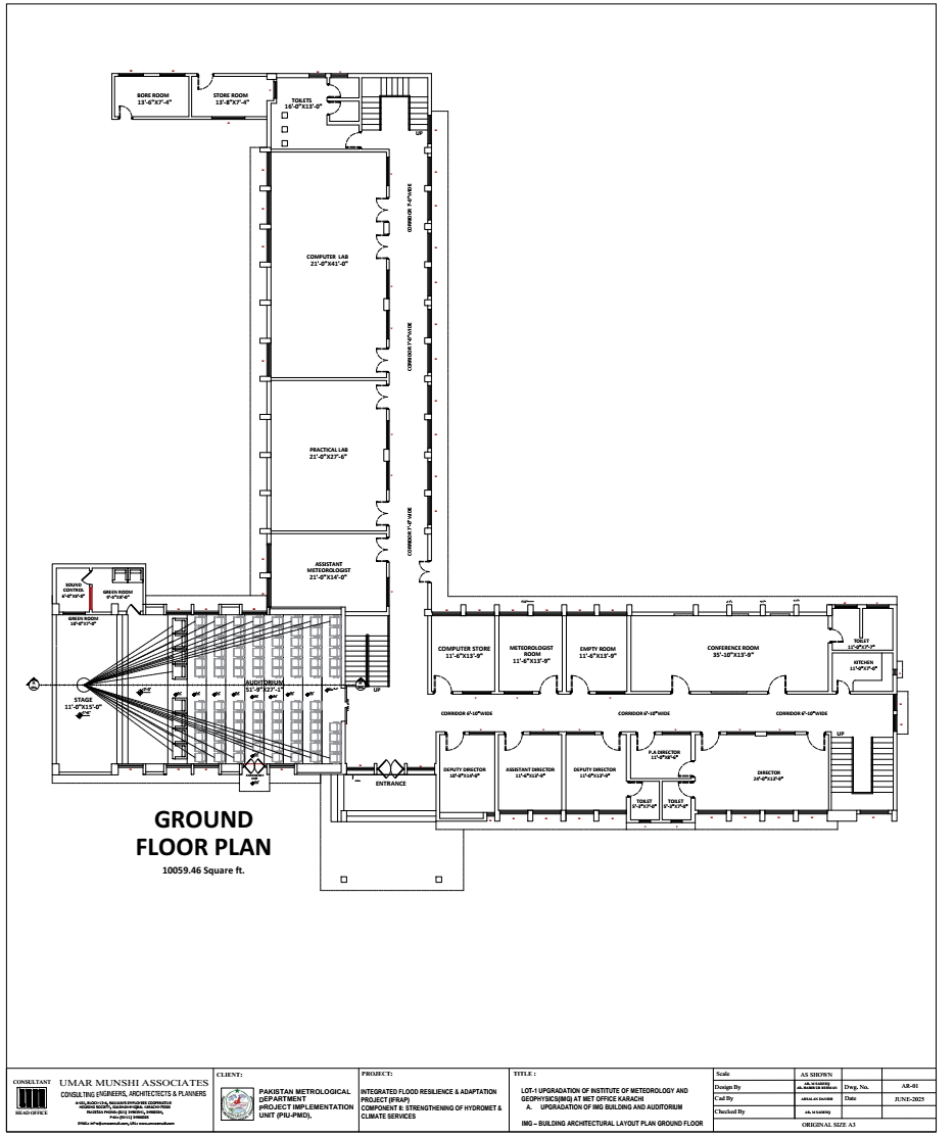
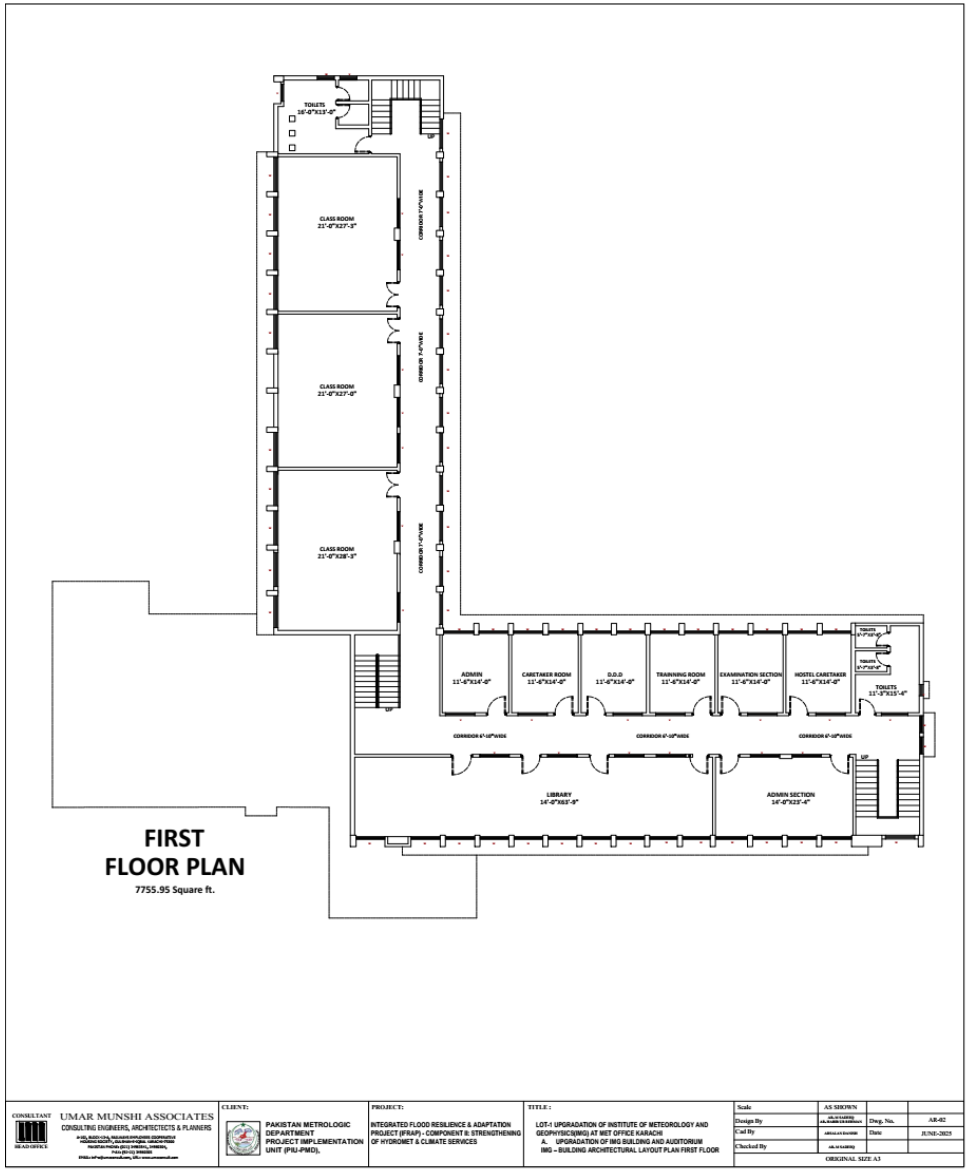
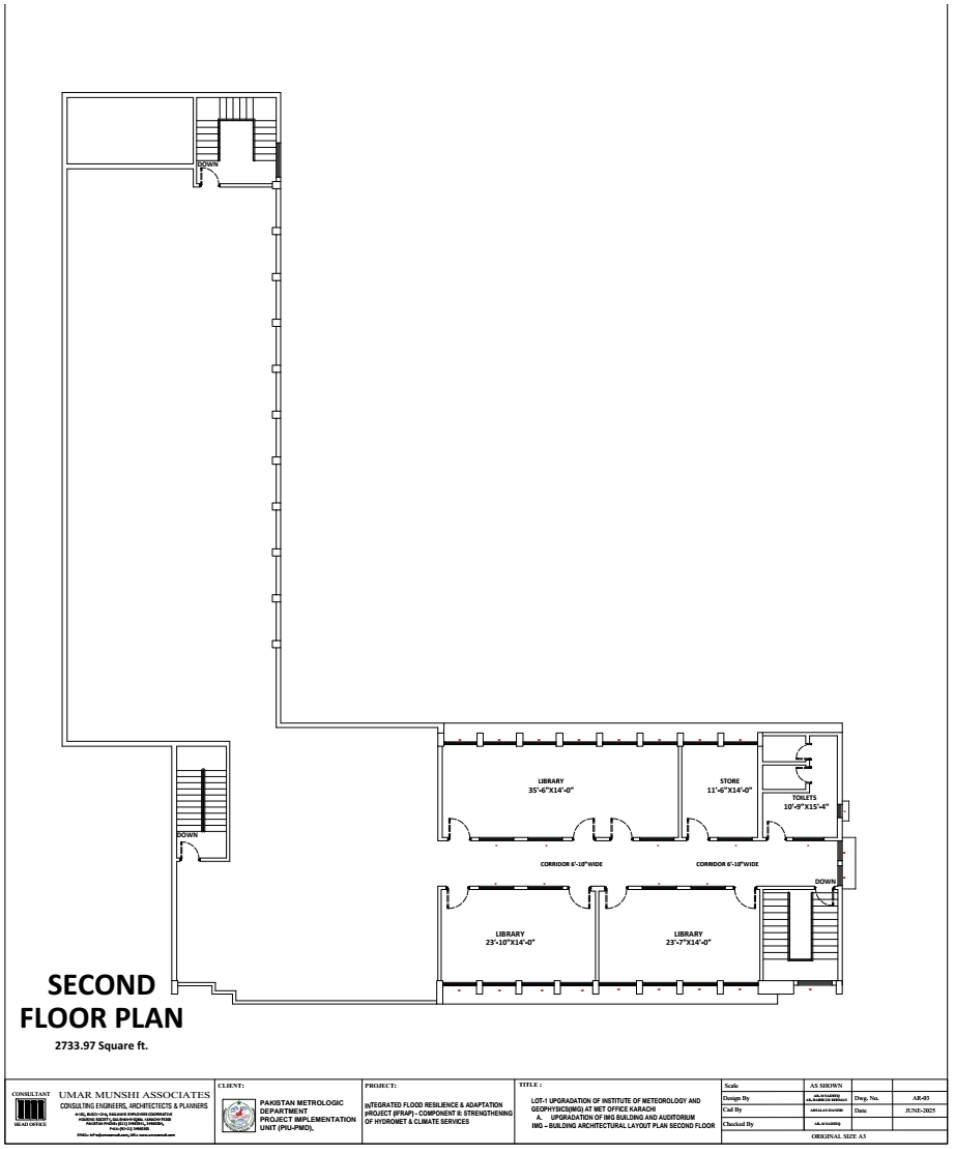
Item No.	Item	Rational	Frequency	Average Rate (Rs.)/unit*	Quantity/year	no of units	Total Quantity	Estimated Amount (Rs.)
15	Training/Capacity Building		50 persons	3,000	2	1	100	300,000
16	Social Expert (for social compliance & GRM implementation) Salary			120,000	6	1	6	720,000
17	Project Dissemination, safety sign Boards, GRM Running, Site protection items, etc.						Lump sum	400,000
18	Environmental & OHS Officer Salaries (120 thousand for each person)			120,000	6	1	6	720,000
							Sub Total - D	**2,140,000**
							TOTAL OF (A to D)	**4,477,000**

Annexures

ANNEXURE - I: Details Drawings



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STORE
11'-6"X14'-0"
TOILETS
10'-9"X15'-4"
CORRIDOR 6'-10"WIDE
CORRIDOR 6'-10"WIDE
DOWN
DOWN
LIBRARY
23'-10"X14'-0"
LIBRARY
23'-7"X14'-0"
SECOND
FLOOR PLAN
2733.97 Square ft.
CONSULTANT
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
HEAD OFFICE
CLIENT:
PAKISTAN METROLOGIC DEPARTMENT
PROJECT IMPLEMENTATION UNIT (PIU-PMD),
PROJECT:
INTEGRATED FLOOD RESILIENCE & ADAPTATION PROJECT (IFRAP) - COMPONENT II: STRENGTHENING OF HYDROMET & CLIMATE SERVICES
TITLE :
LOT-1 UPGRADATION OF INSTITUTE OF METEOROLOGY AND GEOPHYSICS(IMG) AT MET OFFICE KARACHI
A. UPGRADATION OF IMG BUILDING AND AUDITORIUM
IMG – BUILDING ARCHITECTURAL LAYOUT PLAN SECOND FLOOR
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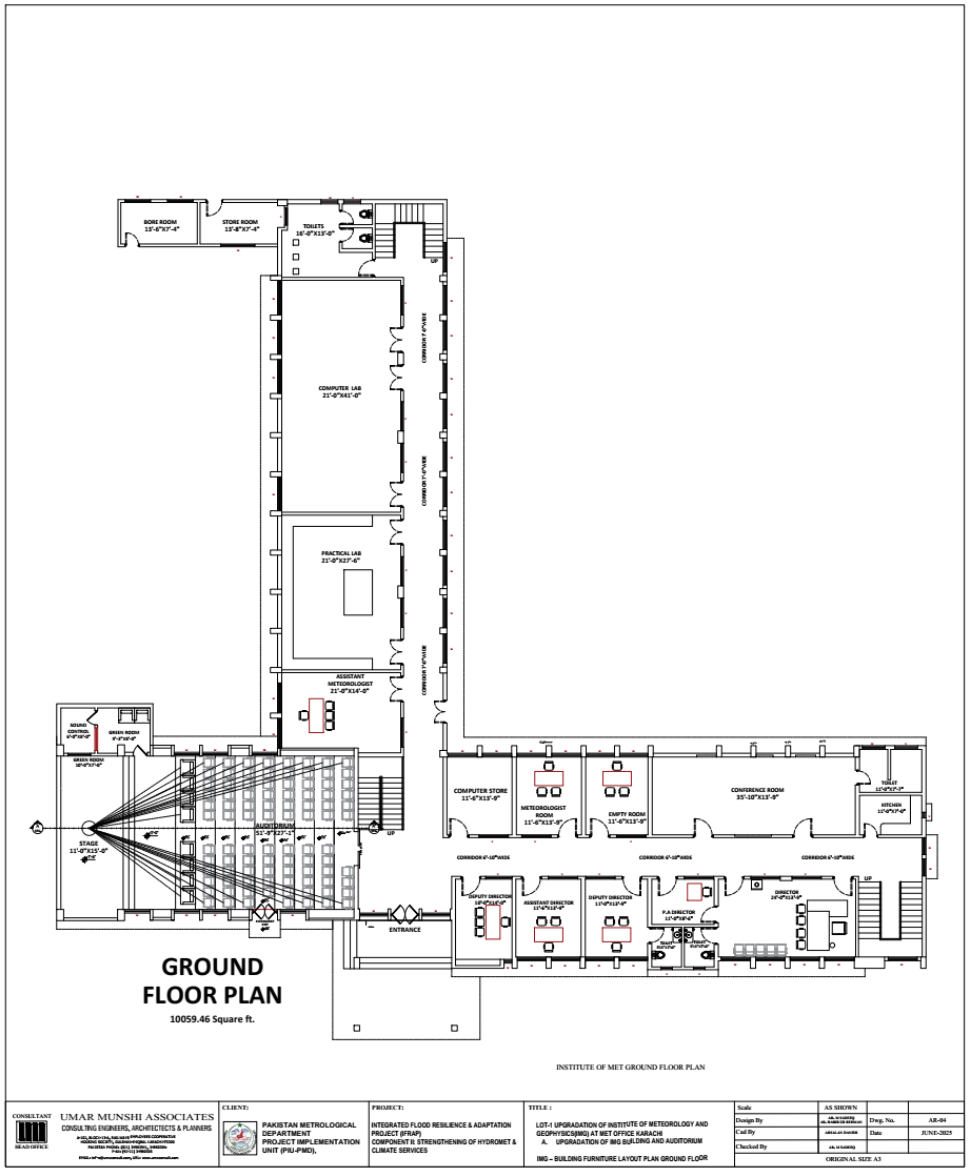
AS SHOWN
Design By
Dwg. No.
AR-03
Cad By
Date
JUNE-2025
Checked By
ORIGINAL SIZE A3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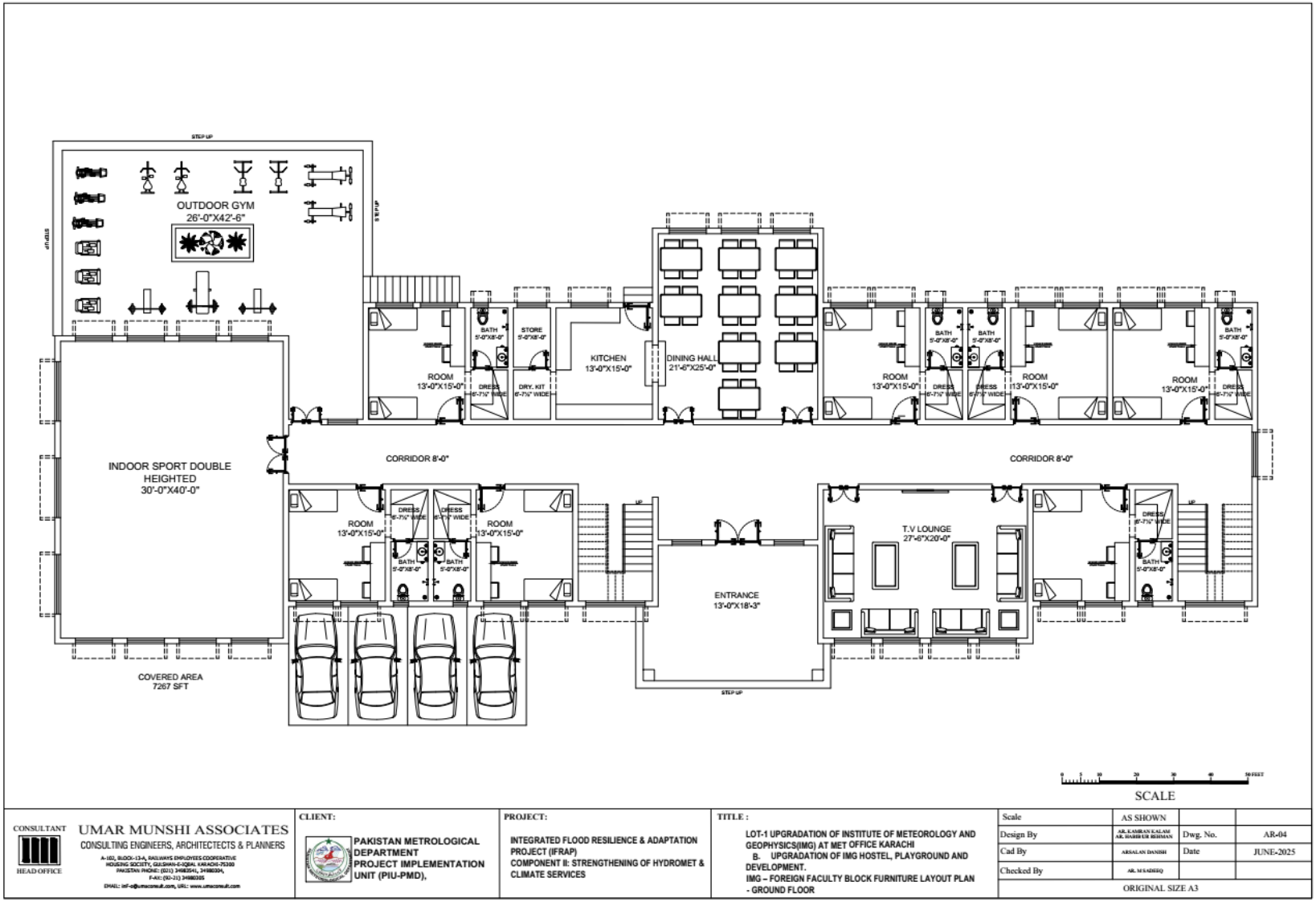
STORE ROOM
TOILETS
COMPUTER LAB
PRACTICAL LAB
ASSISTANT METEOROLOGIST
COMPUTER STORE
METEOROLOGIST ROOM
EMPTY ROOM
CONFERENCE ROOM
KITCHEN
AUDITORIUM
STAGE
ENTRANCE
DEPUTY DIRECTOR
ASSISTANT DIRECTOR
DEPUTY DIRECTOR
P.A DIRECTOR
DIRECTOR
GROUND
FLOOR PLAN
10059.46 Square ft.
INSTITUTE OF MET GROUND FLOOR PLAN
CONSULTANT
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
HEAD OFFICE
CLIENT:
PAKISTAN METROLOGICAL DEPARTMENT
PROJECT IMPLEMENTATION UNIT (PIU-PMD),
PROJECT:
INTEGRATED FLOOD RESILIENCE & ADAPTATION PROJECT (IFRAP)
COMPONENT II: STRENGTHENING OF HYDROMET & CLIMATE SERVICES
TITLE :
LOT-1 UPGRADATION OF INSTITUTE OF METEOROLOGY AND GEOPHYSICS(IMG) AT MET OFFICE KARACHI
A. UPGRADATION OF IMG BUILDING AND AUDITORIUM
IMG – BUILDING FURNITURE LAYOUT PLAN GROUND FLOOR
Scale
AS SHOWN
Design By
Dwg. No.
AR-04
Cad By
Date
JUNE-2025
Checked By
ORIGINAL SIZE A3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INDOOR SPORT DOUBLE HEIGHTED
30'-0"X40'-0"
COVERED AREA
7267 SFT
ROOM
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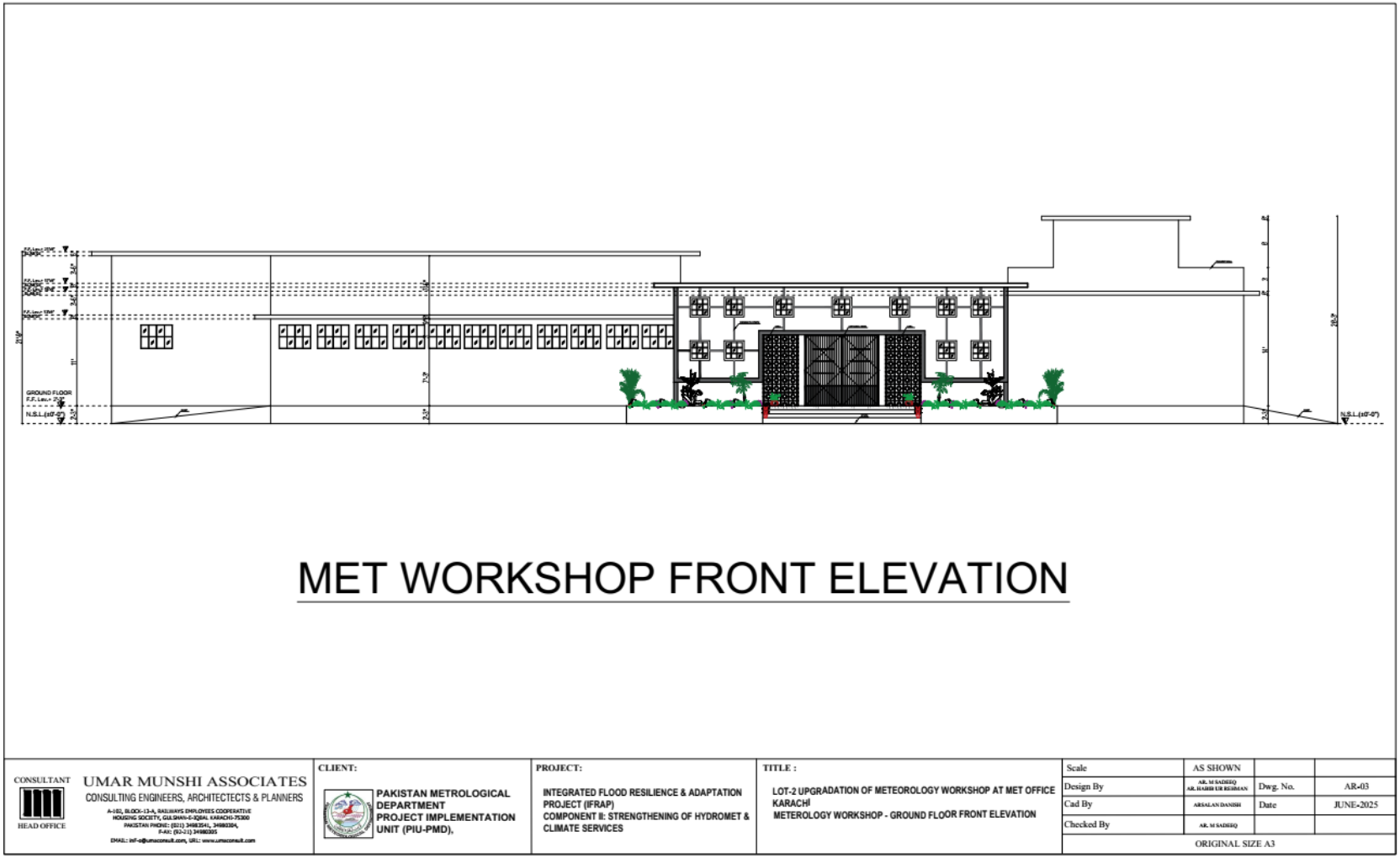
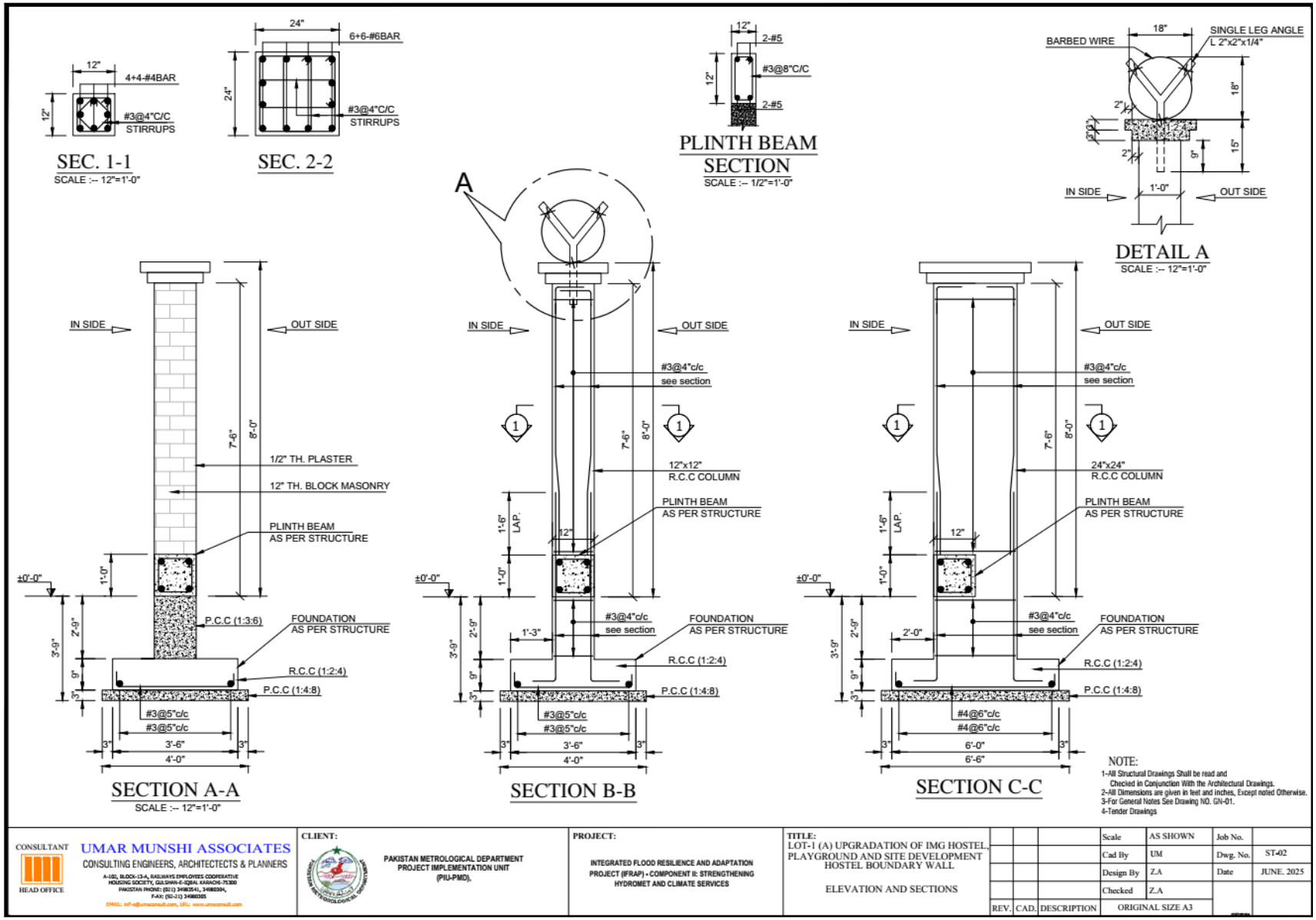
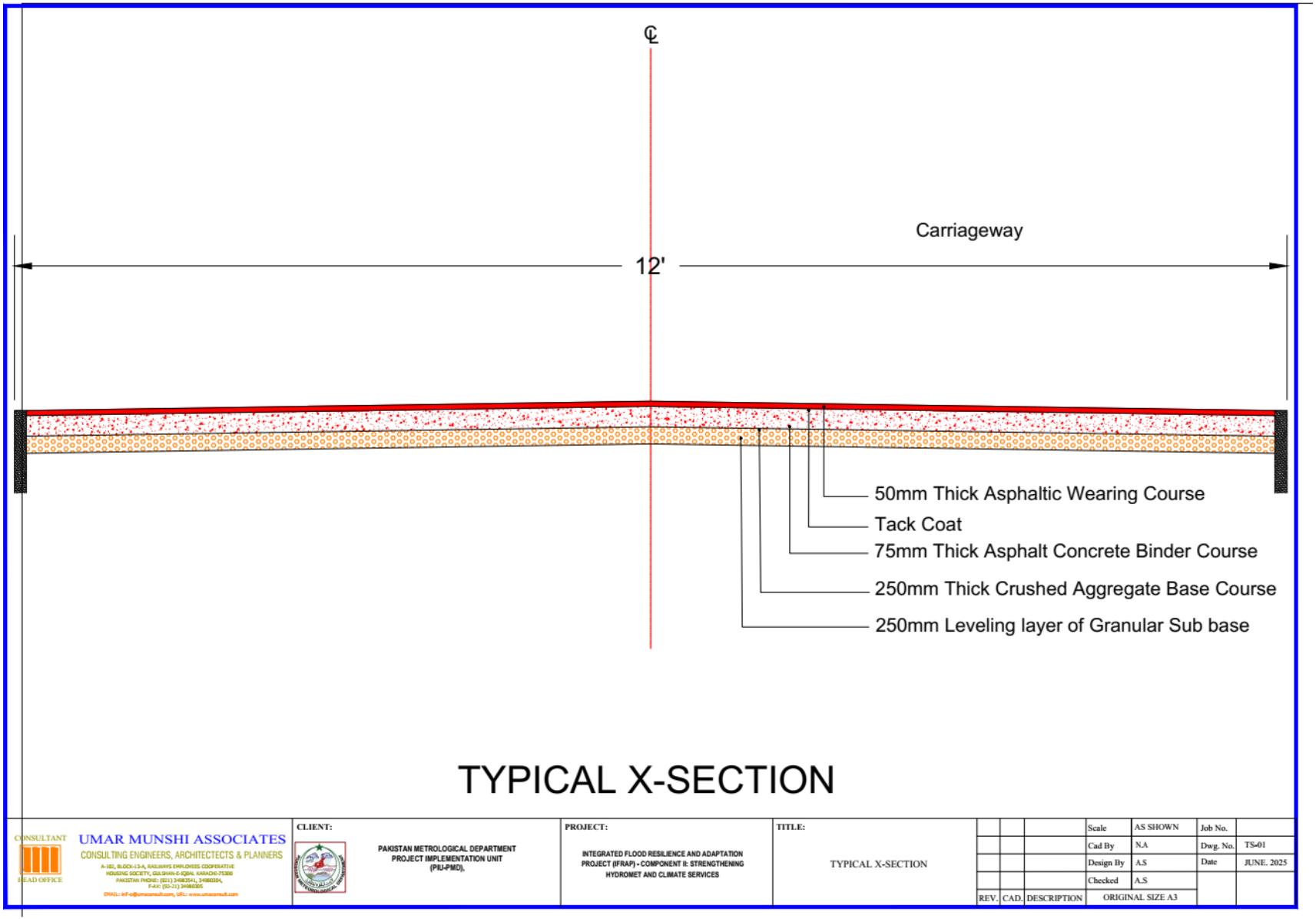
BATH
5'-0"X8'-0"
STORE
5'-0"X8'-0"
DRY. KIT
6'-7½" WIDE
KITCHEN
13'-0"X15'-0"
DINING HALL
21'-6"X25'-0"
DRESS
6'-7½" WIDE
CORRIDOR 8'-0"
ENTRANCE
13'-0"X18'-3"
T.V LOUNGE
27'-6"X20'-0"
STEP UP
SCALE
CONSULTANT
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
HEAD OFFICE
CLIENT:
PAKISTAN METROLOGICAL DEPARTMENT
PROJECT IMPLEMENTATION UNIT (PIU-PMD),
PROJECT:
INTEGRATED FLOOD RESILIENCE & ADAPTATION PROJECT (IFRAP)
COMPONENT II: STRENGTHENING OF HYDROMET & CLIMATE SERVICES
TITLE :
LOT-1 UPGRADATION OF INSTITUTE OF METEOROLOGY AND GEOPHYSICS(IMG) AT MET OFFICE KARACHI
B. UPGRADATION OF IMG HOSTEL, PLAYGROUND AND DEVELOPMENT.
IMG – FOREIGN FACULTY BLOCK FURNITURE LAYOUT PLAN - GROUND FLOOR
Scale
AS SHOWN
Design By
Cad By
ARSALAN DANISH
Checked By
Dwg. No.
AR-04
Date
JUNE-2025
ORIGINAL SIZE A3

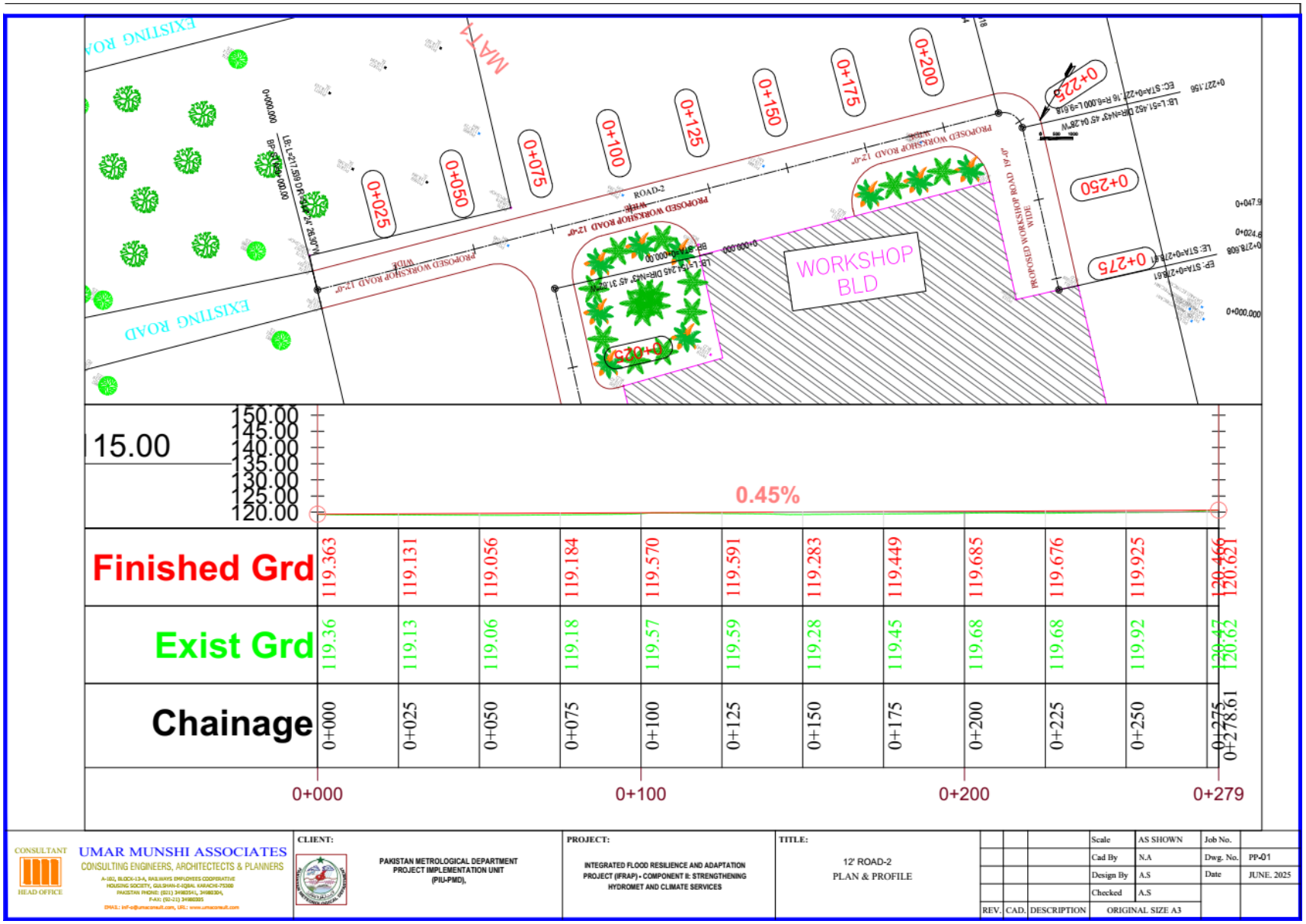


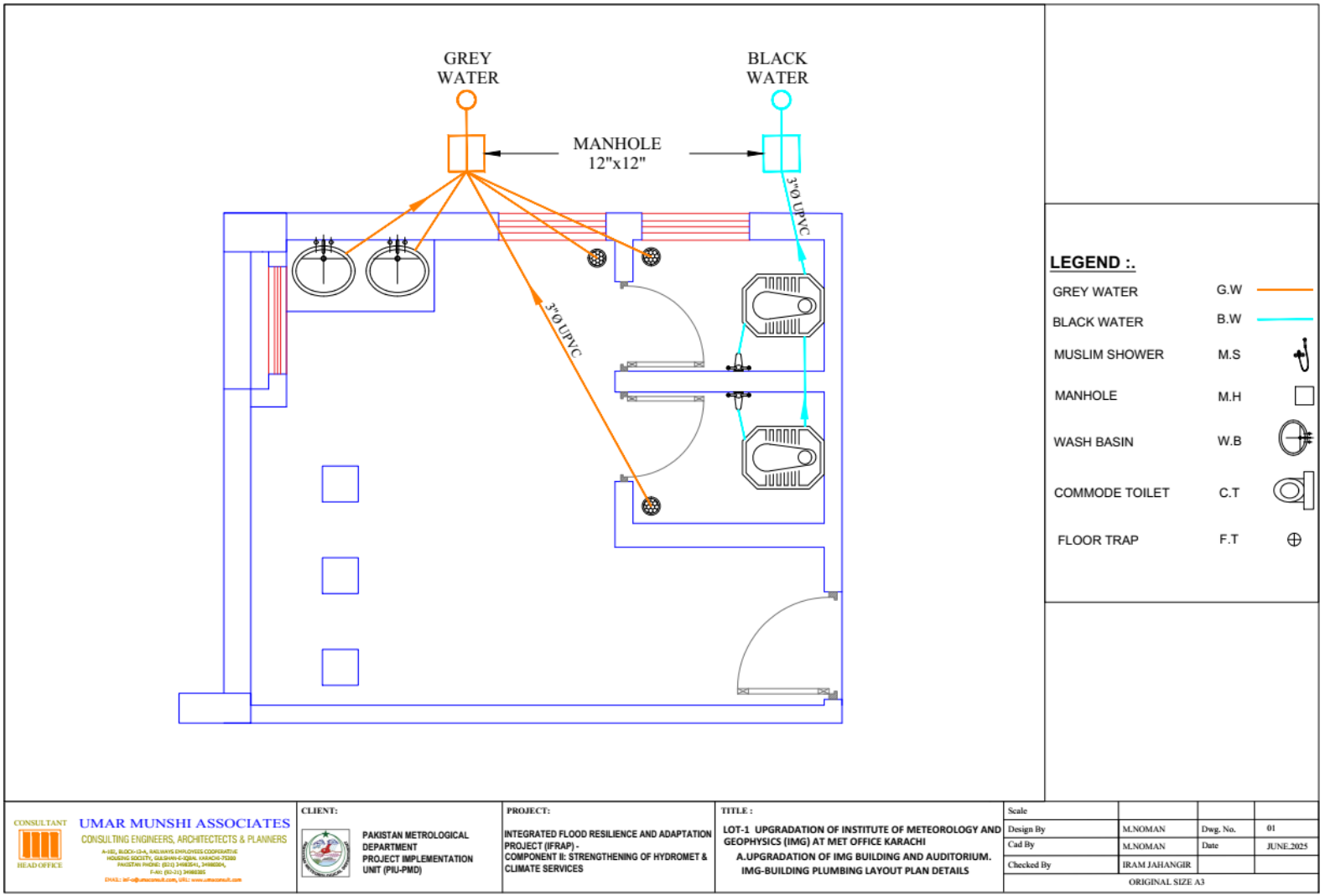
MET WORKSHOP FRONT ELEVATION

CONSULTANT HEAD OFFICE UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS	CLIENT: PAKISTAN METROLOGICAL DEPARTMENT PROJECT IMPLEMENTATION UNIT (PIU-PMD),	PROJECT: INTEGRATED FLOOD RESILIENCE & ADAPTATION PROJECT (IFRAP) COMPONENT II: STRENGTHENING OF HYDROMET & CLIMATE SERVICES	TITLE : LOT-2 UPGRADATION OF METEOROLOGY WORKSHOP AT MET OFFICE KARACHI METEROLOGY WORKSHOP - GROUND FLOOR FRONT ELEVATION	Scale	AS SHOWN		
				Design By	AR. M SADEEQ AR. HABIB UR REHMAN	Dwg. No.	AR-03
				Cad By	ARSALAN DANISH	Date	JUNE-2025
				Checked By	AR. M SADEEQ		
				ORIGINAL SIZE A3			


12"
4+4-#4BAR
12"
#3@4"C/C
STIRRUPS
SEC. 1-1
SCALE :– 12"=1'-0"
24"
6+6-#6BAR
24"
#3@4"C/C
STIRRUPS
SEC. 2-2
12"
2-#5
12"
#3@8"C/C
2-#5
PLINTH BEAM
SECTION
SCALE :– 1/2"=1'-0"
BARBED WIRE
18"
SINGLE LEG ANGLE
L 2"x2"x1/4"
2"
18"
9"
2"
9"
15"
IN SIDE
1'-0"
OUT SIDE
DETAIL A
SCALE :– 12"=1'-0"
A
IN SIDE
OUT SIDE
7'-6"
8'-0"
1/2" TH. PLASTER
12" TH. BLOCK MASONRY
PLINTH BEAM
AS PER STRUCTURE
±0'-0"
1'-0"
2'-9"
3'-9"
9"
3"
P.C.C (1:3:6)
FOUNDATION
AS PER STRUCTURE
R.C.C (1:2:4)
P.C.C (1:4:8)
#3@5"c/c
#3@5"c/c
3"
3'-6"
3"
4'-0"
SECTION A-A
SCALE :– 12"=1'-0"
IN SIDE
OUT SIDE
#3@4"c/c
see section
1
1
7'-6"
8'-0"
12"x12"
R.C.C COLUMN
PLINTH BEAM
AS PER STRUCTURE
1'-6"
LAP.
12"
±0'-0"
1'-0"
2'-9"
3'-9"
9"
3"
#3@4"c/c
see section
1'-3"
FOUNDATION
AS PER STRUCTURE
R.C.C (1:2:4)
P.C.C (1:4:8)
#3@5"c/c
#3@5"c/c
3"
3'-6"
3"
4'-0"
SECTION B-B
IN SIDE
OUT SIDE
#3@4"c/c
see section
1
1
7'-6"
8'-0"
24"x24"
R.C.C COLUMN
PLINTH BEAM
AS PER STRUCTURE
1'-6"
LAP.
12"
±0'-0"
1'-0"
2'-9"
3'-9"
9"
3"
#3@4"c/c
see section
2'-0"
FOUNDATION
AS PER STRUCTURE
R.C.C (1:2:4)
P.C.C (1:4:8)
#4@6"c/c
#4@6"c/c
3"
6'-0"
3"
6'-6"
SECTION C-C
NOTE:
1-All Structural Drawings Shall be read and
Checked in Conjunction With the Architectural Drawings.
2-All Dimensions are given in feet and inches, Except noted Otherwise.
3-For General Notes See Drawing NO. GN-01.
4-Tender Drawings
CONSULTANT
HEAD OFFICE
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-IQBAL KARACHI-75300
PAKISTAN PHONE: (92-21) 34980341, 34980309,
FAX: (92-21) 34980305
EMAIL: imf-o@umaconsult.com, URL: www.umaconsult.com
CLIENT:
PAKISTAN METROLOGICAL DEPARTMENT
PROJECT IMPLEMENTATION UNIT
(PIU-PMD).
PROJECT:
INTEGRATED FLOOD RESILIENCE AND ADAPTATION
PROJECT (IFRAP) - COMPONENT II: STRENGTHENING
HYDROMET AND CLIMATE SERVICES
TITLE:
LOT-1 (A) UPGRADATION OF IMG HOSTEL,
PLAYGROUND AND SITE DEVELOPMENT
HOSTEL BOUNDARY WALL
ELEVATION AND SECTIONS
REV.
CAD.
DESCRIPTION
Scale
AS SHOWN
Job No.
Cad By
UM
Dwg. No.
ST-02
Design By
Z.A
Date
JUNE. 2025
Checked
Z.A
ORIGINAL SIZE A3


℄
Carriageway
12'
50mm Thick Asphaltic Wearing Course
Tack Coat
75mm Thick Asphalt Concrete Binder Course
250mm Thick Crushed Aggregate Base Course
250mm Leveling layer of Granular Sub base
TYPICAL X-SECTION
CONSULTANT
HEAD OFFICE
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
CLIENT:
PAKISTAN METROLOGICAL DEPARTMENT
PROJECT IMPLEMENTATION UNIT
(PIU-PMD),
PROJECT:
INTEGRATED FLOOD RESILIENCE AND ADAPTATION
PROJECT (IFRAP) - COMPONENT II: STRENGTHENING
HYDROMET AND CLIMATE SERVICES
TITLE:
TYPICAL X-SECTION
REV.
CAD.
DESCRIPTION
Scale
AS SHOWN
Job No.
Cad By
N.A
Dwg. No.
TS-01
Design By
A.S
Date
JUNE. 2025
Checked
A.S
ORIGINAL SIZE A3


EXISTING ROAD
MATA
0+000
0+025
0+050
0+075
0+100
0+125
0+150
0+175
0+200
0+225
0+250
0+275
ROAD-2
PROPOSED WORKSHOP ROAD 12'-0" WIDE
PROPOSED WORKSHOP ROAD 18'-0" WIDE
WORKSHOP BLD
15.00
150.00
145.00
140.00
135.00
130.00
125.00
120.00
0.45%
Finished Grd
119.363 119.131 119.056 119.184 119.570 119.591 119.283 119.449 119.685 119.676 119.925 120.466 120.621
Exist Grd
119.36 119.13 119.06 119.18 119.57 119.59 119.28 119.45 119.68 119.68 119.92 120.47 120.62
Chainage
0+000 0+025 0+050 0+075 0+100 0+125 0+150 0+175 0+200 0+225 0+250 0+275 0+278.61
0+000
0+100
0+200
0+279
CONSULTANT
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
HEAD OFFICE
CLIENT:
PAKISTAN METROLOGICAL DEPARTMENT
PROJECT IMPLEMENTATION UNIT
(PIU-PMD),
PROJECT:
INTEGRATED FLOOD RESILIENCE AND ADAPTATION PROJECT (IFRAP) - COMPONENT II: STRENGTHENING HYDROMET AND CLIMATE SERVICES
TITLE:
12' ROAD-2
PLAN & PROFILE
Scale AS SHOWN
Cad By N.A
Design By A.S
Checked A.S
Job No.
Dwg. No. PP-01
Date JUNE. 2025
REV. CAD. DESCRIPTION
ORIGINAL SIZE A3


GREY WATER
BLACK WATER
MANHOLE 12"x12"
3"Ø UPVC
3"Ø UPVC
LEGEND :.
GREY WATER G.W
BLACK WATER B.W
MUSLIM SHOWER M.S
MANHOLE M.H
WASH BASIN W.B
COMMODE TOILET C.T
FLOOR TRAP F.T
CONSULTANT
HEAD OFFICE
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTECTS & PLANNERS
CLIENT:
PAKISTAN METROLOGICAL DEPARTMENT
PROJECT IMPLEMENTATION UNIT (PIU-PMD)
PROJECT:
INTEGRATED FLOOD RESILIENCE AND ADAPTATION PROJECT (IFRAP) -
COMPONENT II: STRENGTHENING OF HYDROMET & CLIMATE SERVICES
TITLE :
LOT-1 UPGRADATION OF INSTITUTE OF METEOROLOGY AND GEOPHYSICS (IMG) AT MET OFFICE KARACHI
A.UPGRADATION OF IMG BUILDING AND AUDITORIUM.
IMG-BUILDING PLUMBING LAYOUT PLAN DETAILS
Scale
Design By M.NOMAN Dwg. No. 01
Cad By M.NOMAN Date JUNE.2025
Checked By IRAM JAHANGIR
ORIGINAL SIZE A3

ANNEXURE - II: Attendance Sheet for Public Consultation

ATTENDANCE SHEET حاضری شیٹ

Sr. No.	Name of the participant شرکت کرنے والے کا نام	Fathers' Name والد کا نام	Profession پیشہ	Contact # OR CNIC # رابطہ نمبر یا کمپیوٹرائزڈ قومی شناختی کارڈ نمبر	Signature/ Thumbmark دستخط/ انگوٹھے کا نشان
01	Baban Massi UC- Charan	Khodi Massi	Notable UC. Charan	0317 2239493	
02	Khodi Massi	Dolat Khan	Notable Business	0336 9229897	
03	M. Ismail	Haleem	Private Job	03482849002	
04	Abdul Jabbar	M. Yaqoob	Shop	0300-2710785	
05	Abdul Noor Khan	Sher Nawaz Khan	Business	0300 2407349	
06	Aman Gul	Rishatullah Khan	Estate property	0300-2122407	
07	M. Shareef	M. Moosa	Driver	0315-2545660	
08	Taj Nabi	Sultan	Labor	0347-9756698	

Sr. No.	Name of the participant شرکت کرنے والے کا نام	Fathers' Name والد کا نام	Profession پیشہ	Contact # OR CNIC # رابطہ نمبر یا کمپیوٹرائزڈ قومی شناختی کارڈ نمبر	Signature/ Thumbmark دستخط/ انگوٹھے کا نشان
09	Raza Jawati	Wahid Jamali	Business	0336 0340252	
10	Aamir	Ghulam Nabi	Business	03003622665	
11	Raja Joyo	Rahem Bux	Clerk	0333-7078515	
12	Abdul Samad	Sabir Ali	Student	0335 7495302	
13	Agha Farhan	Saleem Javed	Student	0340 6886696	
14	Ahmed Soomro	Imtiaz Soomro	Business	0333 3397160	
15	Osama	Sarfaraz Pathan	Business	0321 2179251	
16	Leaf Bluetto	A.J Motti	Public Serv.	0301-7003671	

ANNEXURE - III: Written Particulars of Employment

1. Name of Employer
……

2. Name of Employee
……
3. Date Employment began
……
4. Wage and Method of Calculation
……
5. Interval at which wages are paid
……
6. Normal Hours of work
……
7. Short description of employee's work
……
8. Probation Period
……
9. Annual Holiday Entitlement
……
10. Paid Public Holiday
……
11. Payment during sickness
……
12. Maternity Leave (if employee female)
……
13. Nursing Break Entitlement (for female employee)
……
14. Notice employee entitled to receive
……
15. Notice employer required to give
……
16. Any other matter either party wishes to include
……

Notes:

(a) An employee is free to join a trade union or staff association, which is recognized by the undertaking. The address of the Trade Union or Staff Association is:

(b) The grievance procedure and disciplinary procedure in this undertaking requires to be followed when a grievance arises or disciplinary action needs to be taken.

(c) When any heading is inapplicable, enter NIL.

……

Employer's signature	Witness
……	……
Employee's signature	Witness
……..	……
Date	Date

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ANNEXURE - IV: Environmental Code of Practices (EPCs)

The ECPs aims to mitigate potential construction-related impacts throughout the project implementation. These guidelines offer best practices and environmental management protocols for contractors to ensure sustainable environmental management. The ECPs will be integrated into the general conditions of all contracts, including subcontracts, associated with the project. Below is the list of ECPs prepared for the project.

- ECP 1: Waste Management
- ECP 2: Fuels and Hazardous Goods Management
- ECP 3: Water Resources Management
- ECP 4: Drainage Management
- ECP 5: Soil Quality Management
- ECP 6: Erosion and Sediment Control
- ECP 7: Topsoil Management
- ECP 8: Topography and Landscaping
- ECP 9: Quarry Areas Development and Operation
- ECP 10: Air Quality Management
- ECP 11: Noise and Vibration Management
- ECP 12: Protection of Flora
- ECP 13: Protection of Fauna
- ECP 14: Protection of Fish (if any)
- ECP 15: Road Transport and Road Traffic Management
- ECP 16: Labour Influx Management and Construction Camp Management
- ECP 17: Cultural and Religious Issues
- ECP 18: Workers Health and Safety

ECP 1: Waste Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall • Develop a waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris and food waste.) prior to commencing of construction and submit to CSC for approval. • Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of the disposal site, so as to cause less environmental impact. • Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. • Segregate and reuse or recycle all the waste, wherever practical. • Prohibit burning of solid waste • Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route • Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. • Request suppliers to minimize packaging where practicable. • Place a high emphasis on good housekeeping practices.

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		• Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.

ECP 2: Fuels and Hazardous Goods Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels and hazardous goods.	Materials used in construction have the potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.	The Contractor shall • Prepare spill control procedures and submit the plan for CSC approval. • Train the relevant construction personnel in the handling offuels and spill control procedures. • Store dangerous goods in bunded areas on a top of a sealedplastic sheet away from watercourses; and also, under rainwater shed (to prevent contact with rainwater). • Refueling shall occur only within bunded areas. • Make available MSDS for chemicals and dangerous goods on-site. • Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by KPEPA or sold to KPEPA registered vendors. • Provide absorbent and containment material (e.g., absorbent matting) where hazardous material is used and stored, and personnel trained in the correct use. • Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. • Make sure all containers, drums, and tanks that are used forstorage are in good condition and are labeled with the expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. • Put containers and drums in temporary storage in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. • Put containers and drums in permanent storage areas on animpermeable floor that slopes to a safe collection area in the event of a spill or leak. • Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution..

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ECP 3: Water Resources Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	The Contractor shall • Follow the management guidelines proposed in ECPs 1 and2. • Minimize the generation of sediment, oil and grease, excessnutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, stormwater systemsor underground water tables
Discharge from construction sites	Wastewaters from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of stormwater.	The Contractor shall • Minimize the amount of exposed soil at any one time (onlyclear vegetation immediately before construction is about to begin) • Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and aroundstorage areas for construction materials • Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from the site • Divert runoff from undisturbed areas around the construction site • Stockpile materials away from drainage lines. • Prevent all solid entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting and transport to an approved waste disposal site or recycling depot • Collect, transport and discharge the septic tank waste from the construction camps in the nearby municipal wastewatertreatment plants • Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This shall be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall • Ensure that sealed roads used by construction vehicles are swept regularly to remove sediment. Water the material stockpiles, access roads and bare soils on an as-required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g., high winds)

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ECP 4: Drainage Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earthworks, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms the environment in terms of water and soil contamination, and mosquito growth.	The Contractor shall • Prepare a program for preventing/avoid standing waters, which CSC will verify in advance and confirm during implementation • Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line • Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there • Rehabilitate road drainage structures immediately if damaged by contractors' road transports. • Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by SEQS, before it being discharged into the recipient water bodies. • Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate has stormwater drainage to accommodate high runoff during a downpour and that there is no stagnant water in the area at the end of the downpour.
		• Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. • Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion • Protect natural slopes of drainage channels to ensure adequate stormwater drains. • Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. • Reduce infiltration of contaminated drainage through stormwater management design
Ponding of water	Health hazards due to mosquito breeding	• Do not allow ponding of water especially near the waste storage areas and construction camps • Discard all the storage containers that are capable of storing water, after use or store them in the inverted position

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ECP 5: Soil Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall • Strictly manage the wastes management plans proposed in ECP1 and storage of materials in ECP2 • Construct appropriate spill contaminant facilities for all fuel storage areas • Establish and maintain a hazardous material register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results
Construction material stockpiles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

ECP 6: Erosion and Sediment Control

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities and material stockpiles	The impact of soil erosion is (i) Increased runoff and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullying.	The Contractor shall • Locate stockpiles away from drainage lines • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds • Remove debris from drainage paths and sediment control structures • Cover the loose sediments and water them if required • Divert natural runoff around construction areas prior to any site disturbance • Install protective measures on-site prior to construction, for example, sediment traps • Observe the performance of drainage structures and erosion controls during rain and modify them as required.

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ECP 7: Topsoil Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earthworks	Earthworks will impact the fertile topsoil that is enriched with nutrients required for plant growth or agricultural development.	• The Contractor shall • Strip the topsoil to a depth of 15 cm and store in stockpilesof height not exceeding 2m. • Remove unwanted materials from topsoil like grass, roots of trees and similar others. • The stockpiles will be carried out in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. • Locate topsoil stockpiles in areas outside drainage lines andprotect them from erosion. • Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. • Spread the topsoil to maintain the physio-chemical and biological activity of the soil. The stored topsoil will be utilized for covering all disturbed areas and along with the proposed plantation sites • Before the re-spreading of topsoil, the ground surface will be ripped to assist in the bunding of the soil layers, water penetration, and revegetation
Transport	Vehicular movement outside right of way of existing roads or temporary access roads will affect the soil fertility of the agricultural lands	• Limit equipment and vehicular movements within the approved construction zone • Construct temporary access tracks to cross concentratedwater flow lines at right angles • Plan construction access to make use, if possible, of the finalroad alignment • Use vehicle-cleaning devices, for example, ramps or wash-down areas

ECP 8: Topography and Landscaping

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earthworks	Construction activities especially earthworks will change topography and disturb the natural rainwater/floodwater drainage as well as will change the local landscape.	The Contractor shall • Ensure the topography of the final surface of all raised lands(construction yards, approach roads and access roads.) are conducive to enhance natural draining of rainwater/flood water; • Keep the final or finished surface of all the raised lands free from any kind of depression that insists waterlogging. • Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography. • Cover immediately the uncovered open surface that has nouse for construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping.

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ECP 9: Quarry and Borrow Areas Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of Quarry and borrow areas. The project will use approved quarry sites available near the project site. This ECP will be used only when a new quarry or borrow area is to be developed.	Quarry areas will have impacts on local topography, landscaping and natural drainage.	The Contractor shall • Use only quarry and borrow sites that are licensed by the provincial government and approved by the project management unit/Implementation Consultants • Identify new borrow and quarry areas in consultation with Project Director, if required. • Reuse excavated or disposed of material available in the project to the maximum extent possible. • Store topsoil for reinstatement and landscaping. • Develop surface water collection and drainage systems, anti-erosion measures (berms and re-vegetation.) and retaining walls and gabions where required. Implement mitigation measures in ECP 3: Water Resources Management, ECP 6: Erosion and Sediment Control • The use of explosives will be used in as much minimum quantity as possible to reduce noise, vibration and dust. • Control dust and air quality deterioration by application of watering and implementing mitigation measures proposed in ECP 10: Air Quality Management • Noise and vibration control by ECP 11: Noise and Vibration Management. • In compliance to KP Bonded Labor System (Abolition) Act, 1995 and The Khyber Pakhtunkhwa Prohibition of Employment of Children Act, 2015, use of all forms of forced labor and child labors for quarry sites shall strictly be prevented.

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ECP 10: Air Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall • Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Operate the vehicles in a fuel-efficient manner • Cover haul vehicles carrying dusty materials moving outsidethe construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Water construction materials prior to loading and transport • Service all vehicles regularly to minimize emissions • Limit the idling time of vehicles to not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and the combustion of fuels.	The Contractor shall • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize contaminant emissions. Proof of maintenance register shall be required by the equipment suppliers and contractors/subcontractors • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g., visible smoke) willbe banned from construction sites • Service all equipment regularly to minimize emissions • Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations
Construction activities	Dust generation from construction sites, material stockpiles and access roads are a nuisance in the environment and can bea health hazard.	• Water the material stockpiles, access roads and bare soils on an as-required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g., high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted • Minimize the extent and period of exposure of the bare surfaces Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary, to avoid periods of high wind and if visible dust is blowing off-site • Store the cement in silos and minimize the emissions from silos by equipping them with filters. • Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Crushing of rocky and aggregate materials shall be wet- crushed or performed with particle emission controlsystems

ECP 11: Noise and Vibration Management

roject Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall • Maintain all vehicles in order to keep them in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning the maximum speed limit and driving hours. • Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noiseon the worksite
Construction machinery	Noise and vibration may have an impact on people, property, fauna,livestock and the natural environment.	The Contractor shall • Appropriately site all noise-generating activities to avoidnoise pollution for local residents. • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, the lining of truck trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of the maintenance register of their equipment. • Install acoustic enclosures around generators to reducenoise levels. • Fit high-efficiency mufflers to appropriate construction equipment • Avoid the unnecessary use of alarms, horns and sirens
Construction activity	Noise and vibration mayhave an impact on people, property, fauna,livestock and the naturalenvironment.	The Contractor shall • Notify adjacent landholders prior to any typical noise eventsoutside of daylight hours (6 pm to 7 am) if the construction works are being carried out near residential areas • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ the best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Notify affected people if major noisy activities are undertaken, e.g., pile driving • Plan activities on-site and deliveries to and from site to minimize the impact • Monitor and analyze noise and vibration results and adjustconstruction practices as required.

roject Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		Avoid undertaking the noisiest activities, where possible, when working at night (6 pm to 7 am) near the residential areas.

ECP 12: Protection of Flora

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora is important to provide shelters for the birds, offer fruits and/or timber/firewood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has a wide range of adverse environmental impacts.	The Contractor shall • Reduce disturbance to surrounding vegetation • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Get approval from the supervision consultant for the clearance of vegetation. • Make selective and careful pruning of trees where possible to reduce the need for tree removal. • Control noxious weeds by disposing of them at a designated dump site or burn on site. • Plant only native species that are approved by the local forest department (to confirm that they are not invasive) for plantation in the construction yards and project sites. • Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads. • Before excavation, mark the trees that must remain on the site and cannot be removed. • Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from.

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Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Avoid work within the dripline of trees to prevent damage to the tree roots and compacting the soil. • Minimize the length of time the ground is exposed, or excavation left open by clearing and re-vegetate the area atthe earliest practically possible. • Ensure excavation works occur progressively and re-vegetation is done at the earliest • Provide adequate knowledge to the workers regarding nature protection and the need to avoid felling trees duringconstruction Supply appropriate fuel in the work caps to prevent fuelwood collection

ECP 13: Protection of Fauna

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breedingof animals	The Contractor shall • Restrict the tree removal to the minimum required. • Retain tree hollows on-site, or relocate hollows, whereappropriate • Leave dead trees where possible as habitat for fauna • Identify the trees that require specific attention (e.g., the hollow-bearing trees) and fall them in a manner that reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated orrendered assistance if injured. After felling, hollow-bearingtrees will remain unmoved overnight to allow animals to move of their own volition.
Construction camps	Illegal poaching	• Provide adequate knowledge to the workers regarding the protection of flora and fauna, and relevant government regulations and punishments for illegal poaching. • The contractor's code of conduct shall include on the protection of flora and fauna, and a ban on tree cutting and hunting of animals. Employees found violating would be subject to strict actions including fines and termination of employment.

ECP 14: Protection of Fish

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal ofwastes into the river	The Contractor shall • Prepare procedures for the protection of fish and submit them for supervision consultant approval. • Ensure the construction equipment used in the river are well maintained and does not have oil leakage to contaminate river water. • Contain oil immediately on the river in case of accidental spillage from equipment; make an emergency oil spill containment plan (under the Fuels and Hazardous Substances Management Plan) to be supported with enough equipment, materials and human resources. • Do not dump wastes, be they hazardous or non-hazardousinto the nearby water bodies or in the river.

ECP 15: Road Transport and Road Traffic Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of the road by construction vehicles will affect the movement of normal road traffics and the safety of the road-users.	The Contractor shall • Prepare and submit a traffic management plan to the CSC for their approval before the commencement of construction. • Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs/lights, and road signs. • Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Pakistan TrafficRegulations. • Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in the local language: • Location: chainage and village name • Duration of the construction period • Period of proposed detour / alternative route • Suggested detour route map • Name and contact address/telephone number of the concerned personnel • Name and contact address/telephone number of theContractor • Inconvenience is sincerely regretted.
	Accidents and spillage offuels and chemicals	• Restrict truck deliveries, where practicable, to daytimeworking hours (7 am to 6 pm). • Restrict the transport of oversize loads. • Operate road traffics/transport vehicles, if possible, duringnon-peak periods to minimize traffic disruptions. • Enforce on-site speed limit

ECP 16: Labor Influx Management and Construction Camp Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall • Prepare a management plan for construction of workers camp in accordance with IFC Guidance on Workers Accommodation and submit the plan for supervision consultant's approval. • Locate the construction camps within the designed sites or at areas that are acceptable from the environmental, cultural or social point of view; and approved by the supervision consultant. • Consider the location of construction camps away from communities in order to avoid social conflict in using natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the supervision consultant for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. • Local authorities responsible for health, religion and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The contractor shall provide the following facilities in the campsites • Adequate accommodation, transportation, and basic services including water, sanitation, and medical care for the workers working on that project Safe and reliable water supply, which will meet SEQS. Drinking water to be chlorinated at the source and ensure the presence of residual chlorine 0.1 ~ 0.25 ppm as a minimum after 30 minutes of chlorine contact time (WHO guideline). • Hygienic sanitary facilities and sewerage systems. The toilets and domestic wastewater will be collected through common sewerage. Provide separate latrines and bathing places for males and females with total isolation by location. The minimum number of toilet facilities required is one toilet for every ten persons. • Treatment facilities for sewerage of toilets and domestic wastes. • Stormwater drainage facilities. • Paved internal roads. • Provide child crèches for women working on construction sites. The crèche will have facilities for a dormitory, kitchen, and indoor and outdoor play area. Schools will be attached to these crèches so that children are not deprived of education whose

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		mothers are construction workers. • Provide in-house community/common entertainment • facilities. Dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible.
Workers Accommodation	All workers in the camp will have adequate accommodation facilities	The Contractor shall provide the following: • The labor will be provided with accommodation on twin sharing basis made of insulating material and locally available building material.; • The migrant workers with families shall be provided with individual accommodation comprising a bedroom, sanitary and cooking facilities; • The units will be supported by common latrines and bathing facilities duly segregated for male and female labor; • An adequate number of toilets shall be provided in the accommodation facilities. A minimum of 1 unit for 15 males and 1 unit for 10 females shall be provided; • The contractor shall provide a kitchen facility for the construction workers and the food will be of appropriate nutritional value and will consider religious/cultural backgrounds; • All doors and windows shall be lockable and mobile partitions/curtains shall be provided for privacy; • Facilities for the storage of personal belongings for workers shall be provided within the campsite only; • Dustbins shall be provided for collection of garbage and will be removed on a daily basis; • It is also required to provide first aid boxes in adequate numbers; and • Ventilation will be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor shall • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at the household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on a daily basis to waste collectors. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed. • Dispose of organic wastes in a designated safe place on a daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, and rats are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to the decomposition of wastes. Cover the bed of the pit

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		with an impervious layer of materials (clayey or thin concrete) to protect groundwater from contamination. • Locate the garbage pit/waste disposal site min 500 m away from the residence so that people are not disturbed by the odor likely to be produced from the anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place with fencing and tree plantation to prevent children from entering and playing with it. Do not establish site-specific landfill sites. All solid waste will be collected and removed from the work camps and treated by composting.
Fuel supplies for cooking purposes	Illegal sourcing of fuelwood by construction workers will impact the natural flora and fauna	The Contractor shall • Provide fuel to the construction camps for their domestic purpose, in order to discourage them from using fuelwood or any other biomass. • Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them from using biomass for cooking. Conduct awareness campaigns to educate workers on preserving the protecting biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	The Contractor shall • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint full-time designated first aider or nurse. • Provide ambulance facilities for the laborer's during an emergency to be transported to the nearest hospitals. • Initial health screening of the laborer coming from outside areas • Inspect all camp facilities regularly to ensure ○ Daily sweeping of rooms and houses shall be undertaken; ○ Regular cleaning of sanitary facilities shall be undertaken; ○ The kitchen and canteen premises shall be established under good hygiene conditions; ○ Daily mealtimes shall be fixed for the labor; ○ Smoking and alcohol consumption shall be prohibited in the workplace; ○ Waterlogging shall be prevented at areas near the accommodation facilities and adequate drainage is to be provided; and

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		○ Checklists pertaining to the daily housekeeping schedule shall be maintained and displayed at houses, toilets, and kitchens. • Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work • Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on a regular basis • Complement educational interventions with easy access to condoms at campsites as well as voluntary counselling and testing. • Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellent sprays during monsoon. Carry out short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices.
Safety	Inadequate safety facilities to the construction camps may create security problems and fire hazards	The Contractor shall • Provide appropriate security personnel (police/home guard or private security guards) and enclosures to prevent unauthorized entry into the camp area. • Maintain a register to keep track of the headcount of persons present in the camp at any given time. • Encourage the use of flameproof material for the construction of labor housing/site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding windstorms/cyclones. • Provide the appropriate type of firefighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. Communicate the roles and responsibilities of labourers in case of an emergency in the monthly meetings with contractors.
Site Restoration	Restoration of the construction camps to their original condition requires demolition of construction camps.	The Contractor shall • Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. • Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed

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Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Give prior notice to the labourers before demolishing their camps/units • Reuse the demolition debris to a maximum extent. Dispose of remaining debris at the designated waste disposal site. • Hand over the construction camps with all built facilities as it is if an agreement between both parties (contractor and landowner) has been made so. • Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner. Not make false promises to the labourers for future employment in O&M of the project.

ECP 17: Socio-cultural and Religious Issues

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities near residential areas	Disturbance from construction activities (dust, noise, traffic, conflicts with contractor's workforce.)	The Contractor shall • Establish a system for receiving complaints from the community and address them (the community can also make complaints to the GRM established under the project) • Shall ensure all the construction workers follows the following code of conduct: • All workers are strictly forbidden to establish any kind of relationship with local women and bring any unrelated women to the project site. • All workers will avoid sexual harassment and child abuse. • All workers must not leave the camps or work sites unless written authorization is issued by the respective supervisor • The contractors will advise and prohibit the local population and its authorities or representatives not to enter the project operation areas (campsites and colonies.) in order to minimize the potential risk of incidents related to the operations.
Construction activities near-religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors' lack of knowledge on cultural issues cause social disturbances.	The Contractor shall • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions. • Do not block access to cultural and religious sites, wherever possible
		• Restrict all construction activities within the footprints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) shall there be any mosque/religious/educational institutions close to the construction sites, and users make objections.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Take special care and use appropriate equipment when working next to a cultural/religious institution. • Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by theCSC/PMU. • Provide separate prayer facilities to the construction workers. • Show appropriate behavior with all construction workers especially women and elderly people • Allow the workers to participate in praying during construction time • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process. • Inform the local authorities responsible for health, religion and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters.

ECP 18: Worker Health and Safety

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers willbe exposed to a number of (i) biophysical health risk factors, (e.g., noise, dust, chemicals, construction material, solid waste, wastewater and vector transmitted diseases.), (ii) risk factors	The Contractor shall • Implement suitable safety standards for all workers and sitevisitors which shall not be less than those laid down on the international standards (e.g., International Labor Office guideline on 'Safety and Health in Construction; World BankGroup's 'Environmental Health and Safety Guidelines') andstandards applicable in US/UK/Australia/or any otherdeveloped country can also be used. • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide PPEs for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with damaged ones.
	resulting from human behavior (e.g., STD and HIV.) and (iii)	• Safety procedures include the provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	road accidents from construction traffic.	• Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religion and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters
	Child and pregnant labor	The Contractor shall • not hire children of less than 18 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the National Labor Laws
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	• Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations shall be easily accessible throughout the place of work • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECP 15 • Adequate ventilation facilities • Safe and reliable water supply. • Hygienic sanitary facilities and sewerage systems. The toilets and domestic wastewater will be collected through common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Stormwater drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECP 2 • Solid waste collection and disposal system in accordance with ECP1. • Arrangement for training
		• Paved internal roads. • Security fence at least 2 m in height.

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Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Sickbay and first aid facilities
Water and sanitation facilities at the construction sites	The lack of water sanitation facilities at construction sites causes inconvenience to the construction workers and affects their personal hygiene.	• The contractor shall provide portable toilets at the construction sites if about 25 people are working the wholeday for a month. The location of portable facilities shall be at least 6 m away from the storm drain system and surfacewaters. These portable toilets shall be cleaned once a day and all the sewerage shall be pumped from the collection tank once a day and shall be brought to the common septic tank for further treatment. • The contractor shall provide bottled drinking water facilities to the construction workers at all the construction sites.
Other ECPs	Potential risks to the health and hygiene of construction workers andthe general public	The Contractor shall follow the following ECPs to reduce health risks to the construction workers and the nearby community • ECP 2: Fuels and Hazardous Goods Management • ECP 4: Drainage Management • ECP 10: Air Quality Management • ECP 11: Noise and Vibration Management • ECP 14: Road Transport and Road Traffic Management