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**PUNJAB
MUNICIPAL
DEVELOPMENT FUND
COMPANY**

Environmental and Social Impact Assessment (EIA/ESIA)



**Comprehensive Sewerage
System of Kot Addu City**

EIA/ESIA of Comprehensive Sewerage Scheme of Kot Addu City

Punjab Municipal Development Fund Company (PMDFC)

Subproject: Comprehensive Sewerage System of Kot Addu City

Document Review Form

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ACRONYMS

AHs	Affected Households	NEQs	National Environment Quality Standards
AP	Anaerobic Pond	NOC	No Objection Certificate
APs	Affected Person (s)	OHS	Occupational Health and Safety
BOD	Biological Oxygen Demand	OPs	Operational policies
DPO	Deputy Program Officer	PAPs	Project Affected Persons
CO	Chief Officer	PC-I	Planning Commission Form-I
COD	Chemical Oxygen Demand	PCP	Punjab Cities Program
EHS	Environment Health and Safety	PCRs	Physical Cultural Resources
EIA	Environmental Impact Assessment	PD	Project Director
EPA	Environment Protection Agency	PEPA	Punjab Environment Protection Agency
EPD	Environment Protection Department	PHED	Public Health Engineering Department
ESFPs	Environment and Social Focal persons	PMDFC	Punjab Municipal Development Fund Company
ESM	Environment and Social Management	PPEs	Personal Protective Equipment (s)
ESMMP	Environment and Social Management and Monitoring Plan	PO	Program Officer
FP	Facultative Pond	RoW	Right of Way
GoP	Government of Punjab	RPF	Resettlement Policy Framework
GRC	Grievance Redress Committee	SMP	Social Management Plan
HSE	Health, Safety and Environment	SOPs	Standard Operating procedures
ILO	International Labor Organization	SWM	Solid Waste Management
LG&CDD	Local Government and Community Development Department	TORs	Terms of Reference
MC	Municipal Corporation/Committee	WB	World Bank
MGD	Million Gallons per Day	WWTP	Waste Water Treatment Plant
MLD	Million Gallons per Day		

EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (EIA/ESIA) has been prepared for Comprehensive Sewerage System in Kot Addu City which is being funded by the World Bank through Punjab Cities Program and to be implemented by the Municipal Committee Kot Addu and supervised by consultants appointed by PMDFC.

Project Background

The development objective of the Punjab Cities Program is to strengthen the performance of participating urban local governments in urban management and service delivery. The Program focuses on urban management and improvement of municipal services infrastructure for the following sectors:

- Parks
- Water Supply and Filtration Plants
- Solid Waste Management
- Sewerage and Waste Water Treatment Plants
- Roads and Street Lights

Subproject Overview

Kot Addu located at east of the Indus River at distances of about 100 km from Multan and 16 km from Taunsa Barrage. The entire inhabited areas of Kot Addu district had population of 129,703 persons in the year 2017 that generates wastewater having BOD, COD and TSS exceeding the permissible limit of Punjab Environmental Quality Standards (PEQs) which is discharged directly into the fertile land without any treatment and is substantially the largest source of environmental degradation and pollution. pH, Lead, Manganese, Nickel, Zinc, Total Hardness and Total Dissolved Solids (TDS) at some points are exceeding PEQS in ground water.

In view of that scenario, Government of the Punjab (GoPb) through PMDFC has launched to install wastewater treatment plant as a mandatory requirement of Punjab Environmental Protection Act 2012 and replicated in ESMF for sewerage projects, Kot Addu City under Punjab Cities Program (PCP) which is funded and technically supported by World Bank (WB).

The three sites were considered but rejected due to following reasons.

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Site Visited	Reasons of Rejection
Construction of Waste Water Treatment Plant in Chak No-154/ML Near Judicial Complex Kot Addu (WWTP3)- 11-12-2023	• Rich agricultural fertile land • Cutting of 113 trees • 2x Nearby Mosques • Near Judicial Complex Kot Addu • 20 number of settlements to be relocated /compensated • 07 electric poles to be relocated • 04 Tube-well to be relocated/compensated
Construction of Waste Water Treatment Plant at Chak No-155/ML, Kot Addu (WWTP2)-11-12-2023	• Irrigation Drain passes in 100 m radius • Flood prone area • Highly fertile and rich agriculture area • 02 Mosques but not to be demolished • 02 schools and a Midrassah but not relocated • Tree cutting of 210 trees • Rich fertile land but remains 04 months crop free due to flood
Construction of Waste Water Treatment Plant at Chak No-156/ML Kot Addu (WWTP1)-11-12-2023	• Highly fertile and rich agriculture area in floodplain • Major crops are Wheat, Sugarcane, Potato, Vegetables and Fodder Crops • Disposal station exists here which is bearing the 80% load of wastewater of the city and in working condition • A stormwater drain of irrigation system exists there which is being used to carry wastewater • 03 Mosques exist to be relocated • Kacha/pakka tenants houses and 10 dairy farms (home-based dera) exist there to be relocated/compensated • Estimated 407 large and small trees of Shesham, Backian and Keekar • 4 No. of tube-wells to be relocated/compensated • 15 electric poles • 1 Primary School but may not be relocated • 40 settlements to be relocated/compensated

Punjab Municipal Development Fund Company (PMDFC) has engaged MM Pakistan (Pvt.) Limited to provide consultancy services for the preparation of design while ESIA study of the proposed subproject of Comprehensive Sewerage System in Kot Addu City is prepared by the E&S team of PMDFC.

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The Sub-project has a number of financial, social, economic and environmental benefits (i.e, Protecting Public Health, Environmental Protection, Water Resource Management, Compliance with regulations, Odor and aesthetic control and Resource recovery) including institutional development, rehabilitation and improvement of municipal services, capital investments, better quality of life and employment generation. In addition, a large number of secondary benefits are also likely to accrue in the medium to long term such as institutional reforms at the local level.

Nature, Size and Location of Sub-Project

The proposed sub-project involves rehabilitation and improvement of existing sewerage network, construction of Sullage Carrier, Surface Drain and HDPE Force mains, construction of 1x new disposal station (02 acre) and construction of WWTP in Chak No. 153/ML (30 acre) in Kot Addu. No other project of this nature is being implemented in public as well as private sector because of funding constrains and availability of land.

<i>Scope of Work</i>	Comprehensive Sewerage System in Kot Addu City
Location	Sewerage Network will cover: Muhalla Mariwala, Muhalla Qazi Qaleemullah, and Awan Factory Muhalla, Ansar colony, sabzi mandi town, Ward No. 10, sindhi Basti, Basti Gadion wali, basti mandi maweshian and adjoining areas New Disposal Station: Near City Marriage Hall, Scheme No 5, Zone-1 Kot Addu (02 acre) WWTP Site: Chak Chak No. 153/ML (30 acre)
<i>Sub-project Cost</i>	1212.582 million/- PKR
<i>Total Area</i>	Sewerage Network 10.42 km Disposal Station 2 Acres Surface Drain/Nullah 6.63 km Sullage Carrier 1 km HDPE Force mains 2.74 km WWTP 30 Acres
<i>ESIA implementation cost</i>	7.5 million/-PKR
<i>Sub-project Duration</i>	1.5 year approx.

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<i>Major Work Activities</i>	Comprehensive Sewerage System in Kot Addu City 1. Rehabilitation of Existing Sewerage System (Missing Sewers and replacement of existing lines, Desilting of Sewer lines, manhole covers, disposal stations pumping machinery replacement) 2. Improvement of Sewer Network (10.42 km) 3. Construction of 2x New Disposal Station 4. Construction of Sullage Carrier (3400 Rft) 5. Construction of Surface Drain (21767 Rft) 6. Construction of HDPE Force mains (9000 Rft) 7. Construction of Waste Water Treatment Plant - Inlet Channel and Effluent Drain = 1100 Rft Anaerobic Ponds = 03 Length = 220 Rft Width = 111.5 Rft Depth= 5 Rft Facultative Ponds = 03 Length = 586 Rft Width = 155 Rft Depth= 5 Rft
<i>Executing Agency</i>	MC Kot Addu
<i>Monitoring Agency</i>	Punjab Municipal Development Fund Company (PMDFC)

Sub-project Proponent

MC Kot Addu is the proponent of project and the Chief Executive Officer (CEO) of MC Kot Addu intends to get NOC for the said sub-project as the proponent by submitting the ESIA for the compliance of section 12 of Punjab Environment Protection Act, 2012.

Environmental & Social Baseline¹

Kot Addu located at east of the Indus River at distances of about 100 km from Multan, 80 km from D.G. Khan, 60 km from Muzaffargarh, 60 km from Layyah and 16 km from Taunsa Barrage. The geographical coordinates of the city are: N 30° 28' 34" Latitude and E 70° 57' 52" longitude. The district is composed of five tehsils. Kot Addu is predominantly a rural area. The area around the city is a flat plain and is ideal for agriculture. There are two main canals (Muzaffargarh, and T.P. link). The main languages spoken in Kot Addu are Srariki and Urdu.

The district has extremes of climate. The summer season begins from the month of April and lasts till October while May and June are the hottest months. The maximum and minimum

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temperatures in these months are about 42 and 30 Centigrade respectively. The winter season lasts from the month of November to March. December, January and February are the coldest months. The maximum and minimum temperature during this period is about 20 and 7 Centigrade respectively. The annual rainfall is about 288.8 millimeters. Winds and dust storms are common during the summer season and sometimes they cause much damage.

Air quality analysis shows that parameters like CO, SO₂, SPM and O₃ are within the permissible limits of PEQs at all points. Nitrogen Oxides found exceeded the limits at one points. Particulate Matter (PM₁₀ and PM 2.5) found exceeded the limits of PEQs at all points. To determine the noise quality, sampling was carried out at 5 different commercial points of Kot Addu City showing Noise level at 4 locations is within permissible limits of PEQs.

For water quality analysis, 02 sample was taken from tube well and its results showed that parameters are within PEQS limit. Total coliform also found in two turbines samples. 04 samples were taken from Hand Pumps the analysis showed that nitrites, chromium total Hardness and chlorides are exceeding the PEQS limit. However, T. Coliform bacteria, E. Coli and Fecal Coliform were not detected in all samples collected from handpumps. The E.Coli presence show that there is problem of seepage and this project is the need of the city to resolve the groundwater contamination issues.

Socio economic profile of Kot Addu shows that agriculture is the mainstay of the economy, with a majority of the population engaged in farming and related activities. There are many educational institutes and historical places for tourism. Kot Addu District is a predominantly rural district, 13% of its population lives in urban areas. It covers an area of 3471 km². Kot Addu lies in the Dera Ghazi Khan Division of Punjab province. It has a population of 1.347 million and a literacy rate of 51 percent.¹

Environmental Impact Assessment

Identification of impacts and determining of their significance is one of the main purposes of an ESIA report. Environmental and social impacts of any project are identified considering all phases of the project cycle, including planning and construction. The environmental issues and impacts of a project depend upon the nature of the project activities, and the types and extent of interventions involved. It is not easy to predict the future since every impact has a different and

¹ <https://www.pbs.gov.pk/sites/default/files/population/2017/results/07023.pdf>

multi-dimensional nature, and also because it involves personal and subjective judgment for many attributes.

The specific purpose of this section is to:

- Identify and assess the potential impacts and their severity;
- Explain the ways in which the project might affect the baseline setting;
- Suggest viable mitigation measures for the identified impacts.

Screening of Impacts: The E&S² and IRS³ screening checklist suggested that environmental and social impacts of project are minor to moderate and temporary and can be mitigated and managed with prevailing civil construction measures.

The findings of environmental and social (E&S) safeguards screening checklist depict that:

- ❖ The land is MC owned which has been selected for wastewater treatment plant and disposal station therefore there is no need to acquire land.
- ❖ No settlements to be relocated
- ❖ No damage of agriculture land or standing crops
- ❖ Cutting of 30 small trees and plants will be involved, it is suggested as mitigation measures that compensatory trees will be planted along the buffer zone which has been proposed for WWTP.
- ❖ Sub-project will be of least hindrance in the movement of households of residential units and transport during its construction phase as these project sites are away from residential areas. Anyhow laying of new and replacement of existing sewerage lines may have temporary impacts in the mobility of the local communities.
- ❖ Sub-project will generate loose earth material during excavation, however, it will be reused or disposed of on daily basis.
- ❖ There may be noise generation and exhaust emissions during boring and material transport which will be mitigated by using new and well-tuned machinery by the contractor.
- ❖ Safety issues may arise during movement of construction vehicles which will be mitigated.
- ❖ Excavation may cause accidents particularly for children and elderly. Special attention will be given to remove irrelevant persons away from sub-project site and install barricade and safety/caution sign boards for the safety of local community.

² Environment and Social Screening Checklist

³ Involuntary Resettlement Screening Checklist

- ❖ Mismanagement of construction activities / materials & equipment may impact inhabitants along the sub-project.
- ❖ The sub-project does not fall in any protected area, such as wildlife sanctuary, game reserve, or national park.
- ❖ Smell and odor will be nuisance for the local communities at operation phase of wastewater treatment plant.

E&S impacts during operational phase

During the operational phase, wastewater treatment plants have both environmental and social impacts. Here are some of the key impacts associated with wastewater treatment plants:

Environmental Impacts:

a. **Water Quality:** Wastewater treatment plants play a crucial role in maintaining water quality by treating wastewater before it is discharged into water bodies. The treated effluent can have positive environmental impacts by reducing the pollution load and improving the overall water quality.

b. **Ecosystem Effects:** If not properly designed or operated, wastewater treatment plants can have negative impacts on aquatic ecosystems. For instance, the discharge of inadequately treated effluent can introduce pollutants, such as nutrients and chemicals, into water bodies, potentially leading to eutrophication, oxygen depletion, and harm to aquatic life. In this subproject solar energy system is introduced for energy efficiency and safe use of energy

c. **Energy Consumption and Greenhouse Gas Emissions:** Wastewater treatment plants require energy to operate various treatment processes. The energy sources used can have environmental implications, such as greenhouse gas emissions if fossil fuels are predominantly used. Additionally, the construction and maintenance of treatment plants may contribute to carbon emissions.

d. **Sludge Management:** Wastewater treatment generates sludge, a byproduct that requires PEQs compliance. Sludge can be treated and used beneficially (e.g., as fertilizer or for energy generation), or if mishandled, it can release pollutants and contribute to environmental contamination. If chromium detected in sludge, it is ensured that usage of sludge management will be strictly prohibited.

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Social Impacts:

- a. **Health and Sanitation:** Wastewater treatment plays a crucial role in protecting public health by reducing the risk of waterborne diseases. Properly treated wastewater ensures a safe and clean water supply for communities, reducing the incidence of waterborne illnesses and improving overall sanitation.
- b. **Odor and Visual Impact:** Wastewater treatment plants can sometimes emit unpleasant odors due to the treatment processes and the presence of organic matter. These odors can affect nearby communities and impact their quality of life. Similarly, the visual appearance of treatment plant infrastructure may affect the aesthetics of the surrounding areas.
- c. **Employment and Economic Opportunities:** Wastewater treatment plants create job opportunities for operators, maintenance staff, engineers, and other professionals. These plants also support the local economy through the procurement of goods and services required for their operation and maintenance.
- d. **Community Engagement:** The operation of wastewater treatment plants often involves community engagement and consultation. Communities may have concerns about odor, noise, or potential environmental impacts. Engaging with local stakeholders can help address these concerns, build trust, and ensure the plant's operations align with community needs and expectations.

To mitigate these impacts, wastewater treatment plants employ various technologies, monitoring systems, and management practices to ensure efficient treatment, minimize pollution, and enhance overall environmental and social performance. Regulatory frameworks and compliance measures also play a critical role in ensuring wastewater treatment plants operate in an environmentally sustainable and socially responsible manner.

As per ESMF of PCP, Environment and Social Screening and Involuntary Resettlement Screening Checklists were used to screen the potential environmental and social impacts and to categorize the project which is categorized as E-1, S-2.

E-1 = All those sub-projects having adverse environmental impacts and or those sub-projects that come under Schedule I and II of Pakistan Environment Protection Agency Review of IEE and EIA

Regulations 2000 will need to submit Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA)⁴ report.

S-2= All those sub-projects having negative social impacts of significant nature on 1 – 40 households and or it require displacement/resettlement of 1- 40 households due to land acquisition, a Social Management Plan (SMP) will be prepared and implemented as a part of the ESMP. An Abbreviated Resettlement Action Plan (ARAP) will also be prepared and implemented. (However, the land is MC owned which has been selected for wastewater treatment plant and disposal station therefore there is no need to acquire land).

For sewerage system and new construction of wastewater treatment plant, ESIA is prepared, according to Punjab Environment Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment, Schedule (II)F (3), 2022, i.e., F (3) Combined Wastewater Treatment Plants with treatment capacity greater than 100 m³/hour.

Environmental and Social Mitigation Measures

The specific mitigation measures for each of the anticipated E&S impacts that may emerge at planning, construction and operation phase, have been considered. These mitigation measures are proposed to significantly reduce the identified potential E&S impacts associated with sub-project activities. Proposed mitigation measures include but not limited to the use of PPEs by labor, water spraying for dust control, limiting noise activities during day hours, fencing of construction area, environment quality monitoring during construction & at operation phase and plantation. For handling of odor and smell at operation phase of wastewater treatment plant, floating wetlands are introduced in the facultative ponds for bioremediation which will further reduce the Biochemical Oxygen Demand (BOD) enhance the aesthetic beauty of the overall environmental conditions of the area.

Environment & Social Management & Monitoring Plan

This ESIA report presents the project's site-specific baseline data, identification, assessment and evaluation of project impacts and preparation of environmental and social management and monitoring plan for mitigation of adverse impacts that may arise due to the proposed project interventions.

⁴ All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E1 Category sub-projects will be covered in IEE/EIA report

Stakeholder Consultations

Stakeholder consultations were carried out during preparation of Environmental Management Monitoring Plan (EMMP). Meetings were held with MC Kot Addu Officials (CO, MOI, MOP, Sub-Engineers), nearby industries and local communities where key environmental and social issues were discussed. All the respondents were in favor of improvement of sewerage network and construction of WWTP in the larger interest of the public.

CHAPTER 01

INTRODUCTION

1.1 General

Kot Addu located at east of the Indus River at distances of about 100 km from Multan, 80 km from D.G. Khan, 60 km from Muzaffargarh, 60 km from Layyah and 16 km from Taunsa Barrage and the entire inhabited areas of Kot Addu district had population of 129,859⁵ persons in the year 2017. The city's location near the river has historically influenced its development and significance. The area around the city is a flat plain and is ideal for agriculture. There are two main canals (Muzaffargarh, and T.P. link). Kot Addu's sewerage system is inadequate, sewage and stormwater is being carried through open drains. The sewerage system is drained through four disposal stations which are in poor condition. No gulley grating chambers have been provided. Most of the streets and bazars are flooded with waste water and particularly the area along the railway line is always under waste water stagnation. Wastewater is mostly discharged into the fertile land and some of it is being discharged without any treatment in the Sultan Distributory and is substantially the biggest pollution source. In view of that scenario, Government of the Punjab (GoPb) through the Punjab Municipal Development Fund Company (PMDFC) has launched a subproject under PCP to develop a comprehensive sewerage system in Kot Addu including installation of wastewater treatment plants. The PMDFC itself provided Consultancy Services for the preparation of design of the proposed improvement of sewerage system and construction of Waste Water Treatment Plan (WWTP) while ESIA is developed by the Environmental and Social Management (ESM) team of PMDFC. The Sub-project has a number of financial, social, economic and environmental benefits, including institutional development, rehabilitation and improvement of municipal services, capital investments, better quality of life and employment generation. In addition, a large number of secondary benefits are also likely to accrue in the medium to long term such as institutional reforms at the local level.

1.2 Environment and Social Screening

The current project requires an Environment and Social Impact Assessment (ESIA) Report for its environmental approval under section 12 of the PEPA Act 1997 (amended 2012 & 2017). ESIA is a systematic identification and evaluation of potential impacts of proposed projects, plans,

⁵ <https://www.pbs.gov.pk/sites/default/files/population/2017/results/07002.pdf>

programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the environment followed by mitigation measures in the form of Environmental and Social Management and Monitoring Plan (ESMMP) to ascertain the EPA Punjab requirements.

As per the Environmental and Social Framework (ESMF) of PCP, the sub-projects are categorized in E-1, E-2 and E-3 category and S-1, S-2 and S-3 category based on the magnitude and severity of the environmental and social impacts of the sub-project. This project is categorized as E-1 and S-2.

E-1 = All those sub-projects having adverse environmental impacts and or those sub-projects that come under Schedule I and II of Pakistan Environment Protection Agency Review of IEE and EIA Regulations 2022 will need to submit Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA)⁶ report.

S-2= All those sub-projects having negative social impacts of significant nature on 1 – 40 households and or it require displacement/resettlement of 1- 40 households due to land acquisition, a Social Management Plan (SMP) will be prepared and implemented as a part of the ESMP. An Abbreviated Resettlement Action Plan (ARAP) will also be prepared and implemented.

Environmental & Social Screening Checklist and Involuntary Resettlement Checklists for all major components of the subproject are attached as Annexure A.

1.3 Purpose of the Report

The main purpose of the EIA/ESIA report is:

- To identify the environmental issues pertaining to the operational site
- To evaluate the ability of the site in view of social acceptance and environmental soundness
- To provide the maximum information to the proponent and other stakeholders about the existing environmental conditions and the implications of the operational project
- To collect available data, reports, drawings and other relevant information about area of operational project

⁶ All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E1 Category sub-projects will be covered in IEE/EIA report

- To review the applicable Punjab Environmental Quality Standards (PEQS) attached as Annexure B.
- To propose mitigation measures in order to eliminate or to reduce the negative impacts to an acceptable level
- To develop well-resourced ESMMP including site-specific environmental and social mitigation plan (SSESMP)
- To prepare and submit an EIA/ESIA report to Environmental Protection Agency, Punjab for Environmental Approval.

1.4 Identification of Project and Proponent

1.4.1 Description of the Project:

Kot Addu is located in southern part of Punjab Province. The increased population and socio-economic conditions have exerted immense pressure on city sewerage system. As a result of it, a part of system is outlived and its capacity has decreased due to additional built-up area and with little capacity available in sewer for which it was designed. As a result, sewer chocking causing unhygienic conditions are evident in the city. In addition, existing situation of Kot Addu sewerage system is far below the acceptable standards. During last 30 years, the city has grown considerably but necessary extensions to sewerage system have not been followed.

In view of the above-mentioned issues, a new sewerage system has been proposed for both of the existing MC area and unserved areas. The system will integrate with the current sewerage system to improve overall efficiency. The sewerage network of Kot Addu city is divided into 3 Zones depending upon the topography of the area. The Zone 3 is not included in this subproject as PHED is presently working in this zone while this subproject covers the Zone-1 and Zone-2.

The replacement of existing sewerage system has been proposed as the existing sewerage system, which has been in place for over 30 years and is need of significant improvement. The replacement will include the provision of a sewer and drain system, sullage carrier, surface drain and construction of HDPE force mains that is better suited to the geographic conditions of the area. Additionally, 1x new disposal station along with installation of wastewater treatment plant is proposed. The current sewerage system in the area is under capacity and has over lived, resulting in frequent blockages and other issues. To address this, a new sewerage system is proposed that would involve replacing the current system with a more modern and efficient one. The proposed sewerage system would include sewage collection, disposal, and treatment. The collection system of the proposed system will consist of trunk sewers, sub main and lateral

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sewers. The wastewater generated from homes and business in the area will be collected and transported to a proposed disposal station. From there, a sullage carrier will convey the wastewater to a wastewater treatment plant through a nullah located three kilometers away from the disposal station.

1.5 Details of Consultant

EIA/ESIA Consultants: Punjab Municipal Development Fund Company (PMDFC)

1.6 Nature, Size and Location of the Project

The proposed sub-project involves rehabilitation and improvement of existing sewerage network, construction of 1x new disposal station (02 acre) in Basti Naqdabad and construction of WWTP in Chak Chak No. 153/ML (30 acre) in Kot Addu.

Table 1: Size, Nature and Location of Project

Components	Details
<i>Name of the Project</i>	Comprehensive Sewerage System in Kot Addu City
<i>Scope of Work</i>	Project involves Improvement of Sewerage System in Kot Addu City and Construction of disposal station and WWTP at the periphery of MC Kot Addu.
<i>Location</i>	Sewerage Network will cover: Muhalla Mariwala, Muhalla Qazi Qaleemullah, and Awan Factory Muhalla, Ansar colony, sabzi mandi town, Ward No. 10, sindhi Basti, Basti Gadion wali, basti mandi maweshian and adjoining areas New Disposal Station: Kot Addu (02 acre) WWTP Site: Chak No. 153/ML Kot Addu (30 acre)
<i>Nature & importance of the Project</i>	The proposed Sub-project involves improvement of sewerage network of Zone-1 & Zone-2, construction of 1x disposal station (02 acre) and construction of WWTP in Chak Chak No. 153/ML (30 acre) in Kot Addu.
<i>Type & Category</i>	The sub project is categorized as E-1, S-2.

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Components	Details
	EIA/ ESIA is prepared, according to PEPA Review of Initial Environmental Examination and Environmental Impact Assessment, Schedule (II) F (3), 2022.
<i>Total Area</i>	Sewerage Network 10.42 km Disposal Station 2 Acres Surface Drain/Nullah 6.63 km Sullage Carrier 1 km HDPE Force mains 2.74 km WWTP 30 Acres
<i>Cost of the project</i>	1212.582 million/- PKR
<i>ESIA Implementation cost</i>	7.5 million/-PKR
<i>Project Duration</i>	1.5 years approx.
<i>Major Work Activities</i>	Comprehensive Sewerage System in Kot Addu City 1. Rehabilitation of Existing Sewerage System (Missing Sewers and replacement of existing lines, Desilting of Sewer lines, manhole covers, disposal stations pumping machinery replacement) 2. Improvement of Sewer Network (10.42 km) 3. Construction of 2x New Disposal Station 4. Construction of Sullage Carrier (3400 Rft) 5. Construction of Surface Drain (21767 Rft) 6. Construction of HDPE Force mains (9000 Rft) 7. Construction of Waste Water Treatment Plant - Inlet Channel and Effluent Drain = 1100 Rft Facultative Ponds = 03 Length = 586 Rft Width = 155 Rft Depth= 5 Rft Anaerobic Ponds =03 Length = 220 Rft Width = 111.5 Rft Depth= 5 Rft
<i>Sponsoring</i>	Government of the Punjab (through World Bank funding)
<i>Executing Agency & Project Proponent</i>	MC Kot Addu

Components	Details
Monitoring Agency	PMDFC through engagement of consultants

1.7 Study Approach & Methodology

1.7.1 Study Approach

The study has been conducted in accordance with National Regulatory framework and Environmental & Social Management Framework (ESMF) under PCP (World Bank funded program). The study is based on both primary and secondary data and information. Discussions were held with stakeholders including Government officials and community representatives. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental and social impacts.

1.7.2 Methodology

i. Orientation

Meetings and discussions were held among the executing & implementing Agency. This activity was aimed at achieving a common ground of understanding various issues related to the project.

ii. Planning for Data Collection

Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the consultant. The plan included identification of specific data requirements and their sources, determined time schedules and responsibilities for their collection, and indicated the logistics and other supporting needs for the execution of the data acquisition plan.

iii. Data Collection

In this step, primary and secondary data were collected through field observations, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic environmental conditions. The following activities were undertaken to gather the required data:

- Environment and Social Screening
- Site Reconnaissance
- Analysis of Maps and Plans
- Literature Review
- Desk Research

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- Public Consultations
- Field Observations & Studies
- Stakeholders Consultation
- Laboratory Analysis

Physical Environment

Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality and noise.

Geology, Topography, Soils

A review was conducted of relevant literature on the geology, topography and soils in the project area.

Air Quality

Ambient air quality measurements are essential to provide a description of the existing conditions, to provide a baseline against which changes can be measured and to assist in the determination of potential impacts of the proposed construction on air quality conditions. Ambient air quality was monitored for Carbon Monoxide (CO), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Particulate Matter (PM₁₀) and other parameters mentioned in PEQS.

Noise

Noise level readings were taken for 24 hours and hourly average data was reported.

Water Quality

Water quality monitoring was conducted to determine the water quality situation prior to construction. It has been observed that the surface water and groundwater are the most important environmental variables to be affected due to the project. The extent of surface water and groundwater contamination in the project area was assessed based on the test results of chemical and microbiological parameters for surface and ground water. Dissolved oxygen (DO), pH and conductivity measurements were taken in situ at all sampling stations. Laboratory analyses were performed according to the recognized methods of American Society for Testing and Materials (ASTM), United States Environmental Protection Agency (USEPA), and American Public Health Association (APHA).

Biological Environment

The status of the flora and fauna of the study area were determined by ecological survey, a review of literature relevant to the area, and an assessment of terrestrial environments.

Flora

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

Fauna

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

Socio-Cultural Environment

The consultants utilized a combination of desk research, field investigations, census data, structured interviews and reports to generate the data required for description of the existing social environment and assessment of the potential impacts of the construction of the proposed project.

iv. Identification and Evaluation of Environmental Impacts

The impacts of the project on the physical, biological and socio-economic environment at the design, construction and operational phases were identified and evaluated based on their type and magnitude.

Mitigation Measures and Implementation Arrangements

Adequate mitigation measures and implementation mechanisms were proposed so that the proponent could incorporate them beforehand in the design phase.

v. Report Organization

The ESIA report has been organized in 8 chapters:

Chapter 1: Introduction

Describes the introduction and purpose of this report

Chapter 2: Policy, Legal and Administrative Framework

Description of the national & provincial legislation, regulations and policies those are relevant to project activities and initial environmental examination process.

Chapter 3: Description of Project

This chapter includes the project description, raw materials details and utility requirements and project alternatives.

Chapter 4: Description of Environment

This chapter describes the present environmental settings and socioeconomic value of the project area and surroundings.

Chapter 5: Potential Environmental Impacts and Mitigation Measures

Deals with the identification of potential environmental and social impacts of project for preparation of environmental management and monitoring plan.

Chapter 6: Environmental and Social Management and Monitoring Plan

Deals with the implementation of mitigation measures and monitoring of environmental parameters against likely environmental impacts.

Chapter 7: Stakeholder Consultation and Capacity Building Program

Deals with the consultations held during surveys. Grievance Redress Mechanism (GRM) description.

Chapter 8: Grievance Redress Mechanism

GRM and its different tiers.

Chapter 9: Conclusion and Recommendations

The conclusion of EIA/ESIA report.

Chapter-2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This section provides an overview of the policy framework and national legislation that applies to the proposed project. The project is expected to comply with all national/provincial legislation regulations, EPA guidelines, World Bank Operational Policies and guidelines which are relevant and applicable to the sub-project.

2.1. National Policy and Legal Framework

The Climate Change Division is the responsible authority for environmental protection policy making in Pakistan.

The Pakistan National Conservation Strategy (NCS) that was approved by the federal cabinet in March 1992 is the principal policy document on environmental issues in the country (EUAD/IUCN, 1992). The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the proposed project are pollution prevention and abatement, restoration of rangelands, increasing energy efficiency, conserving biodiversity, supporting forestry and plantations, and the preservation of cultural heritage.

Prior to the adoption of the 18th Constitutional Amendment, the Pakistan Environmental Protection Act (PEPA) 1997 was the governing law for environmental conservation in the country. Under PEPA 1997 the Pakistan Environmental Protection Council (PEPC) and Pak EPA were primarily responsible for administering PEPA 1997. Post the adoption of the 18th Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation.

2.2. Regulations for Environmental Assessment, Punjab EPA

Under Section 12 (and subsequent amendment in 2012 and then 2017) of the PEPA (1997), a project falling under any category specified in Schedule I of the IEE/EIA Regulations 2022 requires the proponent of the project to file an IEE with the concerned provincial EPA while projects falling under any category specified in Schedule II require the proponent to file an EIA with the provincial agency, which is responsible for its review and accordance of approval or

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request any additional information deemed necessary. As this subproject under Punjab Cities Program is funded by World Bank, so in compliance of the WB policies and ESMF of PCP, EIA report has mandatory part of social impact assessment social management plan in the ESMMP and vice versa and termed as Environment and Social Impact Assessment (ESIA) report.

2.3. Regulatory Clearances, Punjab EPA

In accordance with provincial regulatory requirements, an IEE/EIA satisfying the requirements of the Punjab Environmental Protection Act (amended 2012 & 2017) will be marked cleared by Punjab-EPA and No Objection Certificate (NOC) will be issued for it.

2.4. Guidelines for Environmental Assessment, Pakistan EPA

The Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects. The guidelines that are relevant to the proposed project are listed below:

- Guidelines for the Preparation and Review of Environmental Reports, Pakistan, EPA 1997;
- Guidelines for Public Consultations; Pakistan EPA May 1997

These guidelines have been adopted by the Punjab Environment Protection Agency after 18th amendment.

2.5. Punjab Environmental Quality Standards (PEQS), 2016

The Punjab Environmental Quality Standards (PEQS), 2016 specify the following standards:

1. Water Quality Analysis Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers);
2. Air Quality Analysis Maximum allowable concentration of pollutants in gaseous emissions from industrial sources;
3. Noise Quality Analysis

These standards apply to the gaseous emissions and liquid effluents discharged by batching plants, campsites and construction machinery. The standards for vehicles will apply during the construction as well as operation phase of the project. The Air, Noise and Water Quality Standards is attached as **Annexure B**.

2.6. Other Environment Related Legislations

This section describes the national and provincial laws policies, rules and regulations related to environment protection and its applicability to subproject.

Table 2: National and Provincial Legislative Framework

Sr. No.	Act	Description	Applicability to sub-project
1.	Punjab Environment Protection Act, 1997 (as amended up to 2017)	The Act establishes the Environmental Protection Agency that deals with the preparation of national environmental policies, prepare & publish national environment report, ensure the enforcement of National Environmental Quality Standards, establishment of ambient air, water and land quality standards, measures to control environmental pollution. Additionally, under this Act, no proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment (EIA/ESIA), and has obtained from the approval in respect thereof.	Section 11, 12,13 and 14 of PEPA, 2012 will be applicable throughout the length of project and during operation phase of WWTP.
2.	Punjab Environment Protection Review of	Provided that the proponent shall file an environmental impact assessment, if the project is likely	Schedule II- F(3) is applicable under which

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	IEE/EIA Regulations 2022	to cause an adverse environmental impact	this EIA(ESIA) report is developed. As this subproject under Punjab Cities Program is funded by World Bank, so in compliance of the WB policies and ESMF of PCP, EIA report has mandatory part of social impact assessment social management plan in the ESMMP and vice versa and termed as Environment and Social Impact Assessment (ESIA) report.
3.	Pakistan Penal Code, 1860	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
4.	Motor Vehicle Rules, 1969	It defines powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory measures that can be taken to tackle the ambient air quality problems associated with the	This act is applicable to the gaseous emission that will be released from the vehicles in operation phase at machinery used during construction phase of this subproject.

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		vehicular emissions during operation phase.	
5.	The Land Acquisition Act, 1894	The Land Acquisition Act, 1894, is a “law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition”.	This act will not be triggered as no land acquisition is required.
6.	The Punjab Land Acquisition Rules, 1983,	It describes the land acquisition procedure for public purposes or for a company.	This act will not be triggered as no land acquisition is required.
7.	Pakistan Antiquities Act 1975 and Punjab Antiquities Amendment Act 2012	The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following: • “Ancient” is any object that is at least 75 years old; • All accidental discoveries of artifacts must be reported to the Federal Department of Archaeology; • The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise; • All new construction within a distance of 200 feet from protected antiquities is forbidden;	The law will be applicable to the project due to its provision that if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed sub-project. Chance Find Procedures are given as Annexure C .

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		No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	
8.	Punjab Restriction of Employment of Children Act, 2016	According to the sub-section 11(a) of this Act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven days, and a mandatory fine between 10,000 and 50,000 rupees.	The relevance of this act to the project will be to prohibit child employment for construction of the proposed sub- project activities and it will be applicable throughout the construction as activities related to subproject. As well as during operational phase of subproject.
9.	The Punjab Occupational Safety and Health Act, 2019	The Punjab Occupational Safety and Health Act, 2019 (IV of 2019) An Act to provide for occupational safety and health at workplace. It is necessary to make and consolidate the law for the occupational safety and health of the persons at workplace and to protect them against risks arising	The Punjab Occupational Safety and Health Act, 2019 relevant sections to the proposed projects are: 8. Safety and Health, 10. Consultation 13. Notification and investigation of accidents, dangerous occurrences and occupational illness.

		out of the occupational hazards; to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace and to provide for matters connected therewith or ancillary thereto.	Adopting this act, PMDFC has developed SOPs for health and safety of the labor and communities are attached as Annexure M. which will be applicable in this subproject.

2.7. INTERNATIONAL LAWS/TREATIES

Pakistan has been a party to several international environmental treaties and agreements. This section describes the international treaties and conventions.

Table 3: International Laws/Treaties

#	International Laws/Treaties	Description
1	The Convention on Conservation of Migratory Species of Wild Animals, (1981)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species. There are no endangered species of plant life or animal life in the vicinity of the Project.
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further. By controlling the trade in these species, CITES aims to ensure their survival and prevent overexploitation, which can indirectly impact ecosystems and the quality of water resources.

3	International Union for Conservation of Nature and Natural Resources Red List (2000)	It lists sensitive ecological resources that are experiencing various levels of threats internationally. However, the IUCN Red List indirectly relates to WWTPs by assessing and categorizing species that may be impacted by pollution, habitat destruction, or other factors associated with human activities, including inadequate wastewater treatment. By evaluating the conservation status of species, the Red List helps identify the potential threats they face and the need for conservation measures to protect their habitats.
4	Ramsar Convention on Wetlands of International Importance 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention is an international treaty for the conservation and sustainable utilization of wetlands. It is the only global environmental treaty that deals with a particular ecosystem. Additionally, the Ramsar Convention emphasizes the importance of international cooperation and exchange of information among member states to address shared wetland concerns. This can include sharing best practices in wastewater treatment and management to ensure that wetland ecosystems are adequately protected.

2.7.1. World Bank Environmental, Health and Social Guidelines

The principal World Bank publications that contain environmental and social guidelines are listed below.

- Environment, Health, and Safety (EHS) Guidelines prepared by International Finance Corporation and World Bank in 2007

The relevant EHS Guidelines⁷ are as below:

- **Environmental**
 - Air Emissions and Ambient Air Quality
 - Energy Conservation

⁷ <https://documents1.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf>

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- Wastewater and Ambient Water Quality
 - Water Conservation
 - Hazardous Materials Management
 - Waste Management
 - Noise
 - Contaminated Land
- **Occupational Health and Safety**
 - General Facility Design and Operation
 - Communication and Training
 - Physical Hazards
 - Chemical Hazards
 - Biological Hazards
 - Radiological Hazards
 - Personal Protective Equipment (PPE)
 - Special Hazard Environments
 - Monitoring
- **Community Health and Safety**
 - Water Quality and Availability
 - Structural Safety of Project Infrastructure
 - Life and Fire Safety (L&FS)
 - Traffic Safety
 - Transport of Hazardous Materials
 - Disease Prevention
 - Emergency Preparedness and Response
- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.
- Social Analysis Sourcebook
- WB Committee on disability-inclusive development
- WB guidelines on labour influx
- WB Group Gender Strategy

Table 4: World Bank Policy Core Principles and Applicability on Sub-project

Core Principles	Applicability
Core Principle 1 Environmental and social management procedures and processes are designed to (a) avoid, minimize, or mitigate against adverse impacts; (b) promote environmental and social sustainability in program design; and (c) promote informed decision making relating to a program's environmental and social effects.	Under the light of this Principle in order to mitigate negative impacts envisaged in this Sub-project. ESMMP implementation and monitoring arrangements is developed.
Core Principle 2 Environmental and social management procedures and processes are designed to avoid, minimize, and mitigate against adverse effects on natural habitats and physical cultural resources resulting from the program	ESMMP prepared to mitigate all minor impacts anticipated during the course of the Sub-project.
Core Principle 3 Program procedures ensure adequate measures to protect public and worker safety against the potential risks associated with (a) construction and/or operations of facilities or other operational practices developed or promoted under the Program and (b) exposure to toxic chemicals, hazardous wastes, and otherwise dangerous materials	All the mitigation measures have been incorporated in the ESMMP to address risks associated with workers and community health and safety. Contractor will ensure compliance with these attributes.
Core Principle 4 Land acquisition and loss of access to natural resources are managed in a way that avoids or minimizes displacement, and affected people are assisted in improving, or at least restoring, their livelihoods and living standards	This core principle doesn't trigger in this Sub-project as no land acquisition is required during the improvement of sewerage network and construction of WWTP.

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Core Principle 5	No indigenous/Vulnerable groups exist at the site proposed for improvement of sewerage system and construction of WWTP.
Core Principle 6 Avoid exacerbating social conflict, especially in fragile states, post-conflict areas, or areas subject to territorial disputes.	This principle doesn't trigger in this Sub-project.

CHAPTER 03

PROJECT DESCRIPTION

3.1. General

This section of the report provides an overview of the rational of the project, brief description of the project, type and category, its objectives location, land use, vegetation features, cost and magnitude of operation and various phases followed by Environmental Approvals or an approach adapted to conduct EIA/ESIA of Comprehensive Sewerage Scheme in Kot Addu City. For planning horizon 2050, the sewerage system has been proposed in existing MC areas as well as in unserved areas and this will provide 70% coverage of sewerage facilities to the population up to the design horizon. The rehabilitation of existing system has been proposed as the existing sewerage system is more than 25 years old and needs almost complete replacement due to numerous issues (under capacity sewers, old aged Sewerage network etc). For these zones, sewerage system has been proposed considering the land uses (residential, commercial and industrial). The proposed sewerage system comprises sewage collection (sewage network), disposal and its treatment. The collection system will consist of trunk sewers, submain and lateral sewers. The wastewater generated from homes and business in the area will be collected and transported to a proposed disposal station. The sewage generated will be disposed of into proposed one disposal station from where sullage carrier and force main will convey the wastewater into wastewater treatment plant.

3.2. Type and Category of Project

This EIS/ESIA is developed for proposed subproject “Comprehensive Sewerage Scheme of Kot Addu City” with total area for sewerage system of 10.42 Km, disposal station in 2 acres, drain/nullah of 6.63 Km, Sullage Carrier of 1 km, HDPE Force mains of 2.74 km and WWTP of 30 acres in Kot Addu city.

The current project requires an EIA/ESIA report for its environmental approval under section 12 of the PEPA Act 1997 (amended 2012 & 2017). EIA/ESIA is a systematic identification and evaluation of potential impacts of proposed projects, plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the environment followed by mitigation measures in the form Environmental Management Plan (EMP) to ascertain the EPA Punjab requirements:

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As per the ESMF under PCP, the sub-projects are categorized in E1, E2 and E3 category and S1, S2 and S3 category based on the magnitude and severity of the environmental and social impacts of the sub-project.

This project is categorized as E-1 and S-2. Environmental & Social Screening Checklist and Involuntary Resettlement Checklists is attached as **Annexure A**. For new construction of disposal station and wastewater treatment plant, ESIA will be prepared, according to Review of IEE/EIA, Schedule (II) F (3), 2022.

3.3. Objective of Project

The Sub-project comprises of the replacement of old, outlived, damaged or worn-out components in existing infrastructure, improvement of existing sewerage network including laying new sewer works of 10.42 km, construction of one new disposal station, HDPE force main, surface drain, sullage carrier and construction of wastewater treatment plant for; -

The Project aims at improvement of infrastructure of municipal services for sewerage system by providing additional force mains, R.C.C Sewer, manholes, disposal Works, Sullage Carrier, surface drain and Waste Water Treatment Plant.

The Project has the following objectives;

1. Elimination of existing waste water flooding on roads and streets
 2. Elimination of damages to roads, public as well as private properties due to waste water flooding
 3. Improvement in the service delivery level of waste water management facilities
 4. Reduction of water related and vector-based diseases
 5. Protection of drinking water sources from contamination
 6. Elimination of damages to the vehicles plying in waste water
 7. Improvement in environment of the city
 8. Reduction of public frustration created by waste water flooding and foul / obnoxious smells
- Improvement in economic growth potential of the city.

3.4. Sector Objectives

The sector objectives include:

- To provide efficient and effective municipality services to the masses

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- To provide clean and green environment for better living standards
- Community development through improving basic infrastructure
- Capacity building of Local Governments

3.5. Location and Site layout of the Project

Location:

The proposed comprehensive sewerage system along with the construction of WWTP is located at the periphery of MC Kot Addu, main areas included in sewerage network are Muhalla Mariwala, Muhalla Qazi Qaleemullah, and Awan Factory, Muhalla, Ansar Colony, Sabzi Mandi Town, Ward No. 10, Sindhi Basti, Basti Gadion Wali, Basti Mandi Maweshian and adjoining areas of Kot Addu. Figure 1 shows the project site while Figure 2 shows location plan of MC Boundary of Kot Addu and project boundary.



Figure 1: Project Site for Disposal Station and WWTP

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Figure 2: Strategic location Map Kot Addu

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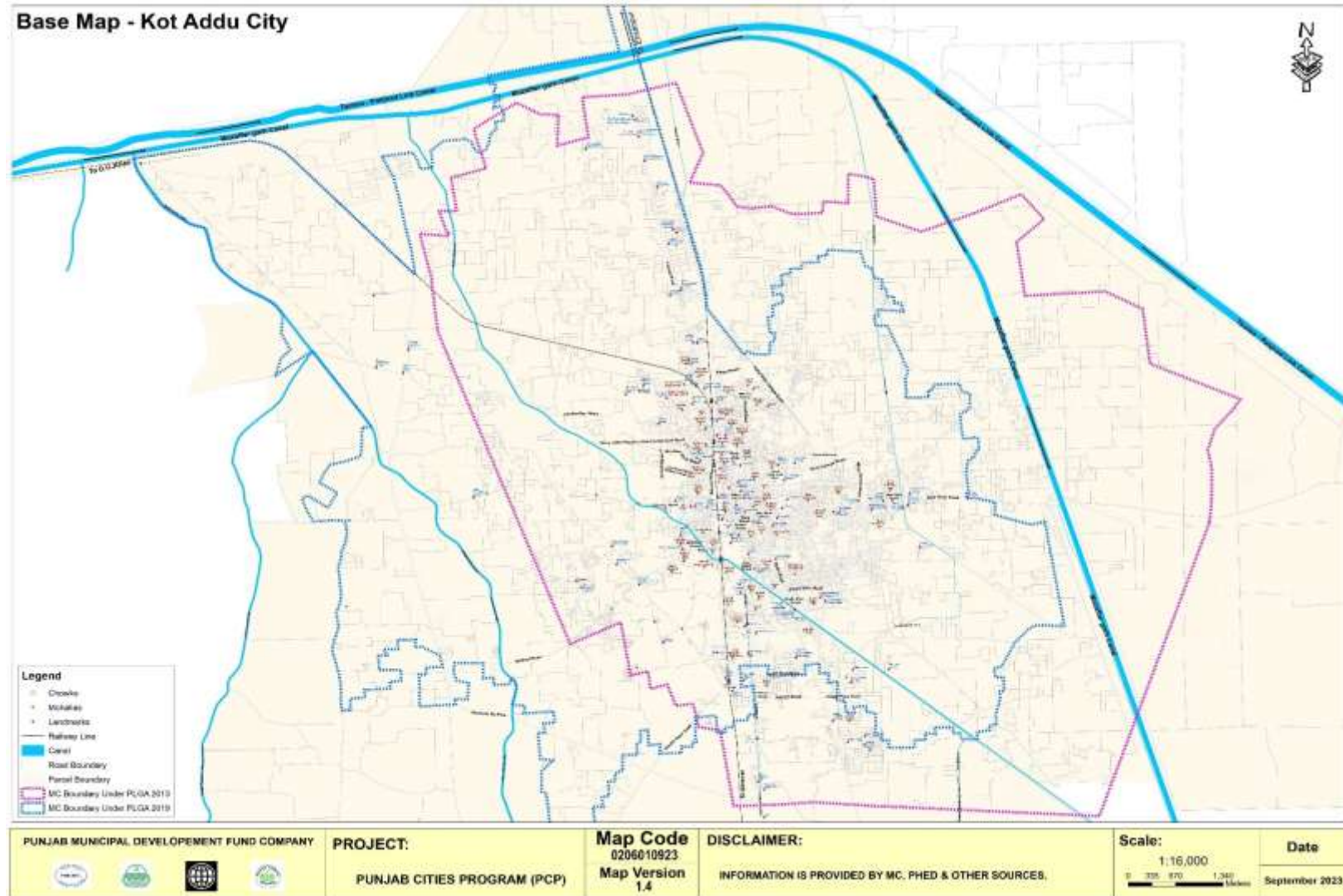


Figure 3: Base Map of Kot Addu

3.6. Objectives of EIA/ESIA Report

The predominant objectives of this EIA/ESIA report are:

- To assess and report the prevailing environmental conditions of the project area.
- To develop a baseline in order to evaluate the suitability of the project in particular area.
- To recognize activities during pre-construction, construction and operational phases and associated impacts.
- To assist the proponent for planning, designing and implementation of the project, keeping in view the elimination or minimization of negative impacts.
- To develop proper mitigation as well as monitoring plans for the uniform implementation.
- To provide opportunity for the public for a better understanding of the project as well as its impacts on community and environment in context of sustainable development.
- To prepare an EIA/ESIA report for the submission to Environmental Protection Agency, Punjab for Environmental Approval.

3.7. Project Alternatives

Alternatives can be defined as different means of meeting the general requirements of the activity, which may include:

- ✓ The property on which or location where it is proposed to undertake the activity.
- ✓ The type of activity to be undertaken.
- ✓ The design or layout of the activity.
- ✓ The technology to be used in the activity.
- ✓ The operational aspects of the activity

The purpose of alternatives is to select the best option amongst all available options for sustainability of the project. It is mandatory to suggest alternatives that are most suitable through site visits, analysis, road access, basic infrastructure or by considering public interest during formulation of EIA/ESIA report. Hence, during project preparation, various alternatives were proposed, screened, and studied against technical, economic, social, and environmental criteria. The primary objective is to identify and adopt options with the least adverse environmental and social impacts followed by maximum environmental benefits.

The improvement of sewerage network and construction of disposal station and WWTP project is proposed on an open straight land. The main consideration for the selection of site for the

development of a project was availability of suitable land with minor environmental and social ramifications. The present site belongs to MC Kot Addu hence, no land acquisition is required; no dismantling of any public structures; and no direct impact to any socially or environmentally sensitive receptors. Based on this environmental and social assessment, it is established that the project will cause minor to moderate environmental and low social manageable impacts during construction phase. Consequent to this assessment, alternatives for the projects were not practical and the present site is best suited for the construction of the project. Therefore, the selected site is ideally suited for construction of the project and no other site was considered. Similarly, the project will benefit the local community creating job opportunities as well as it will solve long-standing issues of availability of public transport for nearby cities.

Eligibility criteria for the implementation of wastewater treatment plants is as under:

Conflict-free land and should be owned by MCs or the provincial government and should be available at technically feasible location preferably near the discharge point/pumping stations of the drain.

- a. Simplest wastewater treatment technology with least operational cost should be selected after alternative analyses, for example, OPs or WSPs.
- b. EIA should be done as per the requirements of PEPA 2012, and accordingly, NOC should be obtained from PEPA before execution of project.
- c. Calculated Capacity of wastewater treatment has been established based on present and projected population of city, average water consumption per person per day, wastewater discharges per day, and pollution load of wastewater
- d. Effluent from wastewater treatment should comply with the PEQS established under PEPA 2012 and WHO guidelines for reuse.

This design criteria are established by WB in ESSA and technology selected for wastewater treatment plant in Kot Addu is most suitable for meeting these requirements.

3.8. Why Treatment of Wastewater is Important:

Treatment of wastewater is important for several reasons:

- **Environmental Protection:** Wastewater contains pollutants such as nutrients, organic matter, and pathogens that can have a detrimental hazardous effect on the environment if discharged untreated into water bodies. Treatment of wastewater removes pollutants

from it, reduces the risk to ecological life, aquatic life and other living organisms that rely on water.

- **Public Health:** Wastewater may contain harmful bacteria, viruses, and other pathogens that can cause disease in humans. Proper treatment of wastewater before it is discharged into water bodies can reduce the risk of these pathogens entering the human food chain, and prevent the spread of waterborne diseases.
- **Water Conservation:** Wastewater can be treated and reused for non-potable purposes such as irrigation, industrial processes, urban gardening, landscaping and even toilet flushing. By treating wastewater, we can reduce the amount of freshwater required for these purposes, which helps to conserve our precious water resources.
- **Regulatory Compliance:** Pakistan has regulations in place that require the treatment of wastewater before it is discharged into water bodies. Compliance with these regulations is essential to avoid penalties, legal action, and damage to a company's reputation.

Technology Options for various methods of wastewater treatment were searched for feasibility, however, wastewater stabilization ponds were selected as the most suitable option for Kot Addu.

3.9. What are Waste Stabilization Ponds

Waste stabilization ponds, also known as oxidation ponds, are large shallow ponds used for the treatment of wastewater. They are designed to use natural processes, such as biological and physical interactions, to treat the wastewater and reduce its pollutants.

Waste stabilization ponds can be classified into three types based on their function and operation: anaerobic ponds, facultative ponds, and maturation ponds. Anaerobic ponds are designed to break down organic matter in the absence of oxygen, while facultative ponds use both aerobic and anaerobic processes to treat wastewater. Maturation ponds are the final step in the treatment process, designed to provide further treatment and disinfection of the wastewater before it is discharged.

Waste stabilization ponds have been used in many parts of the world as a low-cost and effective method of treating wastewater. They require less energy and maintenance than other treatment methods, such as activated sludge systems, and can be used in areas where there is limited access to electricity or other resources. However, they do require a large land area and are sensitive to climate conditions, such as temperature and rainfall.

⁸Floating wetlands with wastewater stabilization ponds:

Floating wetlands combined with wastewater stabilization ponds (WSPs) are an innovative approach to wastewater treatment. The concept involves adding a layer of floating plants on top of a wastewater stabilization pond to enhance the removal of nutrients and other pollutants from the wastewater.

The floating wetlands act as a natural filter, removing pollutants through a combination of physical, chemical, and biological processes. The plants absorb nutrients such as nitrogen and phosphorus, which are commonly found in wastewater, and use them for growth. The roots of the plants also provide a habitat for beneficial microorganisms, which further break down pollutants.

Studies have shown that the addition of floating wetlands to wastewater stabilization ponds can significantly improve the treatment efficiency and reduce the number of pollutants discharged into the environment. Additionally, the use of floating wetlands can enhance the aesthetic value of wastewater treatment facilities and provide habitat for wildlife.

However, the effectiveness of floating wetlands is influenced by several factors, such as plant species, climate conditions, and the design of the system. Therefore, careful planning and monitoring are essential to ensure that the system is operating effectively and efficiently. Figure 4 and 5 depicts Systematic view of Floating Wetland and Pictorial view of floating wetlands with WSP respectively.

⁸ Chen, Y., Chen, L., Zhang, Y., & Yang, Y. (2016). Floating treatment wetlands for wastewater treatment: A review. *International Journal of Phytoremediation*, 18(11), 1153-1166.

Vymazal, J., & Březinová, T. (2015). The use of constructed wetlands with floating macrophytes for wastewater treatment. *Ecological Engineering*, 81, 111-122.

USEPA. (2010). Floating Treatment Wetlands: A Technology Information Sheet. Retrieved from <https://www.epa.gov/sites/production/files/2015-06/documents/floating-treatment-wetlands.pdf>

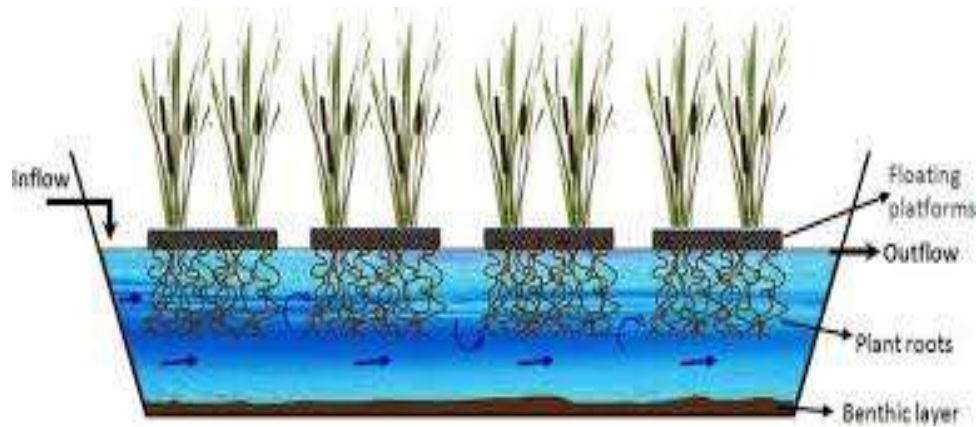


Figure 4: Systematic view of Floating Wetland



Figure 5: Pictorial view of floating wetlands with WSP

Important factors that can influence floating wetlands in WSP:

Several factors can influence the performance of floating wetlands in wastewater stabilization ponds (WSPs). These include:

- **Plant species:** The selection of plant species is crucial for the successful performance of floating wetlands in WSPs. Different plant species have different capacities for nutrient uptake and pollutant removal, and their growth and survival can be affected by the water quality parameters and climatic conditions of the WSP.

- Hydraulic loading rate (HLR): The HLR is the volume of wastewater that is applied to the WSP per unit area per day. The HLR can affect the growth and survival of the plants in the floating wetlands and the treatment efficiency of the system. A high HLR can lead to hydraulic overload and cause plant stress, while a low HLR may reduce the contact time between the wastewater and the plants.
- Water quality parameters: The water quality parameters of the WSP, such as pH, temperature, dissolved oxygen, and nutrient concentrations, can affect the growth and survival of the plants in the floating wetlands. For example, a low dissolved oxygen concentration can limit plant growth, while high nutrient concentrations can lead to excessive plant growth and biomass accumulation.
- Climate conditions: The climatic conditions of the WSP, such as temperature, rainfall, and wind, can affect the growth and survival of the plants in the floating wetlands. Extreme weather events, such as droughts or floods, can also affect the performance of the system.
- Design and operation: The design and operation of the floating wetlands in the WSP can affect their performance. The size, shape, and placement of the floating wetlands can affect the contact time between the wastewater and the plants, while the frequency and timing of maintenance activities can affect the growth and survival of the plants.

Proper consideration and management of these factors are essential to ensure the effective and efficient performance of floating wetlands in WSPs.

⁹Best plant species for floating wetland in WSP:

The selection of plant species for floating wetlands in WSPs depends on several factors, such as the local climate, the water quality parameters of the WSP, and the treatment goals. Some plant species that have been commonly used in floating wetlands in WSPs include:

Cattails (*Typha spp.*): Cattails are commonly used in floating wetlands due to their high capacity for nutrient uptake and their ability to tolerate fluctuating water levels.

⁹ Souza, T. F., Gonçalves, J. R., & Duarte, E. M. (2017). Evaluation of floating macrophytes as an alternative to the wastewater treatment process. *Journal of Environmental Science and Health, Part A*, 52(2), 177-184.

Zhang, Y., Chen, Y., & Chen, L. (2019). Nitrogen and phosphorus removal from simulated wastewater by floating treatment wetlands with water hyacinth and duckweed. *Ecological Engineering*, 134, 113-121.

Bulrushes (*Scirpus* spp.): Bulrushes are tolerant of varying water depths and can remove nutrients and metals from wastewater.

Duckweed (*Lemna* spp.): Duckweed as shown in Figure 6 is a fast-growing floating plant that can remove nutrients and organic matter from wastewater.

Water lettuce (*Pistia stratiotes*): Water lettuce has a high capacity for nutrient uptake and can tolerate a wide range of water quality conditions. Water lettuce showed in Figure 7.

Water hyacinth (*Eichhornia crassipes*): Water hyacinth has a high growth rate and can remove nutrients such as nitrogen and phosphorus from wastewater. However, it is considered an invasive species in some regions as showed in Figure 8.

Several studies have evaluated the performance of different plant species in floating wetlands in WSPs. For example, a study conducted in Brazil found that the combination of cattails and bulrushes was effective in removing nutrients and improving the water quality of the WSP (Souza et al., 2017). Another study conducted in China found that the combination of water hyacinth and duckweed was effective in removing nutrients and organic matter from wastewater (Zhang et al., 2019).



Figure 6: Duckweed (*Lemna* spp.)



Figure 7: Water lettuce (*Pistia stratiotes*)



Figure 8: Water hyacinth (*Eichhornia crassipes*)

¹⁰Is Kot Addu (Pakistan) climate supporting for floating wetlands in WSP?

¹⁰ Tariq, S., Hameed, A., & Mumtaz, R. (2017). Use of constructed wetlands for wastewater treatment in Lahore, Pakistan. *Journal of Environmental Health Science and Engineering*, 15(1), 1-8.

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Kot Addu is located in the Punjab province of Pakistan and has an arid climate with hot summers and relatively cool winters. Climatic conditions of Kot Addu is presented in **Figure 9**. The climatic condition climatic conditions of Kot Addu can affect the performance of floating wetlands in (WSPs).

While there are no specific studies on the performance of floating wetlands in WSPs in Kot Addu, several studies have evaluated the use of floating wetlands in other regions of Pakistan with similar climatic conditions. For example, a study conducted in Lahore, which is located in the same province as Kot Addu, found that the use of floating wetlands in WSPs was effective in improving the water quality of wastewater (Tariq et al., 2017). Another study conducted in Karachi, found that floating wetlands were effective in removing nutrients and organic matter from wastewater (Murtaza et al., 2019).

Overall, the arid climate of Kot Addu is suitable for the use of floating wetlands in WSPs.

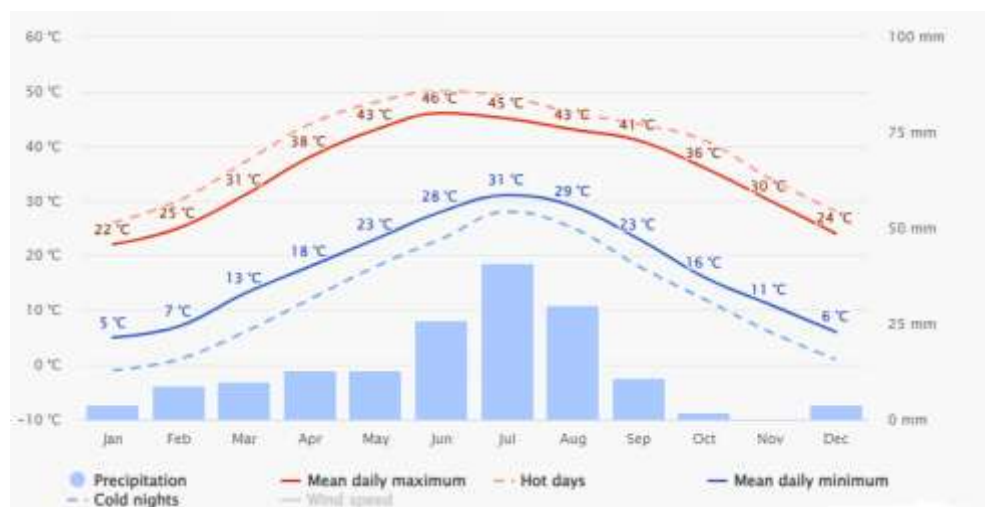


Figure 9: Climatic Conditions in Kot Addu¹¹
Successful story of WSP with floating wetlands in Pakistan¹²:

The Floating Wetlands of Chokera:

Faisalabad, an industrial city in Pakistan, faces severe environmental problems due to rapid industrialization, including untreated industrial effluent discharge polluting water sources and soil.

Murtaza, G., Ghafoor, A., Qadir, A., Hussain, A., & Saifullah, M. (2019). Evaluating the efficacy of floating wetlands for nutrient removal from wastewater in Karachi, Pakistan. *Journal of Environmental Management*, 241, 120-128.

¹¹ https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/kot-addu_pakistan_1173378

¹² <https://medium.com/panda-musings/the-floating-wetlands-of-chokera-5524aa17f63f>

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To address this crisis, floating treatment wetlands have been implemented in Chokera, replicating successful global examples.

WWF-Pakistan, in collaboration with National Institute for Biotechnology and Genetic Engineering (NIBGE) and Water and Sewerage Authority (WASA), has replicated the concept of floating wetlands in Chokera. There are stabilization ponds, covering an area of approximately 400 acres, with the capacity of 20 million gallons per day, to manage the city's wastewater and the floating wetlands have been built in these ponds. The mats or floats are made from thermopool sheets and the common reed plant species, locally known as naro, are used.

The system aims to reduce pressure on depleting groundwater by reusing treated wastewater. Similar systems have been successful in Canada and India, showing positive results in water treatment and habitat restoration. The implementation in Chokera is leading to positive changes, with a return of birds to the area previously affected by unpleasant odors from the ponds.

13 Measures to Make WSPs with Floating Wetlands more Aesthetical

WSPs with floating wetlands can be designed to be aesthetically pleasing, while still providing effective treatment of wastewater. Here are some measures that can be taken to make WSPs with floating wetlands more aesthetically appealing:

Select attractive plant species: Choosing plant species that are visually appealing can enhance the aesthetic value of the floating wetland. Some plant species, such as lotus (*Nelumbo nucifera*) and water lilies (*Nymphaea* spp.), have attractive flowers and can provide shade and habitat for wildlife (EPA, 2002).

Add landscaping elements: Incorporating landscaping elements, such as rocks, boulders, and driftwood, can enhance the natural aesthetic of the floating wetland. These elements can also provide additional habitat for wildlife (Miklasz, 2014).

Use natural materials: Using natural materials, such as stones and wood, can help blend the floating wetland into the surrounding landscape. These materials can also provide a natural, rustic look that is visually appealing (EPA, 2002).

¹³ Environmental Protection Agency (EPA). (2002). *Constructed wetlands manual: Constructed wetlands for wastewater treatment*. Retrieved from <https://nepis.epa.gov/Exe/ZyPDF.cgi/2000LYOD.pdf?Dockey=2000LYOD.pdf>
Miklasz, K. (2014). The importance of aesthetics in constructed wetland design. *World Environmental and Water Resources Congress*, 109-115.

Incorporate lighting: Adding lighting can enhance the nighttime aesthetic value of the floating wetland. Lighting can also provide safety for visitors and wildlife (Miklasz, 2014).

Provide public access: Providing public access to the floating wetland can increase its aesthetic value by allowing visitors to experience its natural beauty. This can be achieved through the construction of boardwalks or viewing platforms (EPA, 2002).

3.10. ¹⁴Other Technologies Options to Treat Wastewater:

In addition to wastewater stabilization ponds (WSPs) and constructed wetlands, there are several other conventional technologies that can be used to treat wastewater, including:

Activated Sludge: Activated sludge is a biological treatment process in which microorganisms are used to break down organic matter in wastewater. It is commonly used in municipal wastewater treatment plants.

Advantages: High removal efficiency of organic matter, nutrients and pathogens; compact and efficient process; widely used and well understood technology.

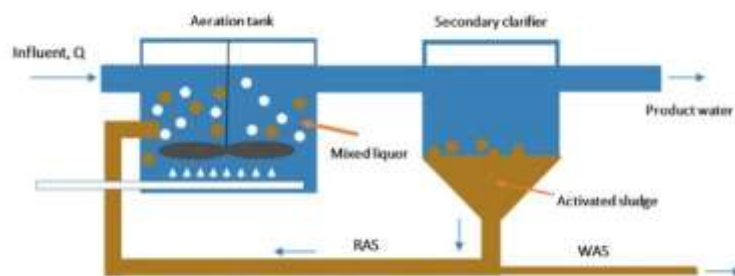
Disadvantages: Sensitive to variations in flow and composition of wastewater; requires significant energy and infrastructure; generation of large quantities of sludge.

¹⁴ United States Environmental Protection Agency. (2019). Wastewater treatment technologies. Retrieved from <https://www.epa.gov/water-research/wastewater-treatment-technologies>

Verlicchi, P., Al Aukidy, M., & Zambello, E. (2015). Wastewater treatment and energy efficiency: a review on sustainability challenges and opportunities. *Resources, Conservation and Recycling*, 105, 163-173.

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Trickling Filters: Trickling filters are a biological treatment process that use microorganisms attached to a medium to treat wastewater. Wastewater is distributed over a bed of rocks or other media and microorganisms in the media break down organic matter.

Advantages: Simple and robust technology; low energy consumption and infrastructure requirements; can be easily retrofitted into existing treatment systems.

Disadvantages: Limited removal efficiency of nutrients and pathogens; high maintenance requirements; limited ability to handle high peak flows.

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Rotating Biological Contactors: Rotating biological contactors are a type of trickling filter in which a series of rotating disks are used to provide a surface for microorganisms to grow on. Wastewater is sprayed onto the disks and the microorganisms break down organic matter.

Advantages: Efficient removal of organic matter and nutrients; low energy consumption and infrastructure requirements; compact and modular design.

Disadvantages: Sensitive to variations in flow and composition of wastewater; limited ability to handle high peak flows; limited removal efficiency of pathogens.

Membrane Bioreactors: Membrane bioreactors use a combination of biological treatment and membrane filtration to treat wastewater. Microorganisms in the wastewater break down organic matter, and a membrane is used to filter out solids and bacteria.

Advantages: High removal efficiency of organic matter, nutrients, and pathogens; small footprint and high flexibility; high-quality effluent suitable for reuse.

Disadvantages: High energy consumption and operating costs; prone to fouling and membrane damage; expensive initial capital costs.

Disinfection: Disinfection is a process that uses chemicals, such as chlorine or ultraviolet light, to kill pathogens in wastewater. Disinfection is often used as a final step in the treatment process to ensure that the wastewater is safe for discharge into the environment.

Advantages: Efficient removal of pathogens; widely used and well understood technology; simple and easy to operate.

Disadvantages: Limited removal efficiency of organic matter and nutrients; potential for formation of disinfection byproducts; requires careful handling and safety precautions.

Each of these conventional technologies has its own advantages and disadvantages depending on the specific situation. The choice of technology will depend on factors such as the quality and quantity of the wastewater, the available land and resources, and the regulatory requirements for wastewater treatment in the area.

3.11. ¹⁵Why WSP with Floating wetlands are best in Kot Addu

Overall, the use of floating wetlands with WSPs can be a cost-effective and environmentally sustainable option for treating wastewater in Pakistan, where space limitations and energy constraints can be major challenges for wastewater treatment.

Floating wetlands with Wastewater Stabilization Ponds (WSPs) would be an effective solution for wastewater treatment in Kot Addu, Pakistan due to several reasons. Here are some references supporting this:

Cost-effectiveness: Constructing conventional wastewater treatment plants can be expensive, especially in rural areas like Kot Addu where infrastructure is lacking. A study published in the Journal of Environmental Management found that using floating wetlands with WSP can be a cost-effective solution for wastewater treatment in rural areas of Pakistan, including Kot Addu (Yasin et al., 2019).

Adaptability: Floating wetlands with WSP can be designed to fit the specific needs of a community or location. A study published in the Journal of Water Process Engineering found that floating wetlands with WSP can be an adaptable solution for wastewater treatment in remote areas of Pakistan, including Kot Addu (Khan et al., 2020).

¹⁶**Ecological benefits:** Floating wetlands with WSP can also provide ecological benefits by creating habitat for aquatic plants and animals. A study published in the Journal of Water Reuse and

¹⁵ Nasir, M., Shahid, S., Aslam, M., Ali, S., Shakoor, M. B., & Ahmad, I. (2021). Sustainability assessment of floating wetlands with wastewater treatment plant in water-scarce regions: A case study of Jhang, Pakistan. *Journal of Environmental Management*, 291, 112657.

Yasin, M., Khalid, S., Shahid, S., Ali, S., & Shakoor, M. B. (2019). Floating wetlands for wastewater treatment and reuse in water-scarce regions. *Journal of Environmental Management*, 236, 558-567.

¹⁶ Khan, M. A., Khan, M. I., Adil, M., Farooq, R., & Akhtar, M. (2020). Treatment of domestic wastewater using floating wetlands technology in remote areas of Pakistan. *Journal of Water Process Engineering*, 38, 101523.

Desalination found that floating wetlands with WSP can support the growth of wetland vegetation and improve water quality in Kot Addu (Ahmad et al., 2020).

Overall, these studies support the idea that floating wetlands with WSP can be a viable and sustainable solution for wastewater treatment in Kot Addu, Pakistan.

3.12. No-Project Option

If no project option is triggered, then we will lose all benefits, opportunities and positive impacts originate due to the project such as:

- The project comprises of Replacements of components of the existing Municipal Infrastructure to improve the service delivery of MC. Presently, the recovery from user charges is very low because of unsatisfactory service delivery but with improvement of service delivery, it is expected that the revenue recovery will also improve.
- MC is proposed to levy user charges on the services provided by MC which will increase the revenue from the Project.
- Increase in efficiency of all infrastructure components
- Improved service delivery level
- Improved hygienic conditions in the city
- Reduction in vector breeding and generated diseases
- Elimination of obnoxious smell
- Reduction in medical expenditures by Public on health

3.13. Description of Project

Comprehensive Sewerage System in Kot Addu City

1. Rehabilitation of Existing Sewerage System
(Missing Sewers and replacement of existing lines, Desilting of Sewer lines and existing disposal stations, manhole covers, disposal stations pumping machinery replacement)
2. Improvement of Sewer Network (10.42 km)
3. Construction of 1x New Disposal Station
4. Construction of Sullage Carrier (3400 Rft)

Ahmad, S., Abbas, M., Majeed, H., Ahmad, R., & Ashfaq, A. (2020). Floating wetlands for improving water quality in Jhang district, Pakistan. *Journal of Water Reuse and Desalination*, 10(3), 315-322.

5. Construction of Surface Drain (21767 Rft)
6. Construction of HDPE Force mains (9000 Rft)
7. Construction of Waste Water Treatment Plant
 - a. Inlet Channel and Effluent Drain = 1100 Rft
 - b. Facultative Ponds = 03 Length = 586 Rft Width = 155 Rft Height = 5 Rft
 - c. Anaerobic Ponds = 03 Length = 220 Rft Width = 111.5 Rft Height = 5 Rft

3.14. Sewage Flow Estimation

The most fundamental factor for planning and designing sewerage systems is the estimation of the sewage flow. Otherwise, sewers may prove inadequate resulting in overflow or may prove too large in diameter, which may make the system uneconomical and hydraulically inefficient. Sewage flow calculations will be based on the following parameters;

Domestic Sewage Flow

Sewage production is based on the water consumption. Average water consumption is taken as 40 GPCD. Normally about 80 percent of the per capita consumption of water becomes wastewater. For population up to 100,000 persons, 80 percent of the total water demand will be taken as sewage flow while for population more than 100,000 persons, 85 percent of the total water demand will be taken as domestic sewage flow. For the project area, 80% of the water demand will be taken as sewage generation.

The capacities of the sanitary sewer must be sufficient to carry peak flows, rather than the average flow because the rate of flows for any design point will vary substantially depending on the local water use customs, climate conditions, the day of the week, the hour of the day etc. So, waste water collection system shall be designed to handle peak flows. The peak flow will be calculated by following formula:

$$\text{Peak flow} = \text{Avg. daily flow} * \text{Peak factor}$$

Peak Factor depends upon the population; it decreases with an increase in population. According to PDSSP 2008, Peak Factor shown in the Table 5 below will be taken for the computation of peak flows;

Table 5: Population and Peak Factor

Population	Peak Factor
Up to 5,000	4.50
5,000 to 10,000	4.00
10,000 to 25,000	3.5
25,000 to 50,000	3.00
50,000 to 100,000	2.50
More than 100,000	2.00

Non-Domestic Sewage Flow

The non-domestic sewage allowance will be taken as 85% of average water consumption that will cover institutional, commercial and small industrial discharges.

Infiltration Rate

This is additional quantity due to groundwater seepage in to sewers through faulty joints or cracks formed in the pipes. The quantity of the water depends upon the height of the water table above the sewer invert level and permeability of the ground soil. If water table is well below the sewer invert level, the infiltration can occur only after rain when water is moving down through soil. PHED Criteria will be followed for infiltration rate for the selected localities of the project area.

Storm Water Allowance:

Keeping in view the project area, 50% of peak flow will be taken as storm water allowance for all semi-urban as well as urban areas.

Total Sewage Flow:

Total sewage flow shall be the sum of all the above flow and sewers/conduits shall be designed on this total sewage flow.

$$\text{Total flow} = \text{Peak sewerage flow} + \text{Infiltration} + \text{Storm water Allowance}$$

DESIGN PARAMETERS

Flow Velocity:

The flow velocity inside the sewer should neither be so large as to require heavy excavation and high lift pumping, nor should be so small causing deposition of the solid in the sewers. The velocity that would not permit the solids to settle down and even scour the deposited particles of a given size is called as self-cleansing velocity. This minimum velocity should at least develop once in a

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day so as not to allow any deposition in the sewers. Thus, the minimum velocity generated in sewers will help in the following ways:

- Adequate transportation of suspended solids,
- Keeping the sewer size under control and
- Preventing the sewage from decomposition by moving it faster, thereby preventing evolution of foul gases.

Following are the limits of the velocities in sewers;

Desirable minimum/ Self-cleansing velocity = 2.5 ft/sec

Maximum velocity = 8.0 ft/sec

Hydraulic Formulae for Determining Flow Velocities

Manning's equation will be used to determine design velocity and longitudinal slope in the sewer line:

$$V = 1/n \times R^{2/3} \times S^{1/2}$$

Where:

V=Velocity of flow in m/sec or ft/sec

R=Mean hydraulic radius in meters or feet

n = Roughness Co-efficient

S = Slope of sewer

SEWER CAPACITY

The full carrying capacity of the sewer pipe will be calculated as follows: $Q = A \times V$

Where,

Q= Flow in cu. m/sec or cu.ft/sec

A= Cross sectional area in sq.m or sq. ft V= Flow velocity in m/sec or ft/sec

DEPTH OF MINIMUM COVER TO SEWERS

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Minimum earth cover over the crown of pipes will be 3 feet (or 1 meter) from the finished ground level/ road level. However, in case of sewer laid under road crossings, sand will be filled to provide cover instead of earth.

MINIMUM DIAMETER OF PIPES

The minimum diameter of pipes to be used shall not be less than 225 mm (9 inches).

Manholes

A) Location

Manholes will be located according to conventional sewer network design i.e., starting point, junctions between sewers and change in direction and grades etc. However, it may be provided in between existing manholes for desilting purposes.

B) Manhole Spacing

Following manhole spacing will be adopted for the design of sewerage system;

C) Manhole diameter

Following manholes dimensions will be adopted for sewerage systems of project area;

SEWAGE DISPOSAL STATIONS

Sewage lift/ pump station are required to pump sewage collected from various sewage zones to the disposal point. The details of Sewage lift/ pump station will be discussed in the following sections.

Sewage Lift Station

Lift station will be provided when sewer reaches a depth where excavation is no more practically and economically possible. It will consist of a wet well and a dry well to accommodate non-clogging centrifugal pumps while only wet well would be required for submersible pumps.

SEWAGE PUMP STATION

The sewage pump station will pump the sewage collected from the entire sewage zone. Types of sewage pumping stations installations either wet-well or wet/dry-well along with screening chamber are studied keeping in view the site circumstances.

Main Components of Sewage Pump Station

Following are the main components of sewage pump stations:

- i. Influent Chamber and Channels
- ii. Wet well
- iii. Dry well
- iv. Sewage Pumps
- vi. Suction and Discharge Piping

3.15. Design Criteria of Wastewater Treatment Plant

3.15.1. Design Criteria of Temperature

1. No design Manual available WSP in Pakistan. So, there could be used only a similar climate area's research and development findings.
2. Mr. Duncan Mara developed a design manual for WSPs in India in 1997 which was adopted by Indian Govt. and implemented throughout the country.
3. The same reference has been adopted in Pakistan in this case as Pakistan has almost same climate conditions.
4. This design manual suggests 20° C for local environment which is adopted same here. (Mara, 1997).
5. Adopted design temperature of 20° C shall result in significant reduction in area requirement (more than 50% less) as well as capital cost of proposed WWTP. At adopted design temperature of 20° C, treated effluent BOD (both filtered and unfiltered) will remain within PEQS limits throughout the year if WSP is properly operated and managed.
6. Mr. Mara in 2007 have suggested the same 20° C in is another study "Waste stabilization pond performance in Pakistan and its implications for wastewater use in agriculture".
7. Other references use to validate the same temperature are as
 - a. "Waste stabilization Ponds" by Marcos von Sperling volume III IWA 2007.
 - b. "Waste stabilization Ponds for Wastewater Treatment, Anerobic Ponds" by Fernando J. Trevino Quiroga
 - c. "Waste Stabilization Ponds and Constructed Wetlands Design Manual" by Kayombo et al. 2004.
 - d. "Waste Stabilization Ponds, Design Guidelines for southern Pakistan" by Dr. Mansoor Ali Khowaja 2000.

Moreover, two WWTPs are under construction in Pakistan on the same technology i.e., “Waste Stabilization Ponds” under ADB fund by PICIIP. Sahiwal WWTP and Sialkot WWTP and in both plants same 20° C has been adopted and same reference has been used.

3.15.2. Geo-Technical Investigation

Before designing of wastewater treatment plant, Geo-Technical Investigations were carried at the proposed site.

Field Investigation

Field investigation comprises the following:

Drilling

As per recommended practice of ASTM D-420, percussion method was adopted for sub-soil exploration. The hole was advanced by hand augur drilling method. The drilling of the holes was carried out up to 50.0 feet depth from existing ground level.

Standard Penetration Test

The objective of this test is to ascertain the resistance afforded to the penetration apparatus to a defined 12” depth. This test gives valuable information regarding the compactness of underlying strata. The test was performed in accordance with ASTM D 1586-84 by Donut type manually operated hammer. Generally, The SPT N-value Increases downward. The degree of compactness and SPT N values of underlying strata represented in borehole logs.

Disturbed Sampling

After the boring is advanced to the desired sampling depth, the disturbed samples are collected with help of spilt spoon sampler. The disturbed sample have been collected and preserved in the Jars which have been properly indexed and transported to the Laboratory

Water Table

At the time of these investigations ground water table were not encountered at under given depths in Exploratory Boreholes in the month of Oct 2023.

Laboratory Testing

Selected soil samples were tested for evaluation of physical and engineering characteristics of the sub-soils, in the laboratory. The laboratory testing was carried out at testing facilities of STS. The following laboratory tests were performed on selected soil samples.

- Sieve Analysis
- Hydrometer Analysis
- Atterberg's limits
- Direct Shear Test
- Moisture Content

Sieve Analysis

Soil samples selected for classification from the various depths after proper treatment were sieved under wet conditions in accordance with ASTM Standard. The curves have been plotted graphically and attached at end of this report.

Sedimentation/Hydrometer Test

The soil samples collected from the drill hole were sieved through No. 200, but to differentiate between silt and clay fraction, sedimentation test was employed in this test soil sample was treated with very diluted HCL and then with Sodium met phosphate for deflocculating. The procedure defined in ASTM standard for Hydrometer analysis was followed. The % age of different sizes were plotted on the grain size curves.

Atterberg's Limits (Liquid & Plastic Limits)

The cohesive soil retrieved with the help of split spoon sampler was tested for liquid and plastic limits in accordance with ASTM D-4318-84. The consistency limits of cohesive soils at various depths. Detail results shown in summary sheet.

Direct Shear Test

The soil possessing non-cohesive characteristics were prepared and tested for their angle of internal friction ϕ and cohesion C in accordance with ASTM D3080. The detailed results are given at summary sheet.

Field Moisture Content

The soil samples collected from the bore holes with shell by tube were tested for their field moisture contents.

Conclusions and Recommendations

1. During these investigations, the subsurface was explored to a maximum depth of 10.0, 25.0 and 40 feet below the existing ground surface. Various soil layers encountered at the site below the existing ground surface are described in borehole logs.
2. To provide foundation options to the structural engineer/designer, shallow foundations have been proposed. The shallow foundation may be square, strip or raft foundations as per objective of load and site conditions.
3. In case the floors are to be placed on in-situ soils then the top layer of soil containing organic matter and roots must be excavated and replaced with two 150 mm thick compacted layers of engineering fill comprising suitable granular material.
4. If required back filling, engineering fill A-2-4(0) should be used as a back-fill material.
5. The soils at foundation level must be carefully inspected prior to placing the foundations to ensure that the soils are similar to those encountered in the boreholes. In case any loose/ weak material or fill material is encountered in the foundation excavation, it must be completely removed and replaced with properly compacted engineering fill prior to placing the foundations. The foundation excavation must be protected from ingress of water during foundation construction.
6. Plinth protection slab sloping away from the buildings should be provided around the structure to reduce ingress of water to foundation soils.
7. Proper surface drainage should be provided in the project area and the area should be graded to keep the surface runoff away from the structure. The ingress of water from any source should be avoided.
8. The side slopes should be stabilized and erosion of the soil and ingress of water into the soil must be protected.

All these conclusions are made part of design of WWTP. Likewise, highest quality geomembrane will be used to protect ground water resources and ecological environment having advantages of:

1. Low cost
2. Good anti-seepage ability
3. High strength
4. Good ductility
5. Good chemical stability
6. Good resistance to ultraviolet light aging, and

7. Resistance to rodent and microbial attack

To ensure the ideal installation and construction quality, the base layer will be further inspected to ensure that the surface of the base layer is flat and smooth, and there is no debris that may damage the geomembrane, such as rocks, tree roots, and sharp objects. There should be no right-angle rigid structure at the bending part of the geomembrane, and it should be made into an arc shape.

3.15.3. Wastewater Quality Analysis

The design of WWTP has been designed on the waste water analysis conducted in Dec 2023 by Pak Green laboratory. Samples were taken from different location for which results are mentioned in Table 3. The results showed that the level of BOD, TSS and COD are exceeding the PEQs.

Keeping baseline of these wastewater quality analysis, 275 ppm BOD is taken as influent for design criteria of WWTP.

3.15.4. Design Criteria of Wastewater Flow

For proposed project design average flow is taken as 18.58 cusec which is approx. ¹⁷10 MGD which is designed for served population for the period of 20 years. Presently (Year 2023) about 60 percent population is being served with sewerage facility. Additional 40 % population is assumed to be served / benefitted by the sewerage facility due to project investment. Over 20-year period of analysis for the population is calculated on the basis of 85 person/ acre with household size 6 will be 241,916 assumed to be served in Kot Addu by the proposed facility due to project investment.

3.16. Cost and Magnitude of Operation

The total cost of the project is estimated to be PKR 1212.582 million, which is further divided into various components/items as shown in below Table 6:

¹⁷ Technical and Service Delivery Standards for Water Supply and Sanitation Sectors page No 64 section 3.4.3 Design flow

Table 6: Cost of Project

SN	Description of works		Total cost in PKR Million
1.1	RCC Sewer		433.263
1.2	Disposal Work		91.287
1.3	HDPE Force Main		243.460
1.4	Surface Drain		21.005
1.5	Sullage Carrier		18.994
	Construction of Waste Water Treatment Plant		258.435
	Total work Outlay		1066.444
1.6	Environmental & Social Mitigation and Monitoring Cost		7.5
	Price Contingencies	2%	21.329
	Consultancy Charges	1%	10.664
	PST-5%	5%	53.322
	Escalation	5%	53.322
	Total Cost (Millions)		1212.582

3.17. Schedule of Implementation

Project development will be executed as soon as the no objection certificate (NOC) from the EPA, Punjab and other required approvals from various departments will be issued. The project is to be completed within 1.5 years.

Implementation Schedule/Duration: 1.5 years maximum.

No. of workers involved: 40 approx.

Expected Starting Date: February, 2024

Expected Completion Date: June, 2025

3.18. Existence of Utility Services within RoW

There is no existence of Sui gas, water supply, electric tower and fiber optic lines etc. within construction zone of the project.

3.19. Temporary Storage Area

Contractor will systematically layout his construction material within the premises of the sub-Project because ample space is available. Contractor will not be allowed to stockpile construction material on any other site.

3.20. Purpose of ESIA

Environmental and Social Impact Assessment (ESIA) report is being submitted to the Environmental Protection Agency (EPA) Government of the Punjab, for the compliance of Section 12 of Punjab Environment Protection Act-1997 (Amended 2012) for obtaining No Objection Certificate (NOC) before starting the construction activity at the sub-project site. The other relevant regulations and guidelines considered while preparing this ESIA report include:

- Policy and procedures for filing, review and approval of environmental assessments
- Guidelines for the preparation and review of environmental reports
- Guidelines for public participation writer
- Guidelines for sensitive and critical areas
- Detailed sectorial guidelines

Various aspects like environmental, social, physical and other aspects of the sub-project both during construction and its regular occupancy are highlighted in this ESIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around are also described. All the important information is also provided as described under the format used to help decision makers (EPA Punjab), before issuing the desired Environmental Approval.

At this stage, the environmental approval from the EPA, Punjab Lahore is the major requirement prior to the execution of subproject. Consequentially during the approval process followed by NOC from EPA, clearance from WB will also be attained.

3.21. Operation & Maintenance Activities

- Establishment of Fire Safety Station and equipment
- Installation of Security Cameras and boundary wall
- Maintenance of Landscaped area
- Operational activities of Municipal Waste through Sanitary Staff

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- Establishment of administration block
- Establishment of lab facility

Chapter 04

ENVIRONMENTAL AND SOCIAL BASELINE DATA

4.1 Review

This section describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Project Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other relevant agencies.

This chapter is divided in to three Sections.

The aim of describing the environmental conditions of the study area is:

- To understand the environmental characteristics of the area
- To assess the existing environmental quality, as well as the environmental impacts of the future developments being studied
- To identify environmentally significant factors or geographical areas that could influence any decision about future development.

The purpose of socio-economic survey was to compile information about:

- The generic characteristics of nearby communities
- Socio-economic status
- Cultural traditions
- Social issues and religious affiliations

A site visit was planned to obtain environmental data on physical, biological and socioeconomic parameters in Dec 2023. In addition to that, interviews with stakeholders, consultation with general public in the surroundings as per need and meeting with concerned government departments regarding project were held to obtain NOC of proposed project. The team comprised SPO ESM, PO ESM, DPO ESM, DPO ESS and MC officials.

Baseline data includes an inventory of physical, ecological and socio-economic parameters in order to identify any potential impact on and changes to the natural and socioeconomic aspects. Covering these aspects, data has been grouped into three sections:

4.2 Physical Environment

The physical environment baseline studies describe the physical conditions and characteristics in the defined study area around and within the Project site.

Physical features of proposed area are given as;

4.2.1. Topography¹⁸

Kot Addu Town is located at east of the Indus River at distances of about 100 km from Multan, 80 km from D.G. Khan, 60 km from Muzaffargarh, 60 km from Layyah and 16 km from Taunsa Barrage. The area around the city is a flat flood plain and is ideal for agriculture. Two main canals (Muzaffargarh Canal, and Taunsa-Panjinad link canal) off taking from Indus River, are flowing at the northern and eastern side of the city.

The geographical coordinates of the Kot Addu are: N 30° 28' and E 70° 58'. Kot Addu city is located at an average elevation of 133 meters above sea level. The city is located in flood plain of River Indus at its left bank and the lands around this town are affected by flood water when the Indus River goes in very high floods.

4.2.2. Geology¹⁹

The prevailing geologic conditions in the region are the results of extensive inundation, depositions, coastal movements, and erosions over a long period of time in the geological ages. The geology of the region is closely related to the formation process of Himalayan ranges resulting in intense deformation with complex folding, high angle strike-slip faults and crust thickening expressed in a series of thrust faults.

Kot Addu is an agricultural city and is divided into two areas on the basis of climate and soil type. One side has rich loamy soil with poor drainage, and is irrigated by the Muzaffargarh Canal. Major crops sown in this part are wheat, rice, sugarcane and cotton. Due to the presence of sugar mills situated in Kot Addu, sugarcane is harvested over a large area. Geographically, the land is leveled and rich in nutrients but due to prolonged cultivation of sugarcane, the problems of water logging and salinity are cropping up. The other part of Tehsil Kot Addu is mainly rainfed and comprises sand dunes. Number of farmers have successfully levelled the sand dunes and brought them under cultivation. Some of the farmers also use modern irrigational facilities such as drip irrigation and rain guns. The main crops sown in the area are wheat and gram. A large number of citrus orchards have also been established in the surrounding area of Chowk Sarwar Shaheed in Kot Addu. The trend of planting citrus is on the rise owing to its high commercial value.

¹⁸ <https://pmdfc.punjab.gov.pk/system/files/Kotaddu-GAR.pdf>

¹⁹ https://gazetteers.punjab.gov.pk/uploads/chapters/chapter_29-pdf.pdf

4.2.3. Soil

Healthy soil consists of roughly 40% mineral, 23% water, 23% air, 6% organic material and 8% living organisms. Soil texture is concerned with the relative proportions of mineral particles of various sizes in a soil. These particles are grouped into three basic categories: sand, silt and clay. Sand particles are the largest ones in soil other than gravel or other rocks. Intermediate sized particles are called silt. The very smallest particles in soil are clay.

The soil of Project Area is 6.76% sandy loam, 85.92% loam and 7.32% clay. Project area has been endowed by nature with a rich soil, aided by an efficient irrigation system. The soil of Project Area is suitable for almost all main and major crops like wheat, rice, sugarcane, gram, all sorts of pulses and oil seeds, jawar, bajra and maize. Almost all the area is plain cultivable land. As per Soil Survey of Pakistan, the soil of project area is classified as Class-1 very good (loamy) irrigated land.

4.2.4. Climate and Meteorology²⁰

Ambient Air Temperature

Project area is characterized by extreme climate. The summers are sweltering, humid, and clear and the winters are short, cool, dry, and mostly clear (Figure 11). Occasionally, there are few dust storms. The summer may be somehow discomforting, but for the greater part of the year the climate is ideal and invigorating. The temperature is generally hot, with marked variations between summer and winter. Over the course of the year, the temperature typically varies from 45°F (7°C) to 107°F (42°C).

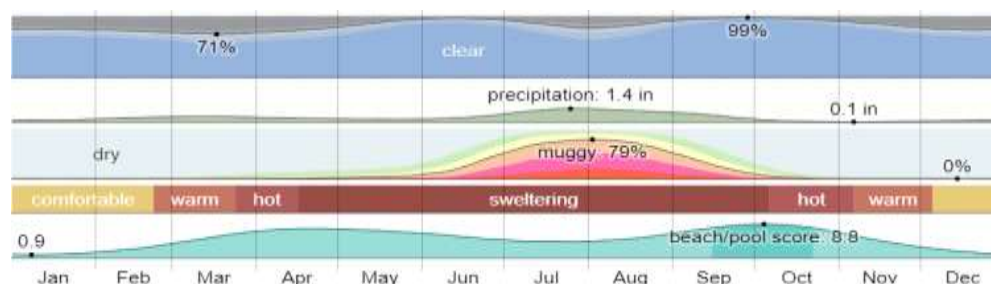


Figure 9: Summary of Climate of Project Area (Source: Weather spark)

²⁰ <https://weatherspark.com/y/106984/Average-Weather-in-Kot-Addu-Pakistan-Year-Round>

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The hot season lasts for 4.1 months, from April 26 to August 30, with an average daily high temperature above 99°F. The hottest month of the year in Kot Addu is June, with an average high of 106°F and low of 86°F. The cool season lasts for 2.7 months, from December 2 to February 23, with an average daily high temperature below 76°F. The coldest month of the year in Kot Addu is January, with an average low of 45°F and high of 68°F as shown in Figure 12.

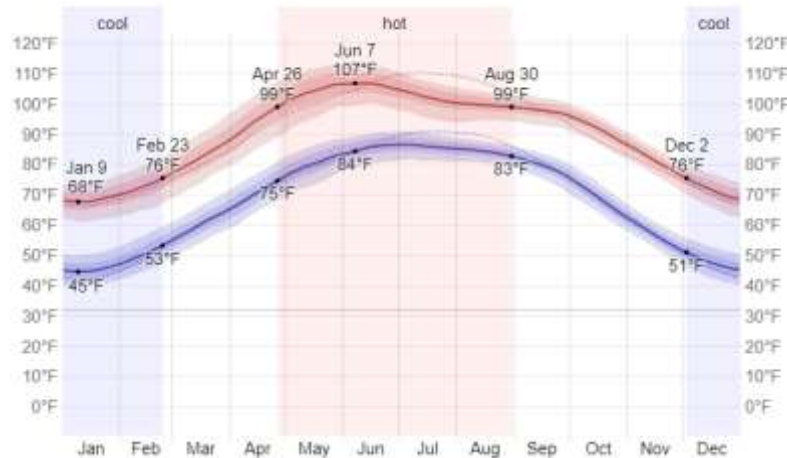


Figure 10: Average High and Low Temperatures at Project Area (Source: Weather spark)

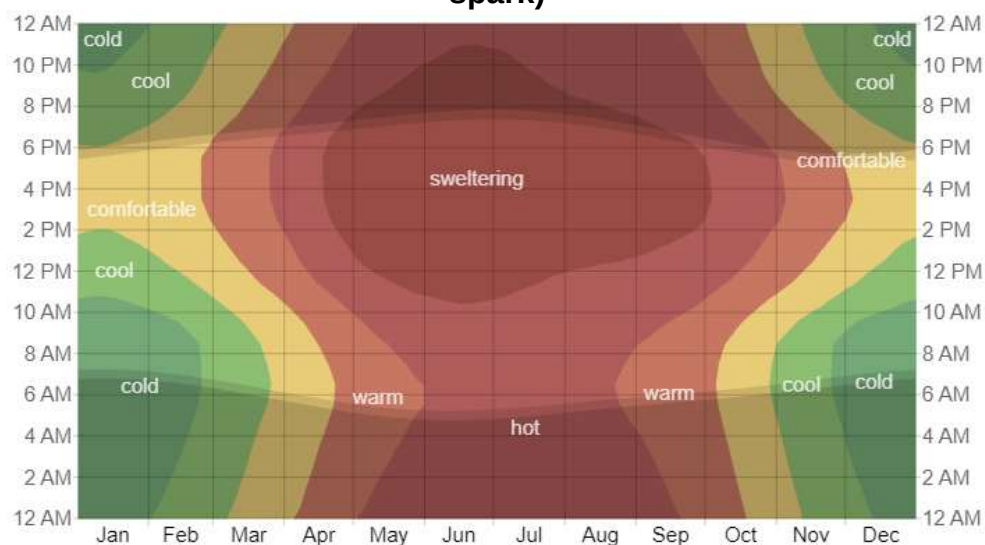


Figure 11: The Average Hourly Temperature at the Project Area (Source: Weather spark)

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in Kot Addu varies throughout the year.

The wetter season lasts 6.0 months, from March 10 to September 11, with a greater than 11% chance of a given day being a wet day. The month with the most wet days in Kot Addu is July, with an average of 5.7 days with at least 0.04 inches of precipitation. The drier season lasts 6.0

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months, from September 11 to March 10. The month with the fewest wet days in Kot Addu is November, with an average of 0.5 days with at least 0.04 inches of precipitation.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. The month with the most days of rain alone in Kot Addu is July, with an average of 5.7 days. Based on this categorization, the most common form of precipitation throughout the year is rain alone, with a peak probability of 20% on July 14. (Figure 14).

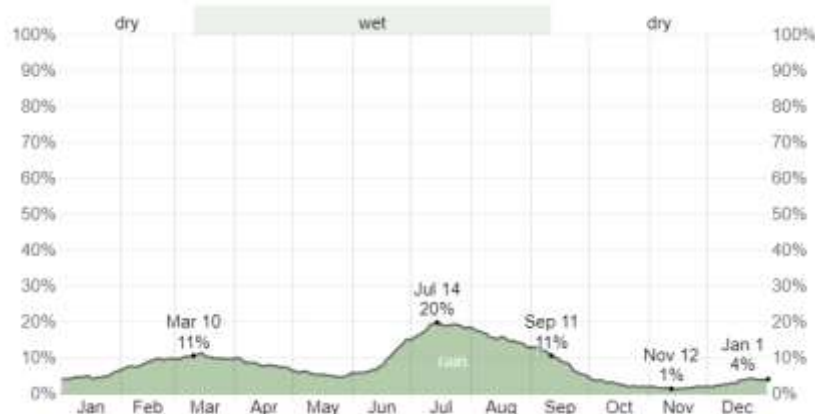


Figure 12: Daily Chance of Precipitation in the Project Area (Source: Weather spark)

Rainfall

Project area experiences seasonal variation in monthly rainfall. The rainy period of the year lasts for 7.3 months, from February 15 to September 24, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Kot Addu is July, with an average rainfall of 1.3 inches. The rainless period of the year lasts for 4.7 months, from September 24 to February 15. The month with the least rain in Kot Addu is November, with an average rainfall of 0.1 inches. (Figure 15).

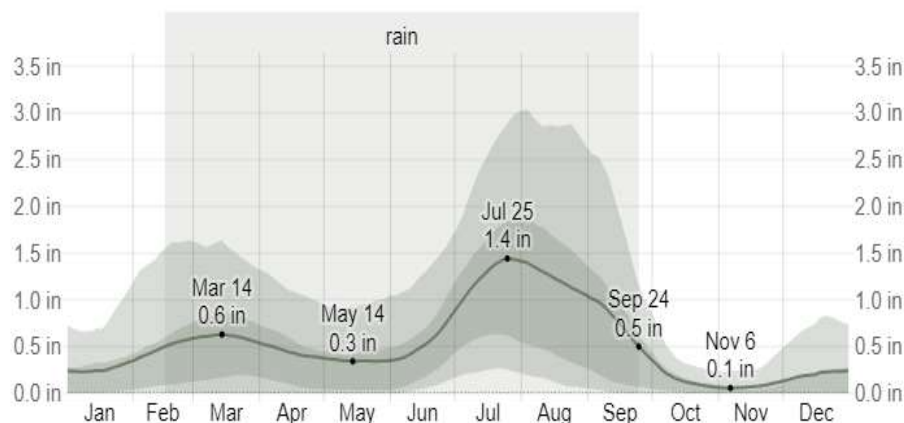


Figure 13: Average Monthly Rainfall at the Project Area (Source: Weather spark)
Sunshine hours

The length of the day in Kot Addu varies significantly over the course of the year. In 2023, the shortest day is December 22, with 10 hours, 11 minutes of daylight; the longest day is June 21, with 14 hours, 7 minutes of daylight (Figure 16).

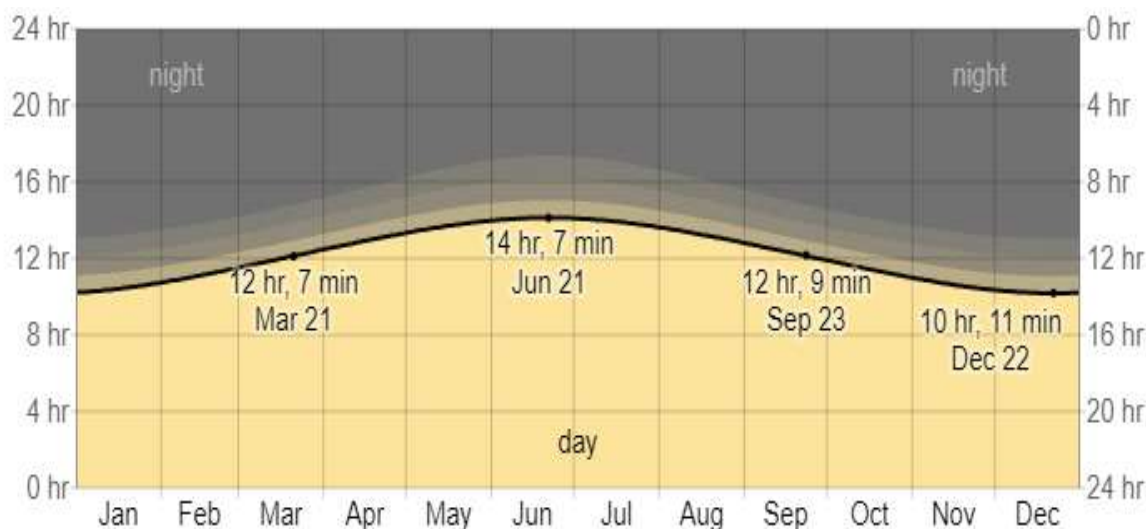


Figure 14: Annual Variation in Length of Day at the Project Area (Source: Weather spark)

The earliest sunrise is at 5:13 AM on June 12, and the latest sunrise is 2 hours, 1 minute later at 7:14 AM on January 10. The earliest sunset is at 5:14 PM on December 3, and the latest sunset is 2 hours, 8 minutes later at 7:22 PM on July 1 (Figure 17).

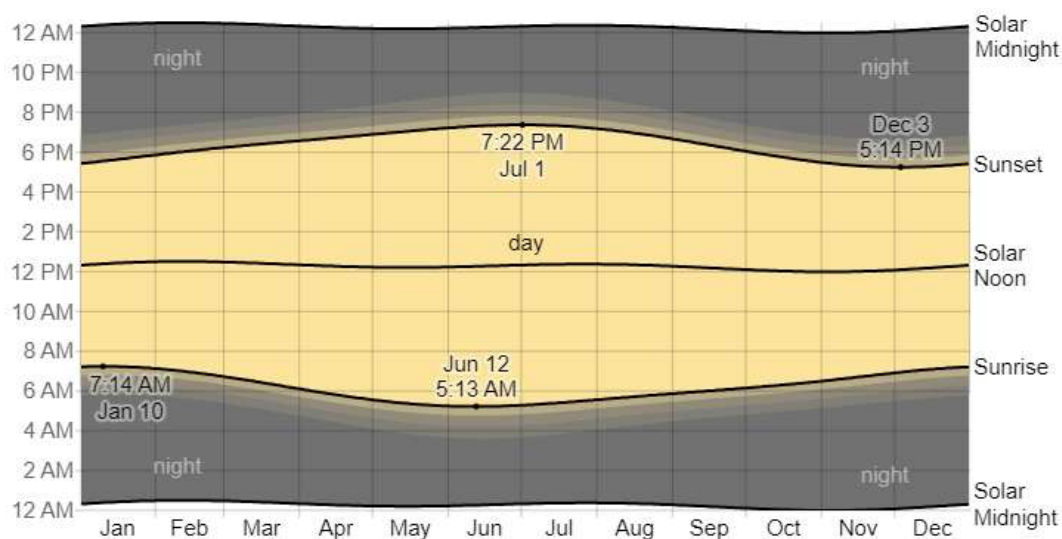


Figure 15: Sun Rise and Sun Set Timings at the Project Area (Source: Weather spark)

Humidity comfort level is based on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid.

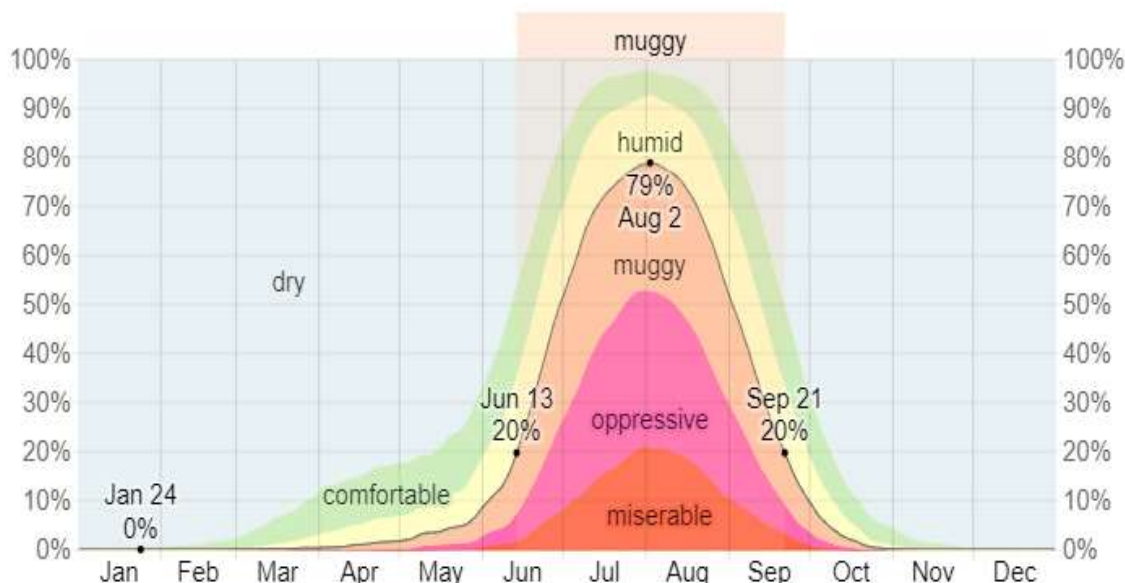


Figure 16: Sun Rise and Sun Set Timings at the Project Area (Source: Weather spark)

Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night.

Kot Addu experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 3.2 months, from June 13 to September 21, during which time the comfort level is muggy, oppressive, or miserable at least 20% of the time. The month with the muggiest days in Kot Addu is July, with 21.9 days that are muggy or worse. The least muggy day of the year is January 24, when muggy conditions are essentially unheard of (Figure 18).

Wind Characteristics

The average hourly wind speed in Kot Addu experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 3.8 months, from May 3 to August 27, with average wind speeds of more than 6.7 miles per hour. The windiest month of the year in Kot Addu is June, with an average hourly wind speed of 7.8 miles per hour. The calmer time of year lasts for 8.2 months, from August 27 to May 3. The calmest month of the year in Kot Addu is December, with an average hourly wind speed of 5.3 miles per hour. (Figure 19).

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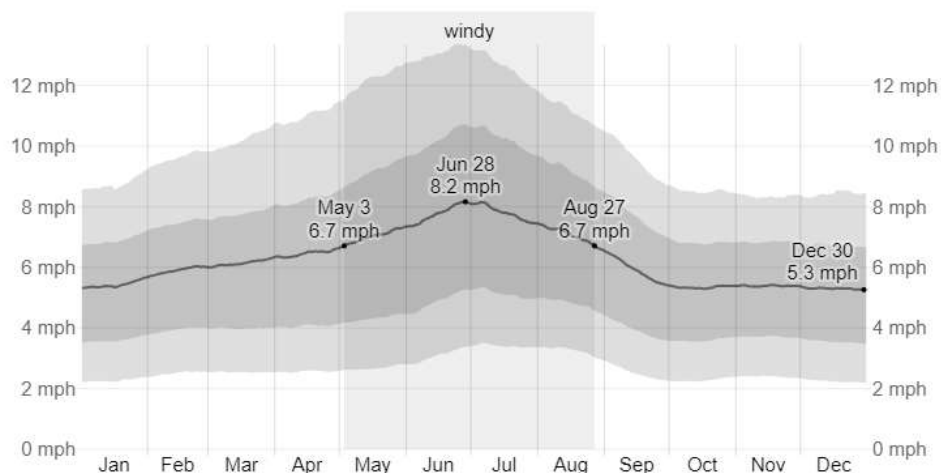


Figure 17: The Average of Mean Hourly Wind Speed at the Project Area

The predominant average hourly wind direction in Project Area varies throughout the year. Figure 20 & 21 show the Average Annual Wind Direction at the Project Area and Wind Rose for the Project Area respectively. The wind is most often from the south for 4.4 months, from May 23 to October 4, with a peak percentage of 62% on August 12. The wind is most often from the north for 7.6 months, from October 4 to May 23, with a peak percentage of 47% on January 1.

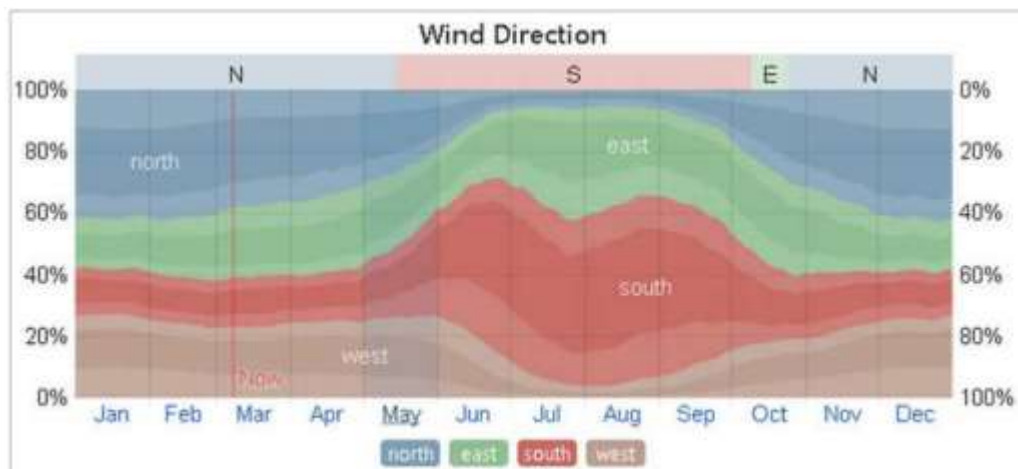


Figure 18: Average Annual Wind Direction at the Project Area (Source: Weather spark)

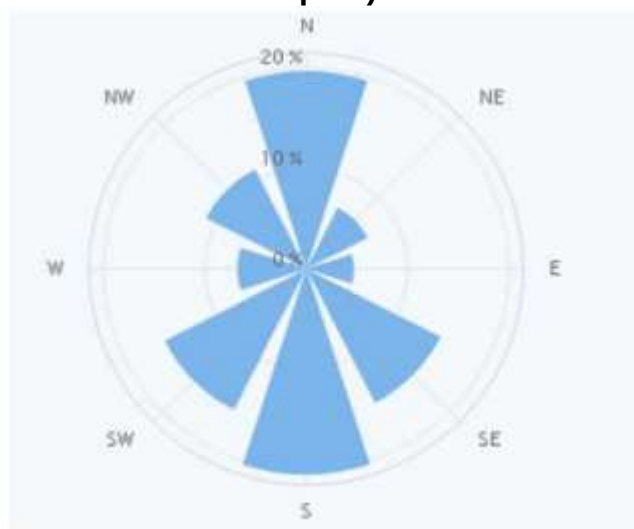


Figure 19: Wind Rose for the Project Area (Source: World weather Climate Change)

Based on the Pakistan Meteorological Department (PMD) station data from 1951 to 2000, a rising tendency in the annual mean surface temperature was observed in the Project Area (Figure 22). There is an increase of 0.97°C in winter, 0.22°C in summer and 0.54°C annual increase in the Project Area²¹. The continuous and longtime span data of various meteorological parameters of 56 selected PMD meteorological stations showed the behavior of summer and winter maximum and minimum temperatures during the last decade. A time series of area-weighted mean annual temperatures of Pakistan for the years 1961 to 2013, after applying uniform weighing factor, based on regional surface feature characteristics for all the climatic zones of Pakistan, is shown in Figure 22 & 23.

²¹ Asian Development Bank, 2017, Climate change profile of Pakistan: <https://www.adb.org/sites/default/files/publication/357876/climate-change-profile-pakistan.pdf>

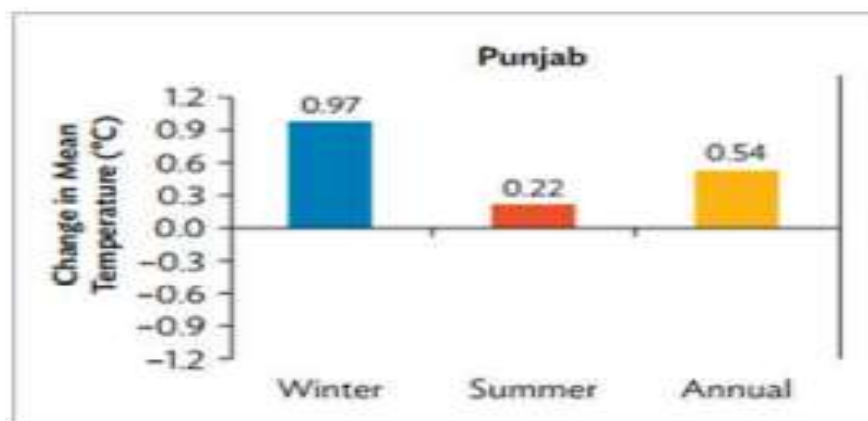


Figure 20: Changes in mean temperature

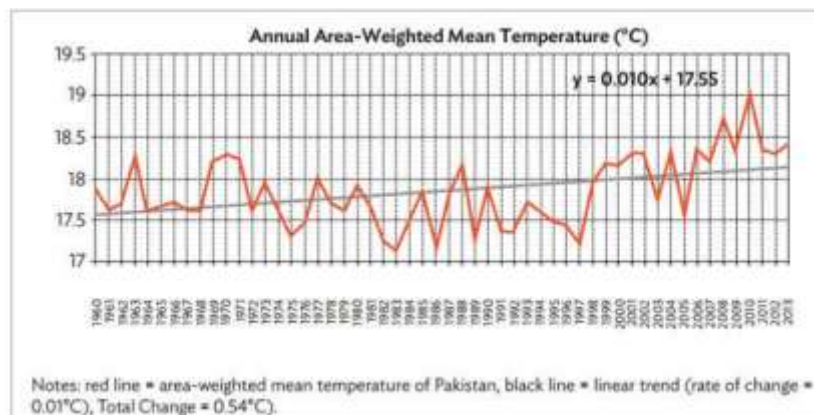


Figure 21: Mean Temperature

It is observed in this study that the warming trend during winter is greater than in summer. This shows that winter is shorter at both ends, hence, summer is now longer. A larger increase in nighttime temperatures than daytime temperatures is noticeable, indicating their adverse impacts on animal and agricultural productivity caused by heat stress, increased water requirements, and higher rates of respiration. In the last decade, a mixed trend in maximum temperatures has been observed during summer. However, the minimum temperature in summer in central parts of Pakistan shows a pronounced warming trend.

Past Changes in the Mean Temperature

The annual and seasonal trends in the mean annual temperature in various climatic zones of the country are listed in figure 24. It is noted that (i) the mean annual temperature has been increasing by 0.11°C in the Project Area; (ii) The Project Area show a rising trend for the pre-monsoon

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summer months (April–May), the temperature rises by 0.83°C; and (iii) the Project Area show decreasing trend for the monsoon period.

Climatic Regions	Mean Temperature Trends (°C/year)				
	Annual	Jun-Sep	Dec-Mar	Apr-May	Oct-Nov
I (a): Greater Himalayas	0.04	-0.80	0.32	1.09	-0.06
I (b): Submountain	-0.19	-0.57	0.00	0.13	0.12
II: Western Highlands	-0.72	-1.48	-0.65	0.17	-0.47
III: Central and Southern Punjab	0.11	-0.25	0.03	0.83	0.31
IV: Lower Indus Plains	-0.08	-0.55	-0.07	0.35	0.15
V (a): Balochistan Plateau (East)	0.11	0.46	0.63	0.79	0.50
V (b): Balochistan Plateau (West)	1.17	1.3	0.43	2.17	1.80
VI: Coastal areas	0.00	-0.18	0.05	0.03	0.30

Figure 22: Mean Temperatures Trends in Pakistan, 1951–2000 (in °C/year)

Source: Global Change Impact Studies Centre, 2005²²

Past Changes in the Mean Precipitation

Figure 25 shows that (i) the mean annual precipitation has generally been increasing in the project area by 0.63%, (ii) the monsoon precipitation shows the same increasing trend with 0.53% increase in the past fifty years, and (iii) the winter rains also increase by 0.99% in the Project area.

Climatic Regions	Mean Annual Precipitation Changes (%)		
	Annual	Jun-Sep Monsoon	Dec-Mar Winter
I (a): Greater Himalayas	0.49	1.73	-0.04
I (b): Submountain	0.3	0.38	0.53
II: Western Highlands	-0.02	0.22	0.00
III: Central and Southern Punjab	0.63	0.57	0.99
IV: Lower Indus Plains	0.22	0.45	-0.27
V (a): Balochistan Plateau (East)	1.19	1.16	1.14
V (b): Balochistan Plateau (West)	0.1	-0.2	-0.4
VI: Coastal areas	-0.82	-1.34	0.00

Figure 23: Percentage of Precipitation Changes on Yearly Basis in Pakistan, 1951–2000

Source: Global Change Impact Studies Centre, 2005²³

²² Global Change Impact Studies Centre. 2005. Final Technical Report for APN CAPABLE Project. Islamabad. http://www.gcisc.org.pk/2005-CRP01-CMY-Khan_CAPaBLE_FinalReport.pdf

²³ ibid

Projections of Future Climate Trends in Pakistan

The PMD conducted another significant study that computed temperature and precipitation change for different regions of Pakistan from 2011 to 2050. The climate models show a maximum rise in the central and south Punjab Province. However, mixed trends are projected for precipitation over different regions of Pakistan. Figure 26 shows the region wide changes in temperature and precipitation over Pakistan.

Region	Precipitation (mm/decade)			Temperature (°C/decade)		
	A2	A1B	B1	A2	A1B	B1
Pakistan	+1.73	+1.26	-0.89	+0.51	+0.41	+0.24
Northern areas	+4.6	+2.9	-1.3	0.76	0.63	0.39
Potohar and upper NWFP	+6.1	+3.8	-0.5	0.01	-0.34	-0.01
Central/southern Punjab and lower NWFP	-2.98	-1.78	-3.5	+0.63	+0.71	+0.05
High Balochistan	+1.48	+0.92	-0.57	+0.15	+0.26	+0.03
Southeastern Sindh	+5.1	+3.0	-0.1	0.00	-0.1	+0.01
Sindh and lower Balochistan	-1.8	-0.98	-0.05	+0.5	+0.27	+0.01

mm = millimeter, NWFP = Northwest Frontier Province and current Khyber Pakhtunkhwa.
Notes: A2 shows business as usual, A1B shows balanced scenarios, and B1 shows Ideal World (SRES Report IPCC 2001) based on greenhouse gas emissions likely in the 21st century.

Figure 24: Region wise Climate Projections for Pakistan, 2011– 2050

Source: Chaudhry et al. (2009)²⁴

4.2.5. Flood Risk

Kot Addu City, located in the Punjab province of Pakistan, is prone to flooding due to its proximity to the Chenab River. The city is situated on the left bank of the river, making it susceptible to flood events during periods of heavy rainfall or when the river overflows.

The flood risk in Kot Addu City is primarily influenced by several factors, including the monsoon season, deforestation in the surrounding areas, inadequate drainage systems, and encroachments on natural waterways. These factors contribute to an increased likelihood of flooding and its associated consequences.

During the monsoon season, which generally occurs from July to September, heavy rainfall can lead to significant increases in the water levels of rivers and canals, including the Chenab River. This increased volume of water can overwhelm the existing drainage infrastructure, causing flooding in low-lying areas of Kot Addu.

Furthermore, deforestation in the catchment areas and the encroachment of riverbanks can exacerbate the flood risk. Deforestation reduces the natural capacity of the land to absorb rainwater, leading to faster runoff into the rivers and increasing the chances of

²⁴ Q. Z. Chaudhry et al. 2009. Climate Change Indicators of Pakistan. Technical Report. No. 22. Islamabad: Pakistan Meteorological Department.

flooding. Encroachments on riverbanks can restrict the natural flow of water and cause water to overflow into nearby areas.

When Flood warnings will be raised the inflow will be stop and bypass drain will be provided to stop the flow of water from the STP to surrounding areas.

To mitigate flood risks, authorities in Kot Addu City have taken measures such as constructing embankments, improving drainage systems, and implementing early warning systems to alert residents in case of potential floods. However, it is important for individuals and communities to remain vigilant during periods of heavy rainfall and to follow the instructions provided by local authorities to ensure their safety. It will be ensured that during the design process of the project both hydrological and hydraulic design variables have been assessed using a very precautionary approach, which included much higher extreme inputs, higher return periods, high freeboards, and design provisions generally considering wide margins. Below attached diagrams indicate that Kot Addu lies in very high flood hazard zone. Emergency Preparedness and Response Plan is attached as Annexure N.

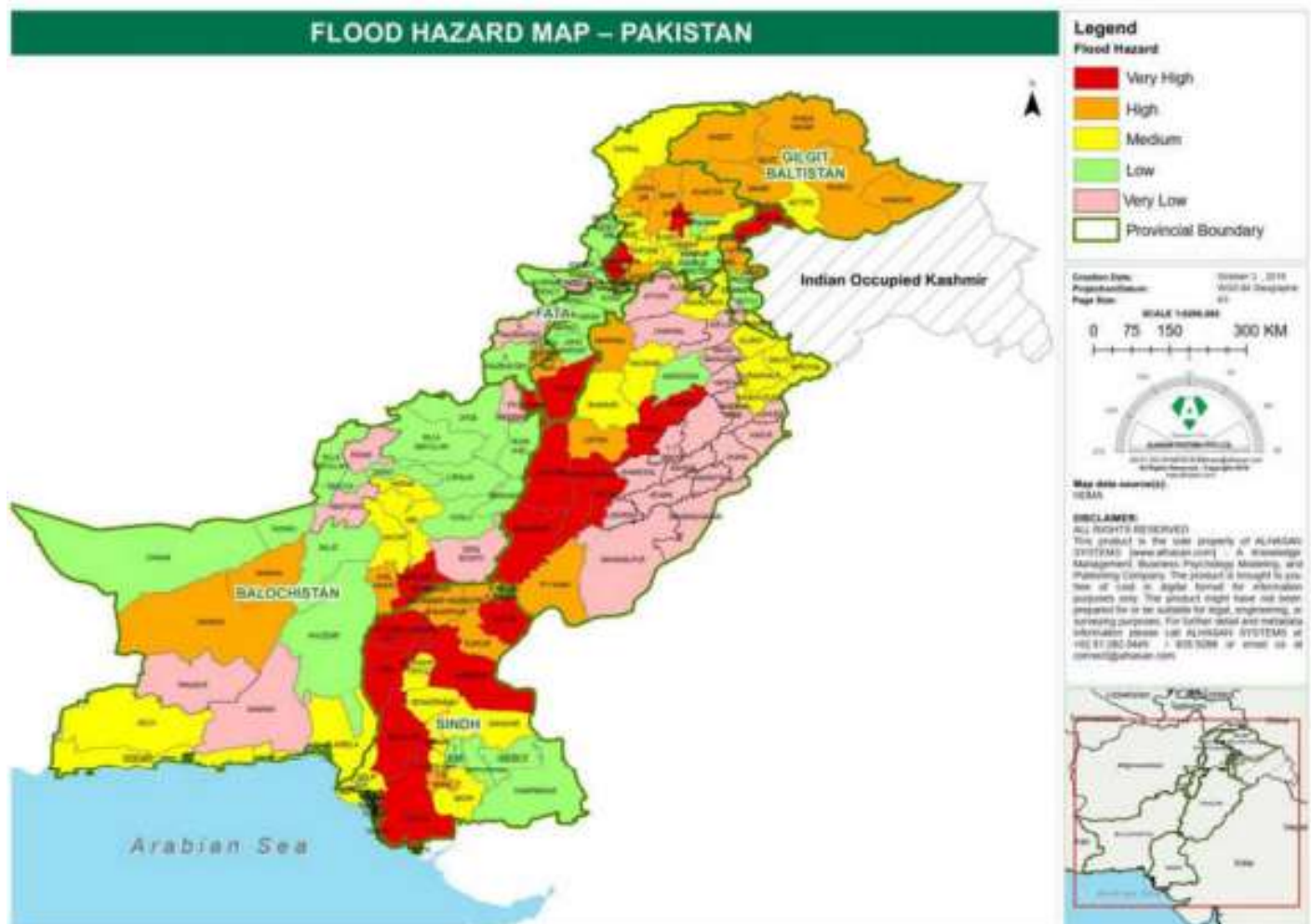


Figure 25:Source Nation Disaster Management Authority Pakistan

4.2.6. Seismologic Zone²⁵

Risk of earthquake devastations for Pakistan's cities should be realized as it is situated at the junction of three tectonic plates namely Indian, Eurasian and Arabian. According to the Seismic data of Pakistan; Kot Addu lies in the "2A zone" with minimum risks to any earthquakes as shown in figure 26 and Table 7 below:

²⁵<https://www.scirp.org/journal/paperinformation.aspx?paperid=66521>

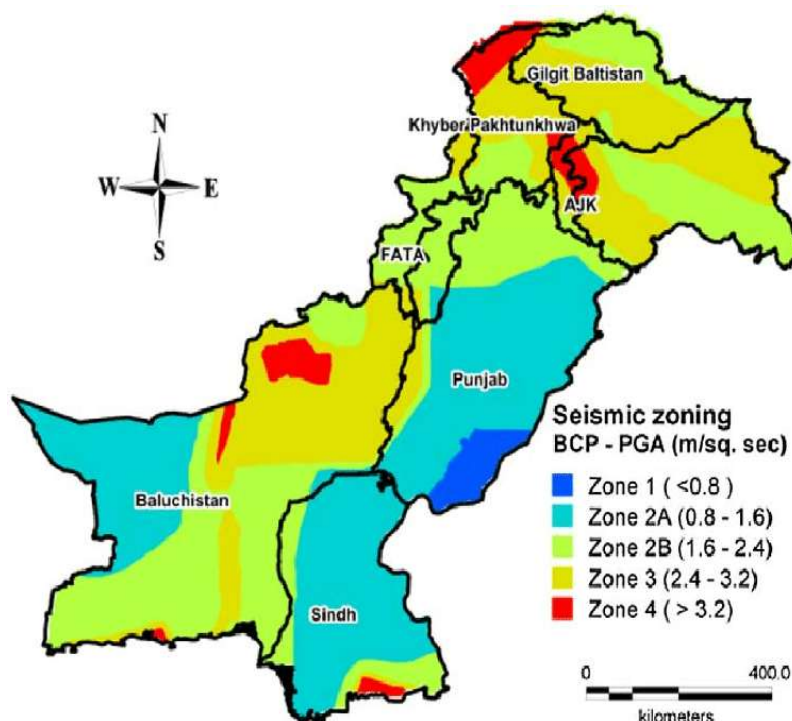


Figure 26: Seismic hazard map of Pakistan

Table 7: Seismic zones

Tehsil	Seismic Zone	Tehsil	Seismic Zone	Tehsil	Seismic Zone
Punjab					
Dera Ghazi Khan	2A	Alipur	2A	Jatoi	2A
De-Ex.Area of D.G.Khan	2B	Kot Addu	2A²⁶	Shujabad	2A
Taunsa	2B	Gojra	2A	Muzaffargarh	2A

Geo-hazards are geological and environmental conditions and involve long-term or short-term geological processes. The earthquake is the only potential geo-hazard at the project area. According to building code of Pakistan, the Project Area is located in moderate Seismic Zone 2A of Pakistan. Zone 2A represents Peak Ground Acceleration (PGA) from 0.08 to 0.16 g.

26 https://iisee.kenken.go.jp/net/seismic_design_code/pakistan/pakistan_table111.html

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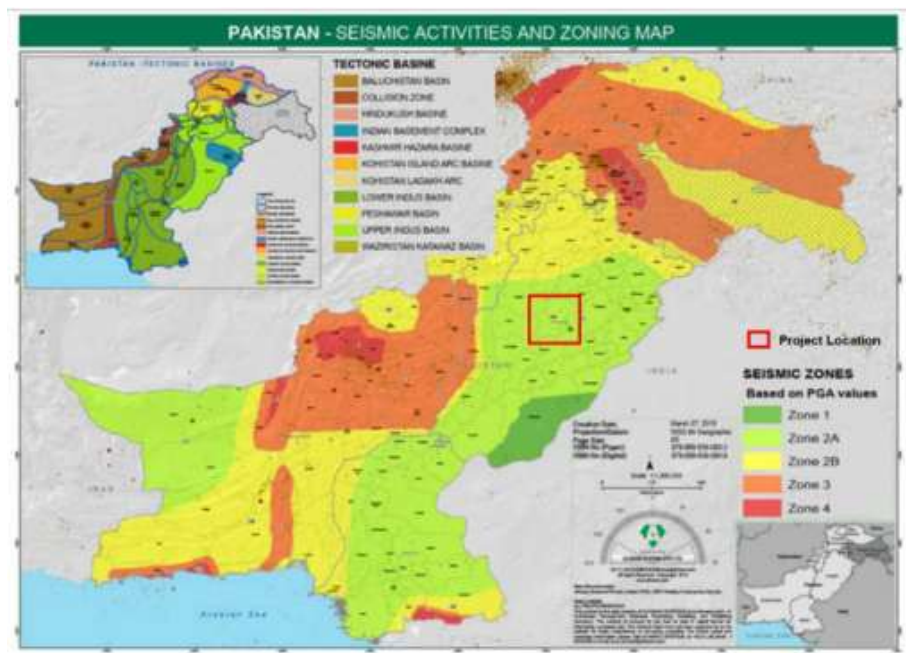


Figure 27: Seismic zoning map of Pakistan (Source: PMD, GSP, 2015)

4.2.7. Environmental Analysis

Environmental Analysis for air, water and noise was carried out by EPA certified Laboratory Pak Green Pvt. Ltd. for specifically proposed project improvement of sewerage system and construction of WWTP to meet the requirement of EPA.

Ambient Air Quality Analysis

Study on air quality status in the vicinity of the proposed projects is an essential and primary requirement for assessing the impacts on air quality due to any proposed developmental activity as degradation of air quality is a predominant environmental concern these days. Air quality analysis has been carried out by EPA certified laboratory. However, the quality of air was assessed by measuring its various parameters and lab reports of air quality is attached as **Annexure E**.

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The Parameters CO, SO₂, SPM and O₃ are within permissible limits of PEQs at all points. Particulate Matter (PM₁₀ and PM_{2.5}) found exceeded the limits of PEQs at all points.

Noise Level Analysis

Noise is considered to be a source of environmental pollution even though it is contemplated to be less damaging for humans when comparison is made with water, air or land pollution. However, when it comes project activities, noise will not be the major concern as there is no nearby residential areas that is likely to be affected due to generation of noise. At this stage, noise monitoring and analysis has been carried out and will be done during execution phase, if level exceeds to certain limit, then effective noise abatement measures are to be implemented to minimize the impact. Noise analysis has been carried out by EPA certified laboratory. The Noise analysis are given in table below and Lab reports of Noise Quality is attached as **Annexure F**.

Table 8: Noise sampling points and results

Sr. No.	Sampling location	Equivalent Noise dB(A)
1.	Back side of Lari Adda	66.71
2.	Lari Adda front side	69.5
3.	WWTP Proposed Site (Point 1)	56.41
4.	WWTP Proposed site (Point 2)	55.51
5.	Nawaz Chowk Commercial Area	67.41
6.	Old Chinniot Road Park (Yousaf vala Bhatta) Proposed Site	65.61
7.	Millat Park Proposed Site	58.91
8.	Disposal (Proposed site) Toba Road Sugar Mill	54.61
9.	Industry Area Toba Road	58.91

Water Quality Analysis

Ground Water samples were collected from 7x different location near proposed site of sewerage network and WWTP. Selected water quality parameters describing physiochemical properties of the water have been carried out for describing the water environment and assessing the impact of the proposed project. Water quality parameters for water resources within 0.5 km of the study

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area have been used for describing the water environment and assessing the impacts on it. Water Quality analysis has been carried out by EPA certified Laboratory Pak Green Pvt. Ltd. The water quality analysis of non-compliance parameters is given in Table 9.

Table 9: Ground Water Quality Analysis of Non-Compliance Parameters

Sr. No.	Sampling location	Source	Parameters not in compliance	Results (ppm)	PEQs (ppm)
1.	Point-1 Near MEPCO Office	Hand Pump	Lead	0.0543	≤ 0.05
2.	Point-2 Near Furqan Dairy Farm	Tube Well	Lead Manganese Nickel Zinc	0.1257 1.3229 0.03235 3.9737	≤ 0.05 ≤ 0.05 ≤ 0.02 5
3.	Point-4 Sarwar Shakir Jamia Mosque	Motor Pump	Total Hardness	540	< 500
4.	Point-7 City Marriage Hall	Motor Pump	pH Total Dissolved Solids (TDS)	8.561 1170	6.5-8.5 < 1000
5.	Point-8 Noor Shah Road	Motor Pump	Total Dissolved Solids (TDS)	1030	< 1000
6.	Point-9 Sindhi Basti Road	Motor Pump	Total Dissolved Solids (TDS)	1400	< 1000
7.	Point-10 Near Railway Quarters	Motor Pump	Total Dissolved Solids (TDS)	1170	< 1000

Lab analysis reports of water quality is attached as **Annexure G**.

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The results of drinking water analysis show that some of physical parameters (Color, taste, odor and turbidity) are within permissible limits of Punjab Environmental Quality Standards (PEQs). However, pH and TDS are exceeding PEQs.

Similarly, Chemical parameters Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chloride, Copper, Fluoride, Mercury, Nitrate, Nitrite, Selenium, Residual Chlorine, Phenolic Compound, Sodium, Potassium, Total Iron, Chromium and other parameters except Total Hardness, Lead, Manganese, Zinc and Nickle are within permissible limits of Punjab Environmental Quality Standards (PEQS).

Biological Parameter analysis shows that there is no contamination of E. Coli, T. Coliform, F. Coli-Form bacteria in ground water. Hence, Biological Parameter analysis are complying PEQS.

Wastewater Quality Analysis

The wastewater analysis was carried out by Laboratory Pak Green Pvt. Ltd at different sites. The results showed that BOD, COD and Total suspended Solids are exceeding the PEQS limits. The lab reports of wastewater analysis are attached as **Annexure H**. The waste water quality analysis of non-compliance parameters is given in below table.

Table 10: Wastewater Quality Analysis of Non-Compliance Parameters

Sr. No.	Sampling location	Sample Type	Parameters not in compliance	Results (mg/L)	PEQs (mg/L)
1.	Zia Colony Disposal	Composite	Biochemical Oxygen Demand (BOD-5)	238	80
			Chemical Oxygen Demand (COD)	380	150
			Total Suspended Solids (TSS)	440	200
			Ammonia (NH ₃)	50.6	40
2.	Railway Chowk Disposal	Composite	Biochemical Oxygen Demand (BOD-5)	362	80
			Chemical Oxygen Demand (COD)	580	150

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			Total Suspended Solids (TSS)	650	200
			Ammonia (NH ₃)	88.1	40
3.	Noor Shah Chowk Disposal	Composite	Biochemical Oxygen Demand (BOD-5)	270	80
			Chemical Oxygen Demand (COD)	436	150
			Total Suspended Solids (TSS)	540	200
			Ammonia (NH ₃)	75.6	40
4.	Mandi Mawasian Disposal	Composite	Biochemical Oxygen Demand (BOD-5)	228	80
			Chemical Oxygen Demand (COD)	360	150
			Ammonia (NH ₃)	46.9	40
5.	Pattal Chowk Disposal	Composite	Biochemical Oxygen Demand (BOD-5)	278	80
			Chemical Oxygen Demand (COD)	448	150
			Total Suspended Solids (TSS)	350	200
			Ammonia (NH ₃)	56.8	40

4.3 Biological Environment

The biological environment baseline studies describe the biological conditions and characteristics of the project site on the basis of primary and the secondary data by describing:

4.3.1. Flora & Fauna

The project area has no protected forest near the areas of works. Common floral species with rooted vegetation and few different types of herbs, shrubs, and bushes are also present along surrounding roads. Common birds like crow sparrow pigeon were observed. In animal's cow donkey, sheep goat was observed at project site. A very important wintering area for waterfowl,

notably Anatidae (ducks, geese, swans, etc.) which breed in the area, and a staging area for some species of cranes and shorebirds²⁷.

4.3.2. Environmentally Sensitive Receptors²⁸

Environmental sensitive areas are more prone towards human disturbance. For this project, no wetland, estuarine, river, lakes, any water resource, protected areas, mangroves, forests etc. lie within 500 meters of sub-project area and no significant environmental impacts has been envisaged. Similarly, there is no protected forest near the areas of works. Common floral species with rooted vegetation and few different types of herbs, shrubs, and bushes are also present along surrounding roads.

However, Taunsa Barrage²⁹ which is situated 15 km from MC Kot Addu is built on the River Indus. It was declared a Wildlife Sanctuary in 1978 with 6,576 hectares. In 1996, Taunsa Barrage was designated as a Ramsar site covering 16,000 hectares. Taunsa barrage wildlife sanctuary (TBWS) was renotified in 2004 with an extended area (Haider, 2022) (Haider et al., 2022). The sanctuary area covers 9 km upstream and 3 km downstream from the barrage³⁰. This wetland provides a suitable habitat for biodiversity, including plants, birds, mammals, fishes, amphibians, and reptiles. This site is linked to the Indus flyway and provides an ambient environment for migratory bird survival. The Wildlife Sanctuary supports a rich variety of wildlife, including 253 avian species, 5 large mammals, 21 small mammals, 3 amphibians, 17 reptiles, and 67 fish species.

²⁷ <https://rsis Ramsar.org/ris/817>

²⁸ Information was obtained/observed by PO ESM and DPO ESM during field visits.

²⁹ S. R. Awan and M. Arshad, Management plan, wwf pakistan, Lahore, Pakistan, 2014.

³⁰ G. Akbar, M. Arshad, M. J. I. Chaudhry, and S. A. Pirzada, Taunsa Barrage Wildlife Sanctuary: Biodiversity Profile, WWF-Pakistan, 2013.

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4.4 Socio Economic Environment

4.4.1. General

This section illustrates the description of socio-economic conditions of the project area. It presents information on the project area's location, population distribution, gender composition, socio-economic conditions, and livelihood activities, state of education and basic facilities.

4.4.2. Administrative Framework

The Project Area mainly lies in the district Kot Addu. The total area of District Kot Addu is 877,989 acres (355,310 ha), of which 4, 24,521 acres are under cultivation. This city is subdivided into 5 Union Councils.

4.4.3. Demography³¹

According to the recent outcomes published by Pakistan Bureau of Statistics for the 6th Population and Housing Census held in 2017, total population of District Kot Addu is nearly 1.30 million. According to this report, 81% of population in district Kot Addu are inhabited in rural areas. Majority of population is male with the 50.96% whereas the female population is 49.04%.

4.4.4. Religious Profile³²

According to the 2017 district census, the Muslim population is by far the largest religious group, constituting more than 99 % of the population across these districts. In Project Area, another group, Ahmadis and Christians, who are barely less than 1% of the population and are equally spread among the urban and rural areas.

4.4.6. Water Sources³³

The city is considered as a single unit or zone with respect to water supply. Kot Addu town is located on the left bank of River Indus in its flood plain and hence the subsoil water is quite fresh with shallow spring level. Deep ground water is also fresh and hence the water supply system is based on deep tube wells installed at various locations in the city. The Town is served by direct pumping in some areas whereas in some areas water is supplied to the consumers through overhead reservoirs.

4.4.7. Social Setup

Kot Addu traces its origins to the Indus Valley Civilization, dating back to 2500 BCE. Throughout history, Kot Addu has been an important regional hub due to its strategic location on the banks of the Indus River. The city has witnessed the rise and fall of various empires, including the Mauryan, Gupta, and Mughal empires. The social life is simple but rich in tradition, with an Islamic influence on social customs and traditions. People in the region are sincere, hospitable, conservative, and humble, they take great pride in following their social traditions.

³¹ <https://www.pbs.gov.pk/sites/default/files/population/2017/results/07002.pdf>

³² <https://www.pbs.gov.pk/sites/default/files/population/2017/results/07023.pdf>

³³ <https://pmdfc.punjab.gov.pk/system/files/Kotaddu-GAR.pdf>

4.4.8. Culture and Traditions

Saraiki folk dances such as Jhummar and Sammi are popular in this area. Jhummar is a dance for men while Sammi is for women. The famous form of folk music is known as Dhola. The men wear turbans and dhotis (like a kilt) though in recent years people have started wearing the national dress which is shalwar kameez. The old women still wear dhotis (skirts) but the younger women wear shalwar kameez. Volleyball and Kabaddi are very popular among the people of Kot Addu.

4.4.9. Literacy

The literacy rate according to the census in 2017 was 51% (64% male and 38% females) with a notable progress compared to previous years. The district's focus on women education has contributed in the progress.

4.4.10. Land use

Main land use in the project districts is agriculture. The total area of Tehsil Kot Addu is 877,989 acres (355,310 ha), of which 4,24,521 acres are under cultivation. The main crops of the area include corn, cotton, rice, sugarcane, tobacco, wheat, and vegetables. Bajra, moong, mash, masoor, and oilseeds (such as mustard and sunflower seeds) are also grown in the district.

4.4.11. Agriculture in Kot Addu³⁴

The area around the city is a flat plain and is ideal for agriculture. The land is fertile. The most people of rural area are agriculturalists. The main crops are the corn, rice, wheat and sugar cane of this land. Mangoes, citrus, guavas, and pomegranates are Kot Addu's most important fruit crops. Minor fruit crops include dates, jaman, pears, falsa, and bananas are also grown. One other local fruit is called a bare (Berry). It is one of the main fruits grown in this region. Now a majority of the agricultural lands are covered by sugarcane. People either sell this sugarcane to sugar mills or produce Jaggery from sugarcane.

4.4.12. Physical Infrastructure

Electricity in Kot Addu is supplied from Multan Electric Power Company. Various industrial units in District Kot Addu which include Sheikho Sugar Mill, Fatima Sugar Mill, Pak Arab Oil Refinery

³⁴ <https://trek.pk/kot-addu/>

(PARCO and famous power stations like Kot Adu Power Company (KAPCO) & Lalpir Thermal Power Stations. Besides these, cotton factories, foundries, cotton, woolen, and silk textile mills, flour, and oil mills are also located in this region. This area is famous for its handicrafts (Kundra work), and cottage industries. Some of area is facilitated with natural gas which is being provided by SNGPL.

4.4.13. Health facilities

The healthcare services in Kot Addu are delivered through both public and private healthcare facilities providers. These two types of facilities vary in accessibility, content, affordability and equitable provision. The public sector facilities are tightly regulated even when quality may vary widely. On the other hand, private sector provision is not optimally regulated and there are wide variations in quality; however, a clear picture is not available due to inadequate documentation, monitoring and reporting mechanisms on working of private sector healthcare facilities. THQ Hospital, situated in front of Government Boys High School Road, Kot Addu. The Hospital constructed in 1979. It consists of 90 beds. It has faculty of Gynae, Paeds, Orthopaedic, Surgery, Medicines, Dermatology, Urology, Radiology, Eye and Dental Unit. It has spread Emergency building in which Laboratory, Blood Bank, Male and Female Emergency wards and four (04) beds of Cardiology are present. It has covered almost 12 Lacks population of the Tehsil. THQ Hospital Kot Addu has been certified by PHC, and has already been certified by ISO 9001 and 14001 which is a best health facility among all public and private hospitals. Some other health facilities in Kot Addu are as:

- Ali Dental Care Hospital, Kot Addu
- Al Noor Clinic, Kot Addu
- Taimur Medical Complex Hospital, Kot Addu
- Ahmad Medical and Surgical Hospital, Kot Addu
- Surayya Medical Centre, Kot Addu
- Niaz Medical Complex Hospital, Kot Addu
- Baloch Health Care Clinic, Kot Addu
- Ali Polyclinic Hospital
- Health Care Hospital
- Child Care Clinic, Kot Addu

4.4.14. Solid Waste Management³⁵

The city has a poor solid waste management system. Resources available to handle the solid waste are limited to serve the whole area of city for solid waste collection and disposal. The entire city is not served with solid waste collection and disposal. 34% area of the city is fully served, 22% is partially served and 44% is un-served. In partially served areas service is rendered intermittently depending upon availability of manpower and transportation machinery. The manpower deployed for collection, transportation and disposal of the solid waste is not sufficient to serve the entire city.

4.4.15. Important Places of Kot Addu

Kot Addu is rich in historical landmarks and natural attractions. The most famous historical site is the Kot Addu Fort, which dates back to the Mughal era, and was used as a residence for local rulers. Other notable landmarks include the Shrine of Hazrat Shah Rukn-e-Alam, the Shrine of Hazrat Sakhi Sarwar Sultan, and the Tomb of Hazrat Hafiz Jamal Shirazi. Natural attractions in the area include the Taunsa Barrage and the Khojki Lake, a popular spot for fishing and boating³⁶.

Taunsa Barrage is a barrage on the River Indus. It is situated 20 kilometers (12 mi) southeast of Taunsa Sharif and 16 kilometers (9.9 mi) from Kot Addu. This barrage controls water flow in the River Indus for irrigation and flood control purposes. This barrage serves 2.351 million acres (951,400 hectares) besides diverting flows from Indus River to the Chenab River through Taunsa Panjnad (TP) Link Canal. The barrage also serves as an arterial road bridge. Besides that, Kot Addu Power Company Limited (KAPCO) and Lalpir Thermal Power Ltd. are two major independent power sectors of Kot Addu.

4.4.16. Economy of Kot Addu³⁷

The industrial and commercial sector in Kot Adu plays a significant role in Pakistan's economy. Its economic contribution and GDP are substantial. It is a central industrial and commercial area, the second-largest after Faisalabad. Prominent industries include cotton mills, where sugar mills such as Sheikho Sugar Mill and Fatima Sugar Mill are located. Power stations such as Kot Adu Power Company (KAPCO) and Lal-Peer Thermal Power Station provide Pakistan with a large electricity share. The Pak Arab Oil Refinery (PARCO), Pakistan's largest oil refinery, is located here. In addition to these, there are also foundries and mills in this region. Salient mills include cotton, silk, and woolen textile,

³⁵ <https://pmdfc.punjab.gov.pk/system/files/Kotaddu-GAR.pdf>

³⁶ <https://words.pk/kot-addu/>

³⁷ <https://www.pakpedia.pk/kot-addu/>

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Gellani flour, rice, and oil. It is renowned for its crafts and small and cottage industries for Kundan work embroidery. Kot Addu is the centre of a purely agrarian society. Agriculture is the chief source of income and employment in Kot Addu. About 70 percent of the Kot Addu's cultivable land is irrigated. The main crops grown in the district are wheat, cotton, sugarcane, rice, maize, tobacco, Bajra, Moong, Mash, Masoor, and oilseeds such as Rape/Mustard, and Sun Flower are also cultivated. Livestock and poultry are also raised in large numbers in district Kot Addu.

Economic activity in Kot Addu city has picked up considerably in recent years, due to cheaper land and relatively skilled labour. Due to favorable conditions for agriculture, a number of crops are grown in the area, including Rabi, Kharif, sugarcane, cotton, wheat, bajra, maize and rice. The per capita income is PKR 15,000 to 20,000 per month approx. People mostly work on daily wages (labor). Some people own small business-like shops and kiosks etc.

4.4.17. NGOs and Social Organizations

There are many NGOs working in the Sub-project area. There is a strong group of non-profit organizations that are involved in the rehabilitation, counselling and financial support of the communities. The famous NGOs working in the Kot Addu are Madni Woman Development Organization, Bano Welfare Society, Haleema Development Org, Jaago Welfare Society, Tirra Development Organization, Idera Refah-e-Ama Kot Addu and etc.

4.4.18. Socially Sensitive Receptors³⁸

There is no major institute situated in the project scheme area. No public infrastructural damage is envisaged as per scope of work under this scheme. No settlements, cultural heritage sites, graveyard, hospital, school/college/educational institute etc. observed within 500 meters of the Sub-project.

4.4.19. Land Acquisition and Resettlement

MC owns the land which will be utilized for the comprehensive sewerage system including construction of WWTP. There is no resettlement of public infrastructure/communities/household involved. Land Ownership Document is attached as **Annexure I**.

³⁸ Information obtained/observed by DPO ESM during field visit.

CHAPTER 05

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

1.1. GENERAL

This section identifies the overall impacts of pre-construction (design), construction and operational phases of the proposed project on the physical, biological and socioeconomic environment due to Improvement of sewerage system in Kot Addu city and construction of WWTP. In addition, it also recommends the measures to mitigate or minimize the project's adverse environmental impacts.

Environmental Impact Matrices

The identification of impacts is done on the basis of literature review, site surveys and expert opinion on prevailing site conditions and sensitive receptors. The significance of the effect on the environment is estimated using an environmental impact significance matrix. This gives each environmental impact either a high, medium or low significance depending on the estimated severity and frequency of the effect on the environment.

Table 11: Environmental Impact Significance Matrices

Significance	Implications
Low	Should not have an influence on the decision to proceed with the proposed project, provided that recommended mitigation measures to mitigate impacts are implemented.
Medium	Should influence the decision to proceed with the proposed project, provided that recommended measures to mitigate impacts are implemented.
High	Should strongly influence the decision to proceed with the proposed project regardless of mitigation measures

1.2. Anticipated Impacts during Pre-Construction/Design Phase

Following is the description of impacts envisaged and the recommended mitigation measures during Pre-construction/Design Phase:

Residual Impacts of this project are negligible and mitigated at design stage. However, the residual impacts after decommissioning of project are also in consideration during planning stage.

1.2.1. Design & Layout Planning

Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the project area. Also, low utilization of the available spaces and not designing the structures taking into account, the prospective and futuristic needs can result in structures with low social acceptability and functionality. This impact will be of high significance in nature. For the mitigation of these impacts it is important that all structural, layout and engineering designing should be in strict accordance with the applicable laws (Land acquisition Act, PEPA 2012, The Punjab restriction on employment of children Act 2016) and engineering parameters.

Furthermore, Emergency Response Plan has been prepared for this project and is attached Annexure N.

1.2.2. Topography

Cut and fill of land for the improvement of sewerage system and construction of WWTP will be required that may contribute to moderate change in the topography of the area.

Removal of topsoil and soil erosion may occur on roadside due to excavation, clearing of existing ROW and cutting and dismantling of existing pavements. The changes due to construction of the proposed project, however, will be of localized nature. This impact is medium in nature.

Mitigation measures will include provision of embankments, designed by considering the Geotechnical investigation studies (if needed). Due consideration should be given to aesthetic improvement during the design phase.

1.2.3. Drainage

Improper drainage from home may cause trash pooling condition; due to which following impact of medium nature are expected to arise:

- Deterioration of the surface road and reduction of its bearing capacity;
- Public inconvenience in road usage; and

The stagnant water may serve as breeding ground for disease vector.

Mitigation measures will include provision of appropriate drainage structures and storm water pumping station in design. Proper slopes shall be incorporated in design feature to avoid the formation of the water layer on road surfaces in rainy seasons.

1.2.4. Resource Conservation

The materials used in construction of proposed project would include coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement and cement etc. Almost all the materials to be used in the construction of proposed project are non-renewable and therefore their sustainable use is necessary for the future use. Resource materials are essential in the pre-construction phase as they support design and engineering efforts, cost estimation, material selection, regulatory compliance, procurement, supply chain management, and sustainability considerations. Their proper utilization ensures a well-planned and organized start to the construction project, leading to successful project outcomes.

Fuel will be used to operate construction machinery, asphalt plant and batching plants. Wastage and unsustainable use of these resources can possess low to moderate impacts. Sustainable use of energy resources is very important not only to continue future use but it will also help to reduce air emissions. For conservation of energy, efficiency of the engines and burning processes shall be considered in planning. Overall, energy resources have a substantial impact on the pre-construction phase of a project, influencing its feasibility, design, cost, environmental footprint, and compliance with regulations. Proper assessment and planning of energy resources during this phase help ensure the efficient and sustainable development of the project.

Mitigation measures will include:

- Wastage of water should be reduced by training the workers involved in water use;
- Source of water should be carefully selected. Water use should not disturb the existing community water supplies;
- Ensure adequate insulation to reduce heat loss through batching plants; and
- Regularly monitor CO and CO₂ content of the flue gases to verify that combustion systems are using practical excess air volumes.

1.3. Anticipated Impacts during Construction

This section explains how proposed project will affect different environmental aspects and its mitigation measures to manage the impact. The impacts arise during construction phase are

generally low to medium in nature. Even though, the measures proposed to minimize such impacts.

The potential environmental impacts of the proposed project at site and surrounding area during construction phase of the Improvement of sewerage system and construction of WWTP involve:

- Noise and vibration due to movement of heavy construction machinery, land clearing, excavation and digging
- Fresh water consumption and wastewater from different activities
- Exhaust, particulate emissions and dust generation due to engines, generators, movement of heavy construction machinery and other construction activities
- Solid waste from construction activities and from site camp office/labors camp
- Increase traffic burden due to construction activities and heavy machinery

However, the majority of these impacts will be low and short-term during construction phase and are envisaged to abate with completion of the construction phase.

1.3.1. Physical Component

The main impacts of the project during construction and development activities are described below:

A. Soil Erosion and Land Use Changes

Soil and land may be affected during construction phase due to land clearing operations, excavations and diggings, cutting of trees if any at the proposed project site, onsite stockpiling of materials and equipment, construction of site offices, movement of heavy construction machinery, disposal of wastes and wastewater along with throwing of chemicals, oils, varnishes, coal tar, packaging materials and other compounds on to the land would be associated with impacts on soil and land.

When it comes to proposed project site, no significant impact on soil would arise. Similarly, the project construction will have apparently no impact on topography and slope stability. However, the soil quality may be affected due to vehicle and equipment maintenance and leakage from equipment and vehicles as explained above. Nevertheless, if appropriate mitigation measures are applied then the overall impact on soil during construction phase would be minor.

i. Potential Impacts

The environmental impacts to soils and lands would be medium in nature some of impacts are listed below:

- Degradation of soils and changing soil properties
- Soil may be contaminated as a result of fuel/minor oils/chemicals spillage leakage, and inappropriate waste (solid as well as liquid) disposal during the proposed project.
- Land instability
- Deterioration of soil due to movement of heavy machinery
- Development of pits and depression in borrow areas and stagnation of water on the land surface.

Impacts, related to soil erosion and degradation will be occurred during construction phase of the proposed project, are characterized above and these will be managed on site by following proposed mitigation measures.

ii. Potential Mitigation Measures

- Wherever possible, avoid excessive and simultaneous excavations to minimize generation of large volumes of soil and chances of destabilization and erosion of adjacent lands. Backfill the soil borrowing areas and level up the surfaces of the pits and depressions is recommended.
- Spills' prevention trays should be provided and used at refueling locations.
- During onsite maintenance of vehicles and equipment, tarpaulin or other impermeable material should be spread on the ground to prevent the contamination of the soil.
- Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.
- Regular inspection should be carried out to detect the leakage in construction vehicles and equipment.
- Domestic solid waste will be disposed in a manner that does not cause soil contamination and ensure provision of dustbins for solid waste at the site.
- Appropriate arrangement, including shovels, plastic bags and absorbent material, should be available near the fuel or oil storage area.
- Select campsite in consultation with site engineer and the project environmentalist and secure a connection of the toilet's wastewater from labors.

As soon as the construction phase is completed or near completion, a plantation program shall be implemented around the site. The significance of the residual impacts is therefore expected to be low because these mitigation measures are based on best management practices.

B. Dust During Construction Deteriorates Air Quality

Dust or the equivalent technical term 'particulate matter', is generally defined as any airborne finely divided solid or liquid material up to the size of about 100 microns (micrometers or one-millionth of a meter). During the development / construction, vehicles and machinery will be employed. These will generate some dust and smoke temporarily which will stop on completion of the construction work. During construction phase due to continuous operation of machinery and movement of heavy trucks and vehicles can generate gaseous emissions and can have a slight adverse effect on the surrounding environment. Combustion exhaust from vehicles and construction equipment during construction phase can affect ambient air quality of project area.

This will possess medium impacts on environment as it will only occur during the excavation activities. Also, these impacts are expected to be contained within the site boundaries.

i. Potential Impacts

- Particulate matter emitted during construction activities can result in deterioration of ambient air quality in the vicinity of the source and be a nuisance to the communities and construction workers.
- The main health hazards are the particles smaller than 10 microns (designated as 'PM10') as they are respire-able. Larger particles also tend to settle rapidly and often do not reach receptors. In cases where they reach the receptors, the dust is considered a nuisance as it may spoil property and affect visibility.
- Large amount of dust particles will be generated from the project site due to various activities such as movement of the heavy construction vehicles on unpaved roads, earthwork, truck dumping, hauling etc. This will be higher than the existing level of the particulate matter measured at the project site.
- Due to continuous operation of machinery and movement of heavy trucks and vehicles can generate gaseous emissions and can have a slight adverse effect on the surrounding environment.

ii. Potential Mitigation Measures

The potential negative impacts during construction stage of the project will be mitigated to an acceptable level. Following environmental protection measures will be adopted to eliminate adverse environmental impacts or to reduce them to an acceptable level within the PEQS. The proposed mitigation measures are listed below:

- Appropriate waste disposal mechanism will be followed during the construction phase. The construction waste will be disposed in a manner that does not contaminate surface or groundwater.
- The construction waste generated will be used for earth filling within the project site premises.
- The Contractor needs to make sure that their machinery and equipment are properly tuned and serviced and there is no leakage of oil from construction equipment and machineries.
- Construction labor must be trained in safety procedures for all relevant aspects of construction
- Ensure water sprinkling on daily basis before the start of the construction activities as dust suppressant. Frequency of sprinkling will be kept such that the dust remains under control, particularly when wind is blowing towards the receptors (especially when the wind blows towards the city).
- Construction materials that are susceptible to dust formation will be transported only in securely covered trucks to prevent dust emission during transportation.
- Properly cover construction material such as soil, sand and cement stockpiles for the shortest possible time to prevent wind whipping.
- Plantation will be done at site.

The effects of the dust nuisance are temporary and no long-lasting impacts are expected after the completion of the construction works. It is therefore recommended to put in place all the suggested mitigation measure in order to avoid significant impact during the construction phase of the facility.

C. Noise and Vibration

Noise is a by-product of -construction activity. Main sources are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment. Noise generated by construction machinery is likely to affect

sensitive receptors located within 50 meters of the proposed site. This noise and vibration can negatively affect the nearby public. Therefore, appropriate measures will be adopted to minimize the repercussion of noise. Noise and vibrations will have low to high impact depends upon the receptors nearby.

i. Potential Impacts

- Noise and vibration can be a source of nuisance for workers and most importantly for local public of the area.
- Distracted attention and inability to concentrate
- Health impact in terms of Irritation and short temperedness, headache, dizziness and ringing ears.
- Physical stress on labor because they have to speak louder than normal in a noisy environment
- Physical damage to ear drum in case of noise crosses the critical threshold for that as a result partial loss of hearing and inability to hear at normal pitch and sound.

ii. Potential Mitigation Measures

All mitigation measures mentioned below should be taken in order to minimize the impacts of noise in the project area. These measures include, but are not limited to the following:

- Plan the traffic route away from the residential settlements.
- Selection of up-to-date and well-tuned machinery.
- Confining excessively noisy work to normal working hours in the day, as far as possible. Therefore, Plan to perform noisy operation at the same time period. The total noise level would not be higher than the level if the operations were performed separately.
- Providing the construction workers with suitable hearing protection like ear plugs, or earmuffs
- It is recommended to use quieted equipment, such as enclosed air compressor and air mufflers (silencer) on all engines
- Select the demolition method that produces the least noise and vibration.
- Use of low noise machinery, or machinery with noise shielding and absorption.
- Regular checkups and maintenance of the construction equipment, periodic preventive lubrication and greasing of the noise making mechanical parts.

- Use noise-abating devices wherever needed and practicable.
- Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive points

Keeping in view all these measures, it is envisaged that residual noise and vibration impacts during construction activities are expected to be low.

D. Surface and Ground Water Quality

The improvement of the proposed sewerage system and construction of WWTP will involve various operations. This section summarizes the various activities and their potential impacts on the surface and the ground water quality.

Surface water might get contaminated due to the disposal of solid waste from different activities during the construction phase. Similarly ground water quality may also be deteriorated by dint of excavation, digging and removal of vegetation.

i. Potential Impacts

- Unauthorized and excessive abstraction of groundwater, imperfect sealing of the groundwater borehole would allow contaminated water to move down along the borehole.
- In the rainy season during construction phase, runoff results significant pollution in the surroundings. Therefore, Construction of temporary infrastructure such as drainage culverts/ducts may be required.
- Solid waste from camps if established, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table and hence, will end up contaminating it.
- The used engine oil and lubricants, and their storage as waste materials has the potential to create impacts if spillage occurs as oil may percolate into the surface soil layer, runoff in to the local watercourses hence adequate measures should bring in to practice in order to prevent spillage. So, there is a possibility that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater, if they are not handled properly
- Contaminated groundwater would lead to serious health consequences as it is used for drinking purposes.

- Wastewater from camps and improper disposal of garbage can contaminate surface and groundwater.
- During construction phase, impacts from the workers include waste and wastewater generated from eating areas, and sewage from temporary sanitary facilities because sewage is characterized by high levels of BOD, ammonia and E-Coli. Adverse water quality impact will be generated only if the sewage is discharged directly into the receiving waters without any prior treatment.

ii. Potential Mitigation Measures

- The surface water quality if there is a potential of contamination should be constantly monitored.
- Wastes must be collected, stored and taken to approved disposal site. Contractor camp if established should be at proper location
- Do not construct unauthorized borehole and do not make boreholes at low lying places and depressions, which attract surface runoff and allow water stagnation. Seal off the borehole with cement mortar.
- Ensure regular laboratory testing of the groundwater/ drinking water from site for timely detection of contamination during execution phase.

The majority of the identified adverse impacts on surface and ground water quality are High in nature. Implementation of the recommended mitigations will result in complete abatement of the adverse impacts on surface waters and there would not remain any residual adverse environmental impacts pertaining to this parameter. The site supervisor -will have the responsibility to ensure the compliance/implementation of the prescribed mitigations measures.

E. Air Quality

Air quality will be affected by fugitive dust emissions from construction machinery and vehicular traffic. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. Usage of poor-quality oils petroleum products, additives and chemicals, unplanned excavations and diggings and leaving the dugout sites open and without backfill, loose stock pile of the materials without covering, shielding or water sprinkling will affect the quality of air. Vehicular emissions such as PM₁₀, SO_x, NO_x and CO₂, CO and the smoke emission will get higher.

i. Potential Impacts

- Transportation of materials and other construction activities will create dust emissions.
- During construction, the continuous operation of machinery and movement of heavy trucks and vehicles may generate gaseous emissions and have negative impact on the surrounding environment.
- Decrease visibility due to smoke and particulate matters
- Deposition of dust and particulates on open surfaces and vehicles
- Inhalation and ingestion of the fugitive dust and consequential health problems.
- Emissions from the generators will also pose significant impact on quantity of GHG emissions.

ii. Potential Mitigation Measures

- All vehicles, machinery, equipment and generators which are used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions
- The quality lubricants and oil should be used
- Open burning of solid waste from the contractor's camps should be strictly banned
- Regular water sprinkling of the site should be carried out to suppress excessive dust emissions.
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions.
- Keep the stockpile materials covered or lightly sprinkle with water in order to avoid dust emissions.
- Use protective inhalation masks and eye glasses during construction works.

The site supervisor is responsible to ensure compliance of the suggested mitigation measures. The impacts during construction phase are envisaged to be low.

F. Solid Waste Generation & Dumping

Solid waste may arise from different activities during construction phase such as waste generated for labor camps, food waste, construction material, waste obtained during excavation and digging

etc. Moreover, different types of raw materials will be used during construction phase which in general comprise of the following:

- Cement concrete
- Plastic pipes
- Bricks, tiles,
- Cement plaster
- Steel (RCC, door/ window frames, roofing support, railings of staircase etc.)
- Rubble, sand, Stone (Marble, granite, sand stone)
- Timber/wood
- Paints/varnishes

Dumping of construction wastes/excavated material in the surrounding area of the proposed project may lead to serious implications pertaining to environment as explained below.

i. Potential Impacts

- Result in degradation of soils
- Solid waste may pose health issues or disturb the scenic beauty of the site.
- Generation of solid waste and its improper management may provide breeding place for mosquitoes, rodents and insects
- Heaps of solid waste may cause disturbance in mobility
- If not properly dispose of or covered or store separately during raining season then it will lead to leachate generation that in turn deteriorate soil and groundwater quality.
- Improper disposal of solid waste and debris can choke sewer lines may cause contamination of drinking water.

ii. Potential Mitigation Measures

- The waste/ spoils will be carefully examined and disposed of in an environmentally friendly manner by transporting it in closed container and filling at appropriate sites.
- The waste transfer vehicles shall be properly covered.
- Waste should be properly covered at the site and maximum effort shall bring in to practice to avoid contact with precipitation.

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- The solid waste generated during this period being predominantly inert in nature. Hence maximum effort would be made to reuse and recycle it. The most of the solid waste material can be used for filing/ leveling of low-laying areas within the site.
- Attempts will be made to keep the waste segregated into different heaps as far as possible so that their further gradation and reuse is facilitated.
- Scattered solid waste should be properly managed in order to avoid contamination and provision of enclosed bins for general refuse at project site.
- The local body/MC or a private company may be arranged to provide appropriate number of skip containers/ trolleys on hire.

The use of the construction material basically depends on their separation and conditions of the separated material. A majority of these materials are durable and therefore, have a high potential for reuse. It would, however, be desirable to have quality standards for the recycled materials. Construction waste can be used in the following manner:

- Reuse of bricks, tiles, stone slabs, timber, piping railings etc. to the extent possible and depending upon their conditions.
- Sale/ auction of materials which cannot be used at the site due to design constraint
- Plastics, broken glass, scrap metal etc. will be stored and processed within the site premises.
- Rubble/ brick bats can be used for building activity, such as leveling, under coat of lanes where the traffic does not constitute heavy moving loads.
- Larger useless pieces can be sent for filing up low laying areas.
- Fine material such as sand, dust, etc. can be used as cover material
- The unearthed soil can be used for leveling as well as for lawn development
- The broken pieces of the flooring material can be used for leveling in the building or can be disposed of.
- The unused or remaining paints/varnishes/wood can either be reused or can be disposed of.

All attempts should be made to stick to the -above mentioned measures. The site supervisor will be responsible to ensure compliance of the suggested mitigation measures. The impacts during construction phase are envisaged to be low.

1.3.2. Biological Component

A. Impact on Floral Species

Trees are vital source of ecosystem perform variety of functions for the improvement of environment such as reduction in air pollution, noise abatement, cooling effect on earth, supply of oxygen etc. As already explained in above sections that site is commercial in nature and have no impact on floral species However, several ornamental plants will be planted for landscaping in decommissioning phase.

i. Potential Impacts

- Cutting of trees from the project site if any
- Cutting of trees for cooking purposes from the surroundings

ii. Potential Mitigation Measures

The following mitigation measures will further minimize any negative impacts on floral resources of the area:

- In the entire project area, a comprehensive plantation plan will be developed, with due consideration given to landscaping. The plantation plan should be implemented as early as practicable.
- After construction besides introducing new ornamental plants, local tree and plants species will be planted. In addition to providing a better view to the area, the proposed vegetation will help minimize the excess noise, vehicular emissions and dust pollution.
- Indigenous species of trees will be recommended to be planted. Other species suitable for site will be planted to increase scenic beauty. Besides, species having dust retention and odor control properties will be recommended for plantation.
- Slopes must be contoured and grass planted to avoid erosion.
- Use of fuel wood will not be allowed.

With the help of the mitigation measures, the residual impact of the project's construction activities is likely to be low.

B. Impact on Faunal Species

During the construction phase, there will be considerable human interventions in the project area which can potentially affect the faunal resources such as land clearing, earthmoving, terrain

shaping, and construction activities, construction camp, dredging and filling, solid and hazardous waste, discharge of polluted or treated wastewater and fuel storage.

No environmentally sensitive area (forest, wetland, national park, wildlife sanctuary, or game reserve) is located in the vicinity of the project area. Most of the animals found are common species that are highly adaptable and are able to co-exist with people. Similarly, there is no wildlife present in the Project area. However, none of the species found to be endangered or of global significance.

i. Potential Impacts

- Water quality impacts such as increased sediment disturbance can indirectly affect habitat health
- Soil and water contamination will affect the faunal resources
- Disruption and dislocation (via noise, vibration, lights and human presence) of local birds or other wild animals
- Tree cutting from the surroundings for heating purposes may disrupt habitat of birds i.e. removal of nests during breeding seasons.

ii. Potential Mitigation Measures

- The measure to prevent soil and water contamination will predict any adverse impact on the faunal resources of the area.
- Construction machinery will remain confined within their designated areas of movement.
- Well-tuned machinery will be used to avoid nuisance to wild life in the surroundings

With the help of the mitigation measures, the residual impacts of the project's construction activities are likely to be low.

1.3.3. Social Component

A. Health and Safety of Workers

Construction activities are always associated with risks, hazards include traffic, working of mechanized equipment and machineries, excavations, falling objects, confined spaces, trapped energy, tripping etc. The contractor will be made bound to provide its workers necessary personnel protective equipment (PPE) to safeguard themselves against any hazard.

i. Potential Impacts

- Hazards during transportation of waste and construction material
- Risk of injury during movement of heavy machinery, lifting of heavy objects, drilling tipping etc.
- Non-observance of worksite safety instructions and non-usage of safety gadgets during construction operation can increase vulnerability to adverse health and personnel safety impacts.
- Fire, explosions and accidents from unsafe storage of hazardous, explosive inflammable and ignitable materials.
- Construction material such as sand, stones, cement may pose health risk
- Unhealthy/ unsafe work conditions if OHS rules and gears are not in placed.
- Transmission lines or electric poles pose a threat to worker/labor health.
- Generation of solid waste may pose health issues or disturb the scenic beauty of the site.

ii. Potential Mitigation Measures

- Material shall be appropriately covered to prevent dispersal of sand material. Also, Protective health & safety measures should be adopted.
- Training programs for the construction crew will also be arranged to let them know about the construction hazards. Also, ensure provision of basic medical training to specified work staff and basic medical service and supplies to workers.
- All the construction work will be contained within the boundaries of the project site and unauthorized personnel will not be allowed to be in the premises of the construction activities without any authorization.
- Protection devices (ear muffs, ear plugs) should be provided to the workers doing job in the vicinity of high noise generating machines
- Provision of adequate sanitation, washing and cooking facilities
- Provision of protective clothing for laborers handling hazardous materials, e.g., helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. Also, ensure strict use of wearing these protective clothing during work activities
- Elaboration of a contingency planning in case of major accidents
- Clear safety warning signs should be placed along strategic locations within the site. Safety and warning devices such as reflectors, lights, etc. shall be installed at designated

spots. During construction, adequate signage, lightning devices, barriers, yellow tape and persons with flags must be there.

- Dustbins should be provided at project site and identification of disposal site for SW with due involvement of MC will be ensured.
- Designated staff should be hired at project site to collect SW at consecutive/ regular intervals
- Ensure the provision of protective devices PPEs, such as earplugs to all those working in a noisy area
- The equipment and construction machinery will only be operated by properly trained and experienced personnel.
- The total noise level would not be higher than the level if the operations were performed separately.
- Frequent water sprinkling at the site will be carried out at regular intervals to avoid generation of dust.
- Workers/labor at the site if established will be advised to maintain specific distance from transmission line during construction activities. Also, Construction of offices, controls rooms etc. will be proposed away from the electric poles.
- Construction area will be properly identified and the access to the area will be limited to only project related personal.
- After the completion of construction phase, proper site restoration will be carried out to eliminate any safety hazards such as any excavation will be leveled to prevent falling injury to construction crew.

Allegiance to these mitigation measures will avoid any incident. With implementation of the mitigation measures proposed above, impacts will be minimized. Therefore, the significance of the residual impacts is therefore expected to be low because these mitigation measures are based on best management practices.

B. Damage to Archaeological, Historical or Cultural Artifacts

There is no site of archaeological, historical, religious and cultural importance within 2km premises of the project. If later on during, drilling, excavation work, if any archaeological artifact is found, the relevant department will be informed.

1.4. Impacts during Operational Phase

During the operation phase of the proposed project, the anticipated impacts on the physical environment, biological environment, and socio-economic aspects related to the proposed project have been studied for operational stage and are discussed as follows:

1.4.1. Impacts on Physical Environment

A. Soil Contamination

i. Potential Impacts

During operation phase, soil might be contaminated by dirt of inappropriate waste treatment, its disposal and due to improper handling. Otherwise, no significant impacts are envisaged in this regard.

ii. Potential Mitigation Measures

- Regular soil testing will be ensured to check the quality of soil.
- Proper handling of sludge will be ensured, design engineers will ensure the best possible design for protection of soil and surrounding environment

If these measures are properly taken by the MC, then the residual impacts will be negligible.

B. Surface and Ground Water Contamination

Surface water can be contaminated if wastewater enter into it whereas wastewater from sewage can also deteriorate ground water quality.

i. Potential Mitigation Measures

The below listed mitigation measures will be useful to control the adverse impacts of surface and ground water contamination:

- To ensure the preservation of surface water quality, the entry of wastewater into any surface water body will be strictly prohibited unless it meets the prescribed Environmental Quality Standards (PEQs). Additionally, the discharge of sewage water into the surrounding area is not allowed."
- During construction asphalt lining will be ensured to control leaching of wastewater.

After adopting all the recommended mitigation measures, the residual impacts during the operations phase of the project shall be medium to low.

C. Air Quality

The air emissions -from electricity generator to run machinery at disposal station.

i. Potential Mitigation Measures

- Plantation will be provided on the main entrance would be useful for landscaping and surroundings which will generate fresh oxygen
- Maintenance of electricity generators will be ensured timely.
- Plantation will be done along the premises of sewerage Network and WWTP. Plantation Plan is Attached as **Annexure J**.

Despite the above measures, there will be some residual impacts on the air quality. The significance of this impact is expected to be from low to moderate.

D. Odour Generation and Associated Issues

a) Potential Impacts

Impact will be low in nature

- According to the 'Wastewater Technology Fact Sheet – US EPA', odor WSP based WWTPs is usually generated due to excessive organic load causing anaerobic decomposition and due to inadequate ventilation.
- Ponding could happen due to excessive biological growth or foreign matter in or on the WSP

b) Potential Mitigation Measures

Mitigation measures to be adopted by the MC include:

- WSP shall be inspected on a daily basis for signs of ponding, uneven flow distribution, clogging, vibration, leakage, flies and unusual odors.

To avoid odors, the operators shall;

- Reduce loading; increase BOD removal in primary settling tanks; enhance aerobic conditions in treatment units by adding chemical oxidants, pre-aerating, recycling plant effluent, or increasing air to aerated grit chambers; scrub off gases; use plastic media instead of rock.
- Increasing the recirculation rate and checking for vent obstructions shall eliminate the problem.
- Check for clogged nozzles which may not be allowing for equal distribution of flow.

To avoid Ponding, the operators shall:

- A sampling plan shall be devised by the MC that will assist in locating problems within the plant with the minimum parameters for the samples being influent flow, recirculation rates, BOD5, TSS, pH, DO, settle-able solids and suspended solids.
- The operational performance of both upstream and downstream treatment units will have a direct effect on the performance of a WSP³⁹.

1.4.2. Social Environment

When a development project is launched in a community, it helps in boosting up the socio-economic conditions by providing the people different economic opportunities. The improvement of sewerage system and construction WWTP would have a positive impact on the commercial activities of the locals. The socio-economic impacts like employment, revenue generation for MC, and improvement of municipal services are the direct benefits during this stage for the people of the sub-project area. Local people will be hired for different jobs like sewerage system maintenance, Environmental Quality parameter testing and handling of WWTP etc. These are some of the many examples. Operation of the project will also result in the decrease land values. This section will highlight positive and negative impact of the project.

A. Employment Generation

The employment opportunities in the sub-project area will be increased due to the development and operation of the proposed project. During development and operation of the proposed project, unskilled workers will be required as labors, sanitary workers and sweepers as well as for the skilled workers such as; environmental engineers and lab analyst to operate WWTP. In totality, the overall economic conditions of the area will be improved.

B. Aesthetic Impacts

Tree plantation followed by ornamental plants within or outside the premises will increase the aesthetic value and scenic beauty of the site. The Proponent will also make arrangements for protection and maintenance of these plants and trees.

C. Occupational Health & Safety Impacts

a) Potential Impacts

³⁹ https://files.dep.state.pa.us/water/bsdw/OperatorCertification/TrainingModules/ww20_WasteStabilizationPounds_wb.pdf

- Work at Sewage Treatment Plant is often physically demanding and may involve hazards such as open water, trenches, and slippery walkways, working at heights, energized circuits, and heavy equipment.
- There is a high potential for illnesses arising from contact with viruses, bacteria and other microorganisms in sewage. The most serious viral risk is hepatitis. The most serious bacterial risk is tetanus.
- Work may also involve entry into confined spaces, including manholes, sewers, pipelines, storage tanks, wet wells, digesters, and pump stations. Methane generated from anaerobic biodegradation of sewage can lead to fires and explosions.
- Moreover, cutting, grinding and hot work shall be done in workshop which also has significant safety risk. Unless suitable precautionary protocols in accordance with international good practices are put in place, there is a high risk of injury and accidents taking place at the WWTP during its day-to-day operations.
- Laboratory staff shall be at risk of getting injuries associated with handling of various lab chemicals and reagents.
- Sanitation workers involved in the cleaning and maintenance of interceptor can be exposed to Hydrogen Sulphide (H_2S) when cleaning or maintaining the interceptor. Sanitation workers dealing with sewage may be at increased risk of becoming ill from waterborne diseases

b) Potential Mitigation Measures

- In order to ensure a safe and healthy working environment for the workers and staff of the WWTP and the sanitation workers involved cleaning and maintenance, the following measures shall be strictly enforced, implemented and monitored by the MC:
- An OHS Management System shall be established and implemented describing standard operating procedures, roles and responsibilities, training needs, emergency response procedures, and reporting and documenting needs.
- Designation of an Environment, Health and Safety (EHS) officer dedicated to the site;
- Workers shall be educated / trained for the following measures as well as they shall be equipped by the plant management accordingly:
- Avoid direct contact with sewage.

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- Avoid aerosolizing sewage water or minimizing exposure time in areas where aerosolizing is occurring. Make sure ventilation systems are functioning properly when working around areas where sewage may be aerosolized.
- Thoroughly cleanse all exposed injuries with soap and water and keep them covered with a bandage (preferably waterproof) while at work. Seek medical attention immediately after suffering cuts or penetrating injuries.
- If a worker is suffering from a skin problem, they should see a physician before working with sewage.
- Avoid touching the face, mouth, hands, eyes or nose with dirty hands or other items and avoid nail biting.
- Thoroughly wash the hands and face with soap and water before eating, drinking or smoking.
- Eat/smoke in designated areas away from sewage contamination. These areas must be kept free from contamination by leaving any protective clothing and boots in a separate area, for example.
- Use appropriate protective clothing at work (coveralls) and personal protective equipment (boots, gloves, plastic face shields) and, where required wearing respiratory protective equipment.
- Remove personal protective clothing and footwear at the end of the shift and leave it at work.
- Shower and change out of work clothes before leaving work.
- Report damaged equipment.
- Report all work-related health symptoms to the supervisor / in-charge
- The plant management shall ensure organization of periodic tests for workers for disease exposure such as: Skin tests for tuberculosis and fungal infections, liver function tests for hepatitis, white blood cell (leukocyte) counts and urinalysis for Fibrinogen Degradation Product (FDP) concentration.
- Safe reach shall be ensured so that all the staff reach their work stations safely.

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- All path, walkways, staircases, ladders and platforms shall be stable and made suitable for the tasks to be undertaken;
- Strict use of Personal Protective Equipment (PPE) by all personnel (especially staff working in Laboratory/chemical building and workshop) shall be ensured.
- Tool Box talks shall be performed at the start of every shift.
- Mandatory training of all employees, including sub-contractors, on Health and Safety Practices for WWTP and its auxiliary facilities shall be ensured.
- Mandatory health and medical check-ups for all sanitary workers working in cleaning of pumping stations and sewers shall be performed.
- A written program (i.e., health information, instruction and training) shall be developed for setting out the procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards of working in WWTP and its auxiliary facilities;
- Accidental fires must be addressed immediately. Firefighting plan shall be developed and appropriate fire extinguishers shall be placed at prominent locations.
- Emergency plan (including fire management) shall be developed and implemented attached as **Annexure N**.
- First aid facilities required to attend workers with minor injuries / ailments shall be established at site for meeting emergency situations;
- Availability of first-aid kits and vehicles that can be used to bring any injured employee to the nearest hospital in cases of accidents shall be ensured;
- Mandatory reporting of all accidents or incident of near misses of accidents and immediate adoption of corrective measures shall be ensured.
- The MC shall provide all the necessary financial and manpower resources for the implementation and enforcement of all health and safety programs and activities throughout the operational phase;
- Regular training and orientation on safety practices will be implemented to impart knowledge of safe and efficient working environment.

- Effective and proper housekeeping shall be ensured.
- Heat levels shall be monitored and spot checks shall be done to ensure that workers' welfare is addressed especially during summer months.
- Railing shall be installed around all process tanks and pits.
- Workers working near water bodies shall be provided with life line and Personal Flotation Device (PFD) and provision / availability of rescue buoys and throw bags shall be ensured;
- Implementation of a confined spaces entry program that is consistent with applicable accepted standards shall be ensured.
- Valves to process tanks shall be locked to prevent accidental flooding during maintenance;
- Provision and use of fall protection equipment shall be ensured during work at heights;
- Work areas shall be maintained to minimize slipping and tripping hazards; Fire and explosion prevention measures shall be adopted in accordance with internationally accepted standards

1.4.3. Biological Environment

During operational phase of the project, there would be medium on the surrounding biological environment.

After adopting all recommended mitigation strategies, the residual impacts shall be low.

A. Pathogens and Vectors

a) Potential Impacts

- Workers and staff at wastewater and sludge treatment facilities where treated wastewater or sludge is applied, as well as operators of sludge collection vehicles, can be exposed to the many pathogens contained in sewage.
- Processing of sewage can generate bio-aerosols which are suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity.

- Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles. Vectors for sewage pathogens include insects (e.g., mosquitoes, flies), rodents (e.g. rats) and birds (e.g. gulls).

b) Mitigation Measures

The Contractor shall ensure the following:

- Comprehensive plan attached as **Annexure K** shall be developed and implemented to manage and avoid the spread of vector borne diseases, also considering the seasonality of the issue;
- Minimize the sludge inventory present at the WWTP as far as possible to prevent breeding of disease vectors;
- Cover the sludge piles present at the WWTP as far as possible;
- Cover all influent drains within WWTP and inject chemicals as required to minimize/prevent breeding of disease vectors;
- Maintain good housekeeping in sewage processing and storage areas;
- Implement safety training program for workers, safe handling and personal hygiene practices to minimize exposure to pathogens and vectors;
- Use of vacuum trucks for removal of sludge instead of manual methods;
- Provision and use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.).
- Provision of prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes;
- Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes;
- Encourage workers to wash hands frequently;

- Provide worker immunization (e.g., for Hepatitis-B and Tetanus) and health monitoring, including regular physical examinations;
- Reduce aerosol formation and distribution by planting trees around the aeration areas to shield the area from wind and to capture the droplets and particles;
- Reducing aeration rate, if possible, but not to the detriment of wastewater treatment efficiency;
- Avoid handling screenings by hand to prevent needle stick injuries;
- Maintain good housekeeping in sewage processing and storage areas;
- Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, because of their greater risk of infection.

B. Community Health & Safety

a) Potential Impacts

If the waste left on the site and not promptly disposed of during maintenance or cleaning, the public may experience inconvenience due to exposure to unpleasant odors and harmful pathogens. Additionally, the transportation of the waste, if not handled properly, could also create problems for general traffic, further adding to the nuisance.

b) Potential Mitigation Measures

- EPA certified hazardous waste handlers shall be contracted for the safe and timely removal and transportation of removed waste for its appropriate disposal. Cleaning and maintenance shall be done at night, when the roads are quieter, with less vehicular traffic.
- Choose the site of the sewerage and waste treatment project carefully, away from sensitive locations such as residential areas, schools, and hospitals.
- Post attention/alert notices at the sub-project site to inform the community about the ongoing construction and potential hazards.
- Barricade the site to prevent unauthorized access and ensure the safety of the surrounding community.
- Use proper signage to clearly indicate areas where access is restricted.
- Develop a stakeholder engagement plan based on consultation with the community regarding the nature and potential consequences of risks.

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- Implement mitigation measures for sewerage and waste treatment projects to prevent waterborne diseases, pollution, and promote public health and safety.
- Design and construct the sewerage and waste treatment system to meet environmental and public health standards with appropriate materials and technologies to prevent leaks, spills, and other hazards.
- Implement odor control measures like covering tanks, using odor control chemicals, and installing air scrubbers.
- Engage with the community throughout the project to provide information, raise concerns, and provide feedback.

Chapter 06

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

6.1. General

This chapter presents the Environmental and Social Management and Monitoring Plan (ESMMP), which describes the various actions taken by the project proponent to ensure long term environment sustainability of the proposed project. Hence, a comprehensive management plan is required that are socially acceptable and environmentally sound. The basic aim of the Environmental and Social Management and Monitoring Plan (ESMMP) is to address all the anticipated environmental issues and proposed framework for mitigation measures of pre-construction, during and operational phases of the project. Besides defining roles and responsibilities of various authorities, the ESMMP also presents a set of environmental mitigation measures, which focus on avoiding and or preventing the adverse environmental and social impacts emerge due to project activities. The ESMMP also suggests institutional setup for ensuring smooth implementation of the various mitigation measures and other recommendations. Institutional arrangements for compliance monitoring, training and capacity building are also included in the ESMMP. ESMMP also defines frequency of taking samples for monitoring of air quality, solid quality, ground water quality, noise and vibration etc.

ESMMP will ensure proper management of the identified environmental impacts, either fully prevented or alleviate to an acceptable level. It would be only possible if proper implementation of the EMP and objectives are successfully adapted by concerned departments, institutions and regulatory agencies. Therefore, there is a need to carefully coordinate with the design and construction phase of the project to assure that relevant mitigation measures are implemented at the suitable stage and resources are properly allocated to attain the desired outcome

The ESMMP is one of the outcomes of the EIA/ESIA identifies major areas which need attention during the various stages of the project implementation such as designing phase (pre-construction phase), construction phase as well as operation phase, in particular, (a) what is to be managed and monitored; (b) when and where; (c) by whom; (d) whom to report and follow up if there is an issue that may raise at any stage of the project. An important component to ponder is that monitoring of every environmental parameter continuously is not practical

and necessary. Environmental monitoring functions according to the characteristics of existing environmental conditions and identifies unacceptable changes during construction period.

Based on these guiding principles, the ESMMP is prepared for the effective implementation, management of the mitigation measures and monitoring requirements, satisfies the requirement of the Pakistan Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022 and WB policy guidelines.

6.2. Primary Objective

The ESMMP devises a mechanism to address adverse impacts that are likely to arise during pre-construction, construction, operation of the proposed facility and the post closure to enhance project benefits and to introduce good practices to be adopted at various stages of project.

The primary objectives of the ESMMP are:

- Outline mitigation measures based on the impact assessment in the EIA/ESIA and define the responsibilities of the contractors, sub-contractors and the project proponent and timing for the implementation of these measures.
- Develop a monitoring mechanism and identify parameters that can confirm the implementation of the mitigation measures.
- Facilitate the implementation of the mitigation measures identified in the EIA/ESIA.
- The development and implementation of environmental monitoring plan for the periodic reviews of the baseline environmental conditions.
- Identify training requirements at various levels.

6.3. Roles and Responsibilities

This section defines roles and responsibilities of the project proponent (for the implementation of ESMMP and identify areas where these roles and responsibilities can be shared with other stakeholders.

The project proponent will be responsible for ensuring compliance to all applicable requirements of ESMMP. The proponent will be responsible for all the activities requiring special attention as specified by the Environmental Expert. Meanwhile, the proponent will ensure that contractor conducts all activities in a manner that minimizes disturbances to the residents and the public in general. The contractor will implement the majority of environmental and social mitigation measures. The contractor will carry out field activities. The contractors

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are subject to certain liabilities under the environmental laws of the country and under its contract with the proponent.

The organizational roles and responsibilities are summarized below:

Role	Responsibilities
Proponent	▪ Implementation and monitoring of the ESMMP ▪ Provide all supervisory and management staff with an awareness and understanding of their responsibilities under this ESMMP. ▪ Provide appropriate and adequate resources are allocated to allow for the effective implementation and maintenance of the ESMMP. ▪ Conduct periodic reviews of environmental performance are conducted. ▪ Report any major environmental incidents that may have a significant impact on the surrounding environment. ▪ Provide employees and contractors with the relevant environmental instruction in relation to the ESMMP and awareness and understanding of their obligations and duties.
Construction Contractor	▪ The Contractor will be responsible for on-field implementation of the ESMMP and environmental protection liabilities under the Punjab Environmental Protection Act (Amendment 2012). He will also be responsible for compliance of ESMMP provisions keeping in view his contract with the MC Kot Addu The Contractor will train his crews in all aspects for implementation of the ESMMP. ▪ Be aware of and understand the contents of and the reason for implementing the elements of the ESMMP and ensure all personnel including subcontractors adhere to these requirements. ▪ Provide adequate training in the elements of the EMMP to all personnel, including contractors.

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Role	Responsibilities
	▪ Provide personnel involved in the project, including subcontractors and visitors, with the appropriate environmental training required to provide them with awareness and understanding of their responsibilities under the ESMMP as well as understanding of the environmental approvals that adhere to the strategies outlined in the ESMMP. ▪ The contractor/ sub-contractor shall carry out field activities as part of the project construction. The contractors/ sub-contractor will be responsible to implement various mitigation measures prescribed in the ESMMP of EIA/ESIA report. The contractors will also be subjected to certain obligations under the PEPA Act, and under their contracts with the concerned authority. ▪ Make sure that all environmental safeguards and precautions are in place and adhered to at all times at the site and activity. ▪ Regularly inspect and monitor all activities for adherence to proper environmental safeguards. ▪ Ensure that all equipment used is properly serviced and that all precautions are in place to prevent the likelihood of an environmental incident occurring. ▪ Report all environmental incidents to the Superintendent's Representative as soon as practicable, but within 24 hours of them.
Superintendent's Representative All employees and subcontractors	▪ Be aware and understand the contents of, and the reason for, implementing the elements of the ESMMP. ▪ Exercise environmental due diligence and achieve compliance with the ESMMP. ▪ Report all environmental incidents to the principal as soon as practicable, but within 24 hours of them occurring.

6.4. Environmental and Social Management and Monitoring Plan

The impacts, mitigation measures, monitoring indicators, frequency and responsibility has been discussed in Environmental and Social Management and Monitoring Plan (ESMMP) hereunder table 11.

2.4.1. Monitoring & Reporting Mechanism of ESIA

- **Monitoring Plan Development:** A monitoring plan is developed, outlining the methods, frequency, and responsibilities for monitoring the identified indicators. The plan should specify who will conduct the monitoring, what data will be collected, how it will be analyzed, and how often monitoring reports will be produced.
- **Ongoing Monitoring:** The project activities and their impacts are regularly monitored according to the established plan. This may involve field visits, data collection, sample analysis, stakeholder consultations, and other monitoring techniques. Monitoring helps track changes, identify emerging issues, and evaluate the effectiveness of mitigation measures.
- **Data Analysis:** The collected monitoring data is analyzed to assess the project's actual environmental and social performance against the predicted impacts outlined in the ESIA report. This analysis helps identify any discrepancies, areas of concern, or unexpected impacts.
- **Reporting:** Regular monitoring reports are prepared and submitted to the relevant stakeholders, including the project proponent, regulatory authorities, affected communities, and other interested parties. The reports should present the monitoring findings in a clear and understandable manner and provide an objective assessment of the project's performance.
- **Mitigation and Corrective Actions:** If the monitoring reports identify significant adverse impacts or non-compliance with environmental and social standards, appropriate mitigation and corrective actions should be proposed and implemented. These actions aim to reduce or eliminate the negative impacts and improve the project's environmental and social performance.
- **Stakeholder Engagement:** Throughout the monitoring and reporting process, it is essential to engage with stakeholders, including affected communities, NGOs, regulatory agencies, and other interested parties. Stakeholder engagement helps ensure transparency, gather feedback and concerns, and foster collaboration in addressing environmental and social issues.

To ensure the successful implementation of an ESMP, monitoring and supervision are considered effective tools. The level of monitoring and supervision must be appropriate. These measures are meant to reduce the risks and impacts and ensure compliance with the sub-project requirements and the procedures for documentation, reporting, and feedback on the outcomes of corrective and preventive action.

Physical, biological, and socio-cultural parameters will be monitored to determine the compliance level with National, World Bank standards and compliance with this ESMP. Monitoring will be divided into Compliance monitoring and Effect monitoring.

Compliance monitoring represents the majority of the monitoring during the sub-project operational and handing over (defect notification). supervision consultant along with ESM will be responsible for day to day monitoring of the contractor's compliance with this ESMP and will monitor the implementation of the mitigation measures. Supervision consultant will complete monitoring within the sub-project area using contract specific monitoring checklists and will engage a full-time environmental representative to be present on-site for daily monitoring who will report directly to the Resident Engineer from supervision consultant, and who will coordinate with the project management unit.

Effects Monitoring will be carried out by M&EC of various environmental and social parameters quarterly to evaluate the performance of this ESMP. The following parameters are to be monitored:

- Monitoring of Noise levels at fixed locations during the construction phase
- Availability of water at the downstream end of the channel system
- Monitoring of ambient air quality during the construction phase
- Health and safety of Contractors personnel
- Monitoring for waste management and sanitary waste disposal
- Monitoring labor management in the project area such as the process of hiring skilled and unskilled labor from the local community or other areas, no any labor rights are affected, camps are located 500 meters away from community trespass area and have an adequate boundary, contractor's training plan is implemented accordingly, no GBV or sexual exploitations are taken place, rights of women and children or any vulnerable groups are not affected.
- Monitoring of overall GRM mechanism developed in the project such as their functional committees, a database of grievances received from the communities

in soft and recorded in hard in database register in writing or verbally and follow-ups status.

6.5 Monitoring Mechanism

Before the execution of work, in the contractor's environmental and social management plan, each Contractor will include details of its proposed social, health, safety, and environmental implementation procedures, to ensure the construction sites are operating satisfactorily and that problems are being dealt with swiftly.

- The format of a monthly report which reviews the Contractor's compliance with the environmental and social requirements of this ESMP and their own plan
- A formalized mechanism to audit the effectiveness of the own plan (i.e. Contractor Environmental Social Management Plan).

Details of the records to be kept demonstrating compliance with safeguards.

- Monitoring checklists for day to day monitoring with safeguards.
- A plan for day-to-day monitoring of the site and identification of staff responsible for this.
- Proposed actions to be taken to correct non-compliances noted by the supervision consultant.
- Internal reporting channels for non-compliances

6.6 Aims of Monitoring

The main objectives of the monitoring plan are:

- Evaluate the performance of the ESMP and to bring about improvements.
- To provide a means where impacts that were uncertain at the time of preparation of ESMP or unforeseen could be identified and steps are taken to adopt appropriate corrective measures.
- Record the inputs provided by various participants in the environmental and social management process, (i.e., client, consultants, contractors)
- To check whether mitigation measures are adequate, effective, and adopted in the field.
- To comply with legal and community obligations, including safety on construction sites.

6.7 Noncompliance and Corrective Measures

The Contractor will be notified of any violations with this ESMP, as well as any corrective actions required. The payment of the mobilization bill item will not be paid to the contractor until the following conditions have been met.

- Preparation and submission of Health and Safety Plan to the supervision consultant in coordination with ESM for review and approval.
- Provision of contractor's staff camps.
- Preparation and submission of the contractor's Environmental and Social Management Plan to the supervision consultant in coordination with ESM for review and approval.
- The contractor will submit the curriculum vitae of its ESMP staff to the supervision consultant in coordination with ESM for review and approval. The availability of the Contractor's ESMP staff will be made full time on site.

Where the contractor fails to comply with his management plans, (i.e., CESMP or Health and Safety Plan) and, therefore fails to comply with this ESMP, payments will be deducted from the relevant bill item each month. The percentage deduction from these bill items will be based on the percentage compliance as measured through monthly monitoring checklists.

The following stages will be performed, relating to the increasing severity of ESMP non-compliances.

Stage 1 Supervision Consultant discusses the problem with ESM and Contractor to work out mitigations together and record the facts and the decision implemented.

Stage 2: A more serious infringement is observed and supervision consultant notifies the Contractor of the issues in writing, with a deadline by which the problem must be rectified. All costs will be borne by the Contractor.

Stage 3: ESM / supervision consultant will order the Contractor to suspend part, or all, of the works. The suspension will be enforced until the offending party, procedure, or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

Stage 4: Breach of contract - One of the possible consequences of this is the removal of a Contractor and/or equipment and/or the termination of the contract. Such measures will not replace any legal proceedings that ESM may institute against the Contractor.

Communication, Reporting, and Documentation

- **Meetings**

A preliminary meeting will be held with the aim of setting out the format for the regular meetings. This meeting will be held before the commencement of the works, following the contract award. The meeting will be attended by ESM /PIU, supervision consultant, and the contractor.

In addition to the meetings above, SUPERVISION CONSULTANT (Environmental Engineer) will monitor or check the compliance status of contractor commitment on

social, environmental, health, and safety-related issues. The day-to-day progress will be provided by the supervision consultant to ESM.

- **Communications**

Most communications between supervision consultant and the contractor will be verbal on site. Where such verbal communication proves to be ineffective for an issue, the environmental team of supervision consultant will issue a formal instruction to the contractor under the civil works contract. Such instructions will also be copied to ESM, as the *Employer*.

- **Reporting Frequency**

The Contractor and supervision consultant will produce monthly reports detailing the compliance level and non-compliance with this ESMMP. The distribution list of reports is given in the below table.

Table : Distribution of Periodic Reports

S. N	Report	Prepared by	Frequency	Reviewed by	Distribution
1.	Monthly supervision consultant Compliance Report	supervision consultant	Monthly	ESM	Contract or
2.	Monthly Contractor's ES Mitigation and Management	Contractor's Environmental Coordinator/Officer	Monthly	ES supervision consultant	ESM supervision consultant &

Pictorial Record

A photographic record of the sub-project locations shall be kept and taken at key locations in a walkthrough survey by the contractor, Supervision Consultant and ESM. The photographic record shall be incorporated into the monthly reports. The pictorial record shall include time, the title of the photograph, and the date.

Monthly Environmental Health and Safety Checklists

The completed monitoring checklists shall be attached to the monthly reports. The format of the monthly monitoring checklist is provided in Appendix E.

Complaints Register

The contractor will maintain social complaints register at all camps and worksites to document all complaints received from the local communities. The register will also

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record the measures taken to mitigate the reported concerns. The final report will be communicated to the ESM. All complaints/issues of the community will be reported in the monthly progress report for the following month along with the status of the last month's complaints.

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Table 12: Environmental & Social Management & Monitoring Plan (ESMMP)

A-Design Stage	Design Responsibility	Implementation responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling it to environmentally and socially sustainable. 1. Wastewater Treatment - Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells - The sewerage system that conveys the wastewater discharge of the current population is connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQs and or re-used as per WHO and USEPA Guidelines. - The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. 2. Better Municipal services and sustainable water application after treatment. Major purpose is to improve quality of wastewater by eliminating pollutants, toxicants and many such to make. wastewater usable for other purposes and preservation of water quality of natural water resources.	Design Consultants	MC Kot Addu
2. Permits, NOCs, Clearances		
Necessary consents, permits, and clearances shall be obtained before the start of civil works Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e.g. WAPDA in case of shifting of transmission lines. Anyhow, this component of project will be executed at MC Kot Addu owned Government land where existing system is present and desilting material will also be disposed off at MC owned disposal site.	PMDFC and MC	MC Kot Addu

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3.Land Acquisition and Resettlement Issues		
- This component of subproject will be executed at MC owned ROW and existing systems - The contractor's temporary facilities will preferably be established on government owned land. Otherwise, such lands/budlings will be obtained on a rental or lease basis. - It will be ensured that no project works are carried out where AED activities have been or are being carried out	MC Kot Addu	MC Kot Addu
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Kot Addu
5. Preparation of Labor Management Procedures		
EHS SOPS for Labor workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractors' term of reference and bid documents.	ESFPS	

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B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
1. Contractors Terms of Reference - The MC Kot Addu shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. - This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. - This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Kot Addu	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants
2. Grievance Redress Mechanism - Grievance Redress Mechanism has been developed under PCP - MC Kot Addu with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints - Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site - Provide sign boards for pedestrians to inform nature and duration of construction works - Provide alternative access road for residents via Peradeniya - Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM - Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Kot Addu Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

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C- Construction Phase								
Proposed Sub-project activities	Potential Env/Soc Impacts	Magnitude of Impact			Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility
		Low	Medium	High				
Dismantling, Excavation for laying of missing sewer links	a) Environmental Issues: - Dust which may affect visibility - Noise from machineries/equipment - Construction waste may be generated due these activities - Safety hazards to labor - Worse House Keeping b) Social Issues: - Excavated waste and construction activity may cause disturbance in mobility - Temporary blockage of road may restrict mobility - Conflict with public and public complaints				- Excavated waste will be reused to restore the road. - Updated and tuned machinery will be used to control noise. - Water sprinkling will be carried out at consecutive intervals as per instruction - Avoiding construction activities during nights. - Removal of excess matter/debris from the site immediately. - Provide PPEs to labor - Provide appropriate signage near the construction activities to sensitize the communities and minimize accidents. - Public must be informed about project major activities, duration of scheme, time and schedule, anticipated impacts and their proposed Mitigation Measures. The contact Nos. of focal person of Grievance	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - Construction Supervision Consultant - DPO ESSs

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				Redress Committee will be displayed at different locations and residents will also be informed about it.			
Supply and Installation of 200KV Transformer 11KV supply Line Completion of incomplete control room and transformer room	Environmental Issues: - Noise and vibration - Most transformers contain insulating oil, which, under rare failure conditions, can leak or even catch fire, creating an environmental issue. Social Issues - Workers that install and repair high voltage lines, transformers and switches may face hazards from electrical shocks, burns and/or electrocution.			- Install Anti-aquatic and anti-vibrant insulators - Provide PPEs to labor - Provide appropriate signage near the construction activities to sensitize the communities and minimize accidents. MC Kot Addu will carry out this work through WAPDA and they may provide the following mitigation measures to the concerned staff of WAPDA: - Traditional transformers are installed with extensive shielding and concrete pools to contain spillage. However, recent developments such as the use of biodegradable ester fluid not only lower the risk of fire, but also eliminate the environmental risks from possible spillage. Using biodegradable ester fluid also reduces the need for extensive surrounding infrastructure. - Absence of Voltage Tester (AVT)			

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				An Absence of Voltage Tester (AVT) is a permanently-mounted test device designed to verify that a circuit is de-energized prior to opening an electrical enclosure containing electrical conductors and circuit parts. Engineering control • Using Cover-Up Equipment Using cover-up equipment properly cover the live power lines to protect line workers from accidental contacts with energized conductors. • Using Non-conductive Ladders These ladders prevent the current from the live power lines to reach the worker if the ladder contacts an overhead power line. • Temporary Protective Grounds Temporary protective grounds create a secure path to ground for induced voltage on de-energized power lines, which otherwise could produce great risks to workers. • Transfer Switch for Generators Installing transfer switches eliminate the risk of			

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				electrocuting line workers through back feed from generators. Work practice • Using Insulating Blankets Insulating blankets cover the live powerlines and protect workers from the accidental contacts with energized conductors. • Using Insulating Line Hose Insulating line hose provides a protective barrier to prevent accidental contact with high-voltage lines. • Using Live-Line Tools Live-line tools provide insulation between line workers and live parts or other conductors while maintaining a minimum approach distance from live powerlines. • Lock Out Tag Out LOTO devices reduce the risk of an unexpected equipment start-up by ensuring that an unauthorized worker cannot energize that equipment. • Safe Work Practices When Using Portable Generators Recommendations to reduce the risk of electrical and fire hazards and exposure to			

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				carbon monoxide while using generators. - Public must be informed about project major activities, duration of scheme, time and schedule, anticipated impacts and their proposed Mitigation Measures. The contact Nos. of focal person of - For emergency, provision of emergency exit in the control room' - To avoid any electricity hazard, provision of Fire extinguishers in the control rooms			
Labor Camp (if established by Contractor)	- Health impacts due to absence of housing and sanitation facilities in labor camp. - Security of labor - Unhygienic conditions			- Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to labor. However local labor will be hired as skilled labor from outstation is not the requirement of this project In case of construction of camp site, following measures will be adopted by the contractor: - Good housekeeping will be ensured inside campsite - Labor will be provided with quality food.	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - Construction Supervision Consultant - DPO ESSs

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				• Better heating & cooling facilities will be provided by the Contractor as per season accordingly. • Better accommodation will be ensured by the Contractor. • Its better to accommodate labor in Containers Camps/houses with all amenities. • Contractor will submit Campsite Management Plan and approve from Construction Supervision Consultant before the execution of work.			
Desilting	○ Traffic/pedestrians hindrance ○ Smell/odor ○ Vector borne diseases sites in case of silt piles			• Desilted material will be disposed off within 24 hours at MC designated site • Silt will be removed through sucker bucket machines and to avoid mobility of the local community, alternate routes will be provided in the main roads while local community will be informed well before time about this activity • In case of sensitive receptors i.e. schools/ colleges and Mosques sites, desilting activity will be scheduled as per the timings of institutions and prayers.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

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					- Safe transportation of silt material will be ensured from the de-siltation site to disposal site by covering with the trapline and using PPEs by the workers handling the overall activity - To know the change in air and water quality due to silt material, contractor will ensure to carry out the air and water quality testing before and after the activity from de-siltation site and disposal site respectively			
Manhole Covers	Accidental falls				- It will be ensured to perform the activity during sunlight hours - Area will be completely cordoned off and prohibited for children - Awareness signage will be displayed at prominent places - Local community will be informed well before time to adopt precautionary measures - It will be ensured to complete the activity in minimum possible time duration	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/ Weekly - Once during the construction phase	- ESFPs - Construction Supervision Consultant - DPO ESSs
Pumping Machinery Replacement	- Electric shocks - Fall and slip damage in the dry well				It will be ensured to switch off all the electric connections before entering the laborer/worker into the well	Visual/ Pictures	During work/ activity	- ESFPs - Construction Supervision Consultant - DPO ESSs

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					• Use of PPEs will be ensured			
Site Safety Issues	○ Accidents				Contractor will ensure site safety using safety cautions (night vision), boards, flagmen, cordon tapes etc. for smooth flow of traffic during the construction phase of the Sub-Project.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
Occupational Health & Safety	○ Injuries to workers/LTI				• Contractor will follow HSE SOPs for all activities on the site. • Workers will be trained and guided to follow EHS SOPs for Labors/Workers (Including Women Labor/worker) for Construction of Development Project, attached as Annexure M and will be provided with necessary PPEs (Safety Helmets, Safety Shoes, Gloves, Chemical Masks etc.) wherever required.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

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					- First aid will be provided onsite - Careful monitoring will also be carried out.			
Damage to Public Infrastructure/utilities	- Accidents/Incidents/Injuries - Structural loss - Social Conflicts				- Contractor will ensure no damage to public utilities or structures. - Contractor will provide compensation in case of any damage may occur to the private property	Visual/Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - Construction Supervision Consultant - DPO ESSs
Sexual Harassment-Labor Influx-Child Labor	Social Conflicts				- Contractor will give behavioural training to the workforce. - Contractor will hire local labor - Child labor will not be allowed for any activity	Visual/Pictures/Reported/Complaints by public during visit	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction	- ESFPs - Construction Supervision Consultant - DPO ESSs

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						ction phase	
CoViD-19 SOPs implementation	○ Spread of Corona among the labor			• Contractor will provide face masks to the labor on daily basis to reduce Corona impact. • Contractor will follow CoViD-19 guidelines during construction works	Visual/ Pictures	• Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

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Part IA-Estimated Budget			
Item	Quantity	Tentative Cost/Item- PKR. /-	Total Cost
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	10	300	3000
Safety Hard Helmets	8	3,000	24000
Safety Shoes	8	3,000	24000
Hand Gloves	8	1,000	8000
Ear Plugs	8	500	4000
Reflective Safety Vest	8	1,000	8000
Safety Goggles	8	500	4000
B-Community Health and Safety			0
Trapline to cover silt during transportation	1	20000	20000
First Aid Box Complete	1	5,000	5000
Safety Signs	2	15,000	30000
Safety Cones	5	1,000	5000
Safety Tapes	5	1,500	7500
Portable Delineator with chain	5	2,200	11000
Solid Waste Collection Drums with Cover	2	12,000	24000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Hiring of EHS Expert	1 for 02 months @ 50,000/month	100,000	100000
Total (PKR)-A+B			287,500

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Table 13: Rehabilitation of Existing Sewerage System (Desilting, replacement of disposal stations pumping machinery)

Execution Phase								
Proposed Sub-project activities	Potential Env/Soc Impacts	Magnitude of Impact			Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility
		Low	Medium	High				
Labor Camp (if established by Contractor)	- Health impacts due to absence of housing and sanitation facilities in labor camp. - Security of labor - Unhygienic conditions				- Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to labor. However local labor will be hired as skilled labor from outstation is not the requirement of this project In case of construction of camp site, following measures will be adopted by the contractor: - Good housekeeping will be ensured inside campsite - Labor will be provided with quality food. - Better heating & cooling facilities will be provided by the	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - Construction Supervision Consultant - DPO ESSs

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					Contractor as per season accordingly. • Better accommodation will be ensured by the Contractor. • Its better to accommodate labor in Containers Camps/houses with all amenities. • Contractor will submit Campsite Management Plan and approve from Construction Supervision Consultant before the execution of work.			
Desilting	○ Traffic/pedestrians hindrance ○ Smell/odor ○ Vector borne diseases sites in case of silt piles				• Desilted material will be disposed off within 24 hours at MC designated site • Silt will be removed through sucker bucket machines and to avoid mobility of the local community, alternate routes will be provided in the main roads while local community will be informed well before time about this activity • In case of sensitive receptors i.e., schools/ colleges and Mosques sites, desilting activity will be scheduled as per the timings of institutions and prayers. • Safe transportation of silt material will be ensured from	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

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					the de-siltation site to disposal site by covering with the trapline and using PPEs by the workers handling the overall activity To know the change in air and water quality due to silt material, contractor will ensure to carry out the air and water quality testing before and after the activity from de-siltation site and disposal site respectively			
Pumping Machinery Replacement	- Electric shocks - Fall and slip damage in the dry well				- It will be ensured to switch off all the electric connections before entering the laborer/worker into the well - Use of PPEs will be ensured	Visual/Pictures	During work/activity	- ESFPs - Construction Supervision Consultant - DPO ESSs
Site Safety Issues	Accidents				Contractor will ensure site safety using safety cautions (night vision), boards, flagmen, cordon tapes etc. for smooth flow of traffic during the construction phase of the Sub-Project.	Visual/Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction	- ESFPs - Construction Supervision Consultant - DPO ESSs

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							ction phase	
Occupational Health & Safety	o Injuries to workers/LTI				• Contractor will follow HSE SOPs for all activities on the site. • Workers will be trained and guided to follow SOPs and will be provided with necessary PPEs (Safety Helmets, Safety Shoes, Gloves, Chemical Masks etc.) wherever required. • First aid will be provided onsite • Careful monitoring will also be carried out.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
Damage to Public Infrastructure/utilities	- o Accidents/Incidents/Injuries - o Structural loss - o Social Conflicts				• Contractor will ensure no damage to public utilities or structures. • Contractor will provide compensation in case of any damage may occur to the private property	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

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Sexual Harassment- Labor Influx- Child Labor	○ Social Conflicts			• Contractor will give behavioral training to the workforce. • Contractor will hire local labor • Child labor will not be allowed for any activity	Visual/ Pictures/Reported/Com plains by public during visit	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
CoViD-19 SOPs implementation	○ Spread of Corona among the labor			• Contractor will provide face masks to the labor on daily basis to reduce Corona impact. • Contractor will follow CoViD-19 guidelines during construction works	Visual/ Pictures	• Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

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Part IB-Estimated Budget			
Item	Quantity	Tentative Cost/Item- PKR. /-	Total Cost
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	15	300	4500
Safety Hard Helmets	5	3,000	15000
Safety Shoes	5	3,000	15000
Hand Gloves	5	1,000	5000
Ear Plugs	5	500	2500
Reflective Safety Vest	5	1,000	5000
Safety Goggles	5	500	2500
B-Community Health and Safety			0
Trapline to cover silt during transportation	1	20,000	20000
First Aid Box Complete	1	5,000	5000
Safety Signs	2	15,000	30000
Safety Cones	5	1,000	5000
Safety Tapes	5	1,500	7500
Portable Delineator with chain	2	2,200	4400
Solid Waste Collection Drums with Cover	2	12,000	24000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Total (PKR)-A+B			155,400

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Table 14:EMMP Improvement of Sewerage Network

A-Design Stage	Design Responsibility	Implementation Responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling to it environmentally and socially sustainable. 1. Wastewater Treatment • Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells • The sewerage system that conveys the wastewater discharge of the current population will be connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQs and or re-used as per WHO and USEPA Guidelines. • The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. 2. Better Municipal services and sustainable water application after treatment. Major purpose is to improve quality of wastewater by eliminating pollutants, toxicants and many such to make.	Design Consultants	MC Kot Addu
2.Permits, NOCs, Clearances		

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Necessary consents, permits, and clearances shall be obtained before the start of civil works. Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e.g. WAPDA in case of shifting of transmission lines.	PMDFC and MC	MC Kot Addu
3.Land Acquisition and Resettlement Issues		
- This component of subproject will be executed at MC owned ROW and existing systems - The contractor's temporary facilities will preferably be established on government owned land. Otherwise, such lands will be obtained on a rental or lease basis. - It will be ensured that no project works are carried out where AED activities have been or are being carried out	MC Kot Addu	MC Kot Addu
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Kot Addu
5. Preparation of Labor Management Procedures		
EHS SOPS for Labor workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractors' term of reference and bid documents.	ESFPS	

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B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
1. Contractors Terms of Reference - The MC Kot Addu shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. - This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. - This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Kot Addu	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants
2. Grievance Redress Mechanism - Grievance Redress Mechanism has been developed under PCP - MC Kot Addu with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints - Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site - Provide sign boards for pedestrians to inform nature and duration of construction works - Provide alternative access road for residents via Peradeniya - Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM - Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Kot Addu Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

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C- Construction phase							
Proposed sub project activity	Anticipated Environment and Social Issues	Magnitude of Impacts	Proposed Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency	Monitoring Responsibility
Establishment of Labor Camp	• Availability of Land • Security • Environment, Health and Safety of Labor at Campsite • Community Concerns regarding privacy of women and GBV⁴⁰ • Sustainable Use of	Medium	• At current, land/road proposed for construction and improvement of existing Sewerage system is open and vacant from any legal/illegal occupants. There are no trees of important flora and fauna observed at the site. This vacant space is owned by MCJ (Land Ownership Documents are attached as Annexure I) and notified as commercial area at the entry of the main city where urban area is a few meters away. • Currently MC owned land at proposed sewerage site is available for construction of labor camp at the current site. • Contractor will prepare Occupational Health and Safety Plan and get approval from MC before the execution of work • Contractor will be instructed (will be included in his term of reference and in the form of EHS SOPs)	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports • Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office • E&S Consultants of Supervision Consultants team

⁴⁰ Gender Based Violence

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	Environmental Resources		strictly implement the PMDFC SOPs for EHS of labor/ construction workers • Contractor will be instructed to prefer the local labor to be engaged. Anyhow, for labor site management, following mitigation measures will be provided: I. Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor if they will be hired from outstation. II. Good housekeeping will be ensured inside campsite III. Labor will be provided with hygienically good quality food. IV. During winter hot water will be provided for bathing and likewise as per the weather condition. Labor Training and Code of Conduct- • The contractor shall develop a labor code of conduct indicating specific labor management procedures applicable to different categories of workers including short time and full-time workers. The labor code of conduct shall be consistent with and part of the overall EHS SOPs for Labor developed by the PMDFC. • The labour Code of Conduct shall be translated into Urdu language upon clearance from the MOI of MC Kot Addu and DPO-ESM of regional office of PMDFC. The code of conduct must be made available to all staff and displayed in the work site in local languages				

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			• Labor awareness programs to educate the laborers about the code of conduct, general conduct, the Environmental and Social Management and Monitoring Plan, Public and Occupational Health and Safety Plan and sustainable use of local environmental resources etc. should be conducted throughout the contract period as per the Labor management plan and ESH plan approved by the MOI and DPO-ESM. • The contractor shall give priority to selecting labor from project influenced areas so as to minimize the need for erecting labor camps and minimizing labor influx. • Frequent supervision of laborers' activities, labor welfare needs, and action to ensure hygienic conditions in the work sites/ camps • Avoid social conflicts among contractor's labor force and the surrounding community or tension and prevalence of gender- based violence through the implementation of LMP. • Conduct awareness program on Gender Based Violence (GBV), good hygienic practices and dangers of sexually transmitted diseases such as HIV/AIDS and sensitize them to avoid interference and consider the privacy of local community women and vulnerable groups. • Introduce a code of conduct for labor teams to prevent alcohol and drug abuse, violence, sexual abuse etc.				

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			• Continue consultation and interaction with host community • Prepare an inventory (including names/ National ID numbers/addresses etc.) of entire labor force employed by contractor, and share with the Resident Supervision Consultants. This inventory shall be updated at each recruitment or resignation of labors.				
Site Preparation	• Accessibility of local communities and Work Site Management • Health and Safety of local communities • Traffic Management	Medium to High	• All public access to the site via adequate fencing and signage which prohibit public access completely, in order to avoid risk to the public • The site entrance will include adequate signage indicating the details of the proposed subproject, implementing agencies etc. as well as safety signage to keep public away. • A fence shall be erected to cover the entire perimeter of the facility using cost effective fence materials consisting of chain link fence fabric, concrete post, etc. as specified in the Technical Specifications in order to ensure, animals and public are unable to access the site. • To avoid land disturbance and movement, the fence shall generally follow the contour of the ground. • Grading shall be performed where necessary to provide a neat appearance • The contractor should provide a site-specific proposed site layout plan that identifies various zones within the construction site for designated use such as material and equipment storage areas, construction	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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			vehicle parking areas, vehicle/equipment maintenance areas, labor camps (if any onsite), temporary spoil storage areas etc. which shall be approved by the MC • Parking, repairing vehicles, machinery and equipment shall be stationed only within the work site and/or in any other designated areas by the MC • The contractor should provide instruction and advice to drivers and operators to park vehicles and store equipment at the designated area Traffic Safety and Management Plan- I. The contractor will prepare a Traffic management plan in consultation with the city traffic committee approved by the MC and duly disclosed to the public in a timely manner II. Carryout a road safety assessment in order to establish traffic control and safety measures such as road humps, fixing of signage etc. prior to commencement of construction III. Based on the initial road safety analysis a monitoring and management plan shall be prepared and submitted to the MC by contractor and Road Management Plan to be placed at the prominent places IV. In order to ease traffic within the city, transport of construction material and machinery will be done prior to 6.00 am and after 8.00 pm V. During school traffic hour's transportation of construction materials and heavy machinery shall not be done.				

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			VI. Provide information and boards at each strategic location indicating basic info – times of closure, diversion routes etc. I. Special consideration shall be given in the preparation of the traffic management plan ensuring the safety of pedestrians and workers at night. II. Personnel used for traffic control by the contractor shall be properly trained, provided with proper gear including communication equipment, luminous jackets for night use. All signs, barricades, pavement markings used for traffic management should be to the standards and approved by the City Traffic Police Road Safety Monitoring Plan shall be implemented throughout the construction period. • Monitoring incidents and accidents and monthly reporting shall be ensured. • Appropriate safety improvement measures shall be implemented avoiding incidents due to movement of construction vehicles based on the periodic review of reports. Environment, Health and Safety of Labor and Communities and Implementation of ESMMP I. The contractor will employ a qualified Health and Safety Specialist in his team for a period of 06 months. He/she will submit to the engineer a comprehensive Health and Safety Plan for the site which will be based on an assessment of OSH/EHS and public safety				

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			risks in relation to various types of construction activity and which covers the entire construction period. II. The H&S specialist will oversee its implementation regularly assessing the risk of various hazards and adopting mitigation measures. III. He shall ensure the all reasonable precautions will be taken to prevent danger of the workers and the public from accidents such as fire, explosions, blasts, falling to excavated pits, chemical sprays, unsafe power supply lines etc. IV. The Contractor shall comply with requirements for the safety of the workmen as per the international labor organization (ILO) convention No. 62 and EHS SOPs of PMDFC to the extent that those are applicable to this contract. V. The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, boots, etc., to the workers and staff. Community Safety Management Plan- I. All debris, waste generation from construction activity, labor camps etc. will be disposed only at locations approved by the MC for such purpose II. The debris and spoil shall be disposed in such a manner that;				

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			(i) waterways and drainage paths are not blocked (ii) the disposed material should not be washed away by runoff and (iii) should not be a nuisance to the public. (iv) The contractor shall do what is necessary in the minimum to ensure the disposal sites are made safe after disposal of the waste (level the waste, ensure drainage and safety) (v) The contractor shall as much as possible dispose waste on daily basis (or as necessary given the waste quantities generated and onsite stockpiling space) without allowing to stockpile onsite, at identified locations for debris disposal, recommended by the MC. (vi) During transportation, dispose materials should be covered with tarpaulin				
Excavation and Construction Activities	Dust/Air and noise	High	- All sedimentation and pollution control work and maintenance thereof are deemed, as incidental to the earthwork. Works to minimize cleared areas and exposed soils at a given time. - Barricades such as humps shall be erected around excavated areas for culverts, silt traps, foundations, sewerage pipes as some work in - The contractor shall effectively manage the dust generating activities such as handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities. - The Contractor shall erect a dust/noise barrier has around the site.	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultant of Supervision Consultants team

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			• All vehicles delivering materials shall be covered to avoid spillage and dust emission. • The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being carried to the roadway (particularly following wet weather). • The contractor should enforce vehicle speed limits to minimize dust generation. • The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of waste water / waste oil for dust suppression is prohibited) • All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. • Clearance shall be affected immediately by manual sweeping and removal of debris and ensure sprinkled water using appropriate equipment • Dust emissions should be controlled by wet spraying of construction sites and roads which are used for transportation of Construction materials at regular intervals. • Tarpaulin covering is mandatory on trucks /lorries which are used for transporting materials. • All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering. • Noise and Dust barriers with minimum height of 4m should be erected around entire working sites to control dust emission to the ambient air. Selection of the suitable material.				

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			• Contractor shall take appropriate action to ensure that construction works do not result in damage to the adjacent properties due to vibration. • Contractor shall pay due consideration on vibration impacts of construction on adjoining structures. In the event vibration levels are found to be exceeding national standards, he shall modify the method of construction until compliance with stipulated national vibration standards is met. • Vehicles should be maintained in good condition regularly so that noise and emission generating from wear and tear will be minimal • Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the DPO-ESM to keep noise and air emissions from these at a minimum				
	• Soil and Vegetation Cover Loss		• Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the MC Kot Addu. • Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover. • The contractor shall include in the construction site layout plan indicating various areas identified for designated use including parking areas. • Contractor should provide necessary instructions to drivers/operators and other construction workers not to destroy ground vegetation cover unnecessarily. • Designated vehicle parks and maintenance yards must be informed to labor force. • Top soil of productive areas where it has to be removed for the purpose of this project shall be stripped to a specified depth of 150mm and stored				

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			in stockpiles of height not exceeding 2m, if directed by the MC. If the contractor is in any doubt on whether to conserve the topsoil or not for any given area he/she shall obtain the direction from the MC in writing • Removed top soil could be used as a productive soil when replanting/establishing vegetation under landscaping plans Stockpiled topsoil must be returned to cover the areas including cut slopes where the topsoil has been removed due to project activities. • Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the MC. • Waste oil, lubricants and other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil by spillage of petroleum/oil products from storage tanks and containers • Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work				
	• Water and Soil Contamination		• The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the MC at his own cost. • The contractor shall indicate on a site layout plan the drainage network and strategic locations in which soil erosion control devices will be installed. The contractor shall, to the extent possible, schedule/stage these sections will have to be stopped during heavy rains due to heavy erosion.				

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			Work that lead to heavy erosion shall be avoided during the raining season. If such activities need to be continued during rainy season prior approval must be obtained from the MC by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion.				
	Damage to archeological sites		Chance Find Procedure will be adopted in case any such discovery of archeological property, the contractor shall take reasonable precaution to prevent his workmen or any other persons from removing/damaging any such article and shall immediately inform the MC and immediately stop construction activities. (Chance Find Procedures are attached as Annexure C)				
	Management of Hazardous Waste		- Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/ material that will be used in the project work to the MC. - Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful Asbestos Containing Materials (ACM) shall not be used for any temporary and permanent work on the SEWERAGE site.				
	Disturbance to Flora and Fauna and vegetation cover		- All construction works shall be carried out in a manner that the destruction to flora and their habitats is minimized. - At current, no trees are found at the proposed site of sewerage but if all such cases of tree removal contractor shall take prior approval from the MC and DPO-ESM prior to removal with a justification as to why the removal is unavoidable and plantation will be carried out with 1:10 removal ratio				

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	• Wastage of Water		• Arrange adequate supply of water for the project purpose throughout the construction period in consultation with the MC Kot Addu. • The contractor should discuss the daily requirement for potable and non-potable water and confirm with the MC Kot Addu that the demand can be met through their supply connection. • Do not extract water from surface water bodies or water sources without the permission from MC & relevant authority. Obtain permission for extracting ground water, if needed, prior to the commencing of the project, from the relevant authority • The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc. • The contractor shall maintain a record of usage of water for various purposes and sources tapped. • The contractor will adopt measures that are technically and financially feasible that avoid or minimize water usage throughout the construction period.				
	• Traffic Jams and Congestion and road accidents		• The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the Site to avoid disturbance to site mobility, traffic and stored away from drainage paths • Efficient use of all construction material in order to reduce waste generation. • All use of chemicals and hazardous materials will be subject to national and international regulations and				

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			requirements. Their use will be minimized and their release will be controlled				
Construction Material Storage, Handling and Use	Spillage Odor	Low	- Contractor shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odor and offensive smell emanating from chemicals and processes applied in construction works or from labor camps. - In a situation when/where odor or offensive smell does occur, contractor shall take immediate action to rectify the situation - Contractor is responsible for any compensation involved with any health issue arisen out of bad odor and offensive smells	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultant's team
Construction Machinery/ Equipment Use	- Emissions from Construction Vehicles, Equipment and Machinery - Noise from Vehicles, Plants and Equipment - Health and Safety of Labor /Workers	Low	- The emission standards promulgated under the Punjab Environmental Quality Standards (PEQs) shall be strictly adhered to all vehicles, equipment and machinery used for construction shall be regularly serviced and well maintained to ensure that emission levels comply with the relevant standards. - The contractor shall maintain the average noise levels within the construction site during the day time to 65 dB and night time to 55 dB Punjab Environmental Quality Standards (PEQs). - Noise barriers (cum dust) with minimum height of 4m shall be installed around the site as shown in the following figures and the construction noise levels outside the noise barriers should be maintained below 75dB during day time. - Within the site, the contractor shall measure noise levels on a monthly basis, or as per requirement, and report to the DPO-ESM through the contractor's monthly progress reports. Where, exceedances are noted, that can adversely affect construction	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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			workers, the contractor shall propose methods to control noise levels. • All machinery and equipment should be well maintained and fitted with noise reduction devices in accordance with manufacturer's instructions. • All vehicles and equipment used in construction shall be fitted with exhaust silences. • During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site • Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum. • Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall be provided with PPEs				
D- OPERATION PHASE							
Proposed sub project activity	Anticipated Environment and Social Issues	Magnitude of Impacts	Proposed Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency	Monitoring Responsibility
Water use activities taking place at buildings/	Water/soil pollution	Low to	• Effluent from septic tanks used in the labor camps can pollute groundwater or surface water, particularly if piped to an open drain.	MC Kot Addu	• Site Visits • Monitoring Reports • Implementation of GRM	Site visit	MC Kot Addu

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shelters of Labor Camps (Sanitation)		medium	The contractor shall ensure that under no circumstances foul sewage flow can be diverted into the main sewerage system drains and vice versa.				
Seepage / salinity	Weaken the structure strength and in watering and salinity condition.		- Runoff from the Site shall be controlled to ensure that adjacent areas are not affected and disturbance to the public is to minimum. - Anti-percolation material layer will be installed under the sewerage lines that no seepage into the soil occur.				
Waste water storage and disposal from labor camps	Nuisance, odor		- Emission from labor camps septic tanks during its decommissioning and connection to sewer and from centralized sewerage system. - The Contractor shall ensure covering and sealing off all water collection tanks and septic tanks at the end of construction works.				
	Unhygienic condition, public health risks		- Sewerage disposal connections to the periphery wastewater system shall be maintained properly with routine maintenance of plumbing/pumps diligently carried out. - Trees shall be managed properly that includes watering, fertilizing, weeding, pest controlling, pruning and training of trees timely. - MCJ shall take necessary actions to prevent the breeding of mosquitoes where stagnation of water in any areas along the sewerage system.				
Emergency Leakage and burst of	Nuisance for the local inhabitants		- MC shall ensure to adopt the emergency plans to deal such leakages - Current subproject is designed to be sustainable till at-least 20 years	MC Kot Addu	- Site Visits - Implementat ion of GRM	Site visit	MC Kot Addu

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Sewerage Lines	Odor and vector breeding hazards Mixing of sewerage water with drinking water		- MCs shall adopt Integrated Development Asset Management Plans (IDAMPs) - Record maintenance of emergency hazards and preparedness Emergency response plan is attached as Annexure N.				
Waste water disposal without treatment	Environmental hazard Ecological Hazard Non-compliance of PEQs Hazardous impacts on agricultural crops if used for irrigation		- Improved sewerage network shall be connected to the proposed disposal station and will be further transmitted to WWTP where its BOD, temperature, flow and other parameters will be monitored at entry point (influent) to the last exit (effluent) after treatment through anaerobic ponds, facultative ponds and through bioremediation by introducing floating wetlands. - Sludge dry beds will be used to prepare the compost for further selling to the local farmers which will be a source of revenue generation for the MC. - After disinfection and chlorination and helminths and pathogens removal, treated water will be reused for irrigation purposes and during monsoon or no irrigation usage seasons, treated water shall be	MC Kot Addu	- Site Visits - Lab Facility working and maintenance of record/data - Implementation of GRM	Site visit	MC Kot Addu

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			pumped through watercourse to the nearest canal which is 4-5km away from the WWTP. • For discharge of treated water into surface water body, PEQSS⁴¹ shall be strictly followed (Attached as Annexure B) • As Pakistan has no Guidelines/Standards for treated water re-use, so WHO, FAO and USEPA Guidelines and Standards (attached as Annexure L) shall be used to ensure the environmental and ecological safety				

⁴¹ . As per PEQSS, Biochemical Oxygen Demand (BOD₅) at 20⁰ C for inland water discharge is 80

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3.Estimated Budget			
Item	Quantity	Tentative Cost/Item- PKR. /-	Total Cost
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	15	300	4500
Safety Hard Helmets	10	3,000	30000
Safety Shoes	10	3,000	30000
Hand Gloves	10	1,000	10000
Ear Plugs	10	500	5000
Reflective Safety Vest	10	1,000	10000
Safety Goggles	10	500	5000
B-Community Health and Safety			0
First Aid Box Complete	1	10,000	10000
Safety Signs	4	15,000	60000
Safety Cones	8	1,000	8000
Safety Tapes	15	1,500	22500
Portable Delineator with chain	5	2,200	11000
Emergency Portable Lights	5	3,000	15000
Solid Waste Collection Drums with Cover	3	12,000	36000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Hiring of Environmental Manager (for 03 months)	3	50,000	150000
Labor Campsite Management	1	120,000	120000
Water Sprinkling	1	100,000	100000
Ambient Air Quality- Before, during, and after construction	3	85,000	255000
Noise Quality-Before, during, and after construction	3	1000	3000
Water Quality-Before, during, and after construction	3	22,000	66000
Total (PKR)-A+B			961,000

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Table 15: EMMP Construction of Disposal Station and Nullah from Disposal Station to WWTP

A-Design Stage	Design Responsibility	Implementation Responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling to it environmentally and socially sustainable. 1. Wastewater Treatment • Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells • The sewerage system that conveys the wastewater discharge of the current population is connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQs and or re-used as per WHO and USEPA Guidelines. • The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. 2. Better Municipal services and sustainable water application after treatment. Major purpose is to improve quality of wastewater by eliminating pollutants, toxicants and many such to make.	Design Consultants	MC Kot Addu
2.Permits, NOCs, Clearances		

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Necessary consents, permits, and clearances shall be obtained before the start of civil works Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e,g. WAPDA in case of shifting of transmission lines.	PMDFC and MC	MC Kot Addu
3.Land Acquisition and Resettlement Issues		
- This component of subproject will be executed at MC owned ROW and existing systems - The contractor's temporary facilities will preferably be established on government owned land. Otherwise, such lands/budlings will be obtained on a rental or lease basis. - It will be ensured that no project works are carried out where AED activities have been or are being carried out	MC Kot Addu	MC Kot Addu
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Kot Addu
5. Preparation of Labor Management Procedures		
EHS SOPS for Labor workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractor's term of reference and bid documents.	ESFPS	

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B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
c) Contractors Terms of Reference - The MC Kot Addu shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. - This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. - This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Kot Addu	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants
d) Grievance Redress Mechanism - Grievance Redress Mechanism has been developed under PCP - MC Kot Addu with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints - Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site - Provide sign boards for pedestrians to inform nature and duration of construction works - Provide alternative access road for residents via Peradeniya - Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM - Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Kot Addu Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

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C- Construction Phase							
Proposed sub project activity	Anticipated Environment and Social Issues	Magnitude of Impacts	Proposed Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency	Monitoring Responsibility
Establishment of Labor Camp	• Availability of Land • Security • Environment, Health and Safety of Labor at Campsite • Community Concerns regarding privacy of women and GBV⁴² • Sustainable Use of Environmental Resources	Med.	• At current, land proposed for construction of disposal station is open and vacant from any legal/illegal occupants. There are no trees of important flora and fauna observed at the site. This vacant space is owned by MCJ (Land Ownership Documents are attached as Annexure I) and notified as commercial area at the entry of the main city where urban area is a few meters away. • Currently MC owned land at proposed site is available for construction of labor camp at the current site • Contractor will prepare Occupational Health and Safety Plan and get approval from MC before the execution of work • Contractor will be instructed (will be included in his term of reference and in the form of EHS SOPs) strictly implement the PMDFC SOPs for EHS of labor/ construction workers	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports • Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office • E&S Consultants of Supervision Consultants team

⁴² Gender Based Violence

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			• Contractor will be instructed to prefer the local labor to be engaged. Anyhow, for labor site management, following mitigation measures will be provided: V. Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor if they will be hired from outstation. VI. Good housekeeping will be ensured inside campsite VII. Labor will be provided with hygienically good quality food. VIII. During winter hot water will be provided for bathing and likewise as per the weather condition. Labor Training and Code of Conduct- • The contractor shall develop a labor code of conduct indicating specific labor management procedures applicable to different categories of workers including short time and full-time workers. The labor code of conduct shall be consistent with and part of the overall EHS SOPs for Labor developed by the PMDFC. • The labor Code of Conduct shall be translated into Urdu language upon clearance from the MOI of MC Kot Addu and DPO-ESM of regional office of PMDFC. The code of conduct must be made available to all staff and displayed in the work site in local languages • Labor awareness programs to educate the laborers about the code of conduct, general conduct, the				

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			Environmental and Social Management and Monitoring Plan, Public and Occupational Health and Safety Plan and sustainable use of local environmental resources etc. should be conducted throughout the contract period as per the Labor management plan and ESH plan approved by the MOI and DPO-ESM. • The contractor shall give priority to selecting labor from project influenced areas so as to minimize the need for erecting labor camps and minimizing labor influx. • Frequent supervision of laborers' activities, labor welfare needs, and action to ensure hygienic conditions in the work sites/ camps • Avoid social conflicts among contractor's labor force and the surrounding community or tension and prevalence of gender- based violence through the implementation of LMP. • Conduct awareness program on Gender Based Violence (GBV), good hygienic practices and dangers of sexually transmitted diseases such as HIV/AIDS and sensitize them to avoid interference and consider the privacy of local community women and vulnerable groups. • Introduce a code of conduct for labor teams to prevent alcohol and drug abuse, violence, sexual abuse etc. • Continue consultation and interaction with host community				

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			• Prepare an inventory (including names/ National ID numbers/addresses etc.) of entire labor force employed by contractor, and share with the Resident Supervision Consultants. This inventory shall be updated at each recruitment or resignation of labors.				
Site Preparation	• Accessibility of local communities and Work Site Management • Health and Safety of local communities • Traffic Management	Medium to High	• All public access to the site via adequate fencing and signage which prohibit public access completely, in order to avoid risk to the public • The site entrance will include adequate signage indicating the details of the proposed subproject, implementing agencies etc. as well as safety signage to keep public away. • A fence shall be erected to cover the entire perimeter of the facility using cost effective fence materials consisting of chain link fence fabric, concrete post, etc. as specified in the Technical Specifications in order to ensure, animals and public are unable to access the site. • To avoid land disturbance and movement, the fence shall generally follow the contour of the ground. • Grading shall be performed where necessary to provide a neat appearance • The contractor should provide a site-specific proposed site layout plan that identifies various zones within the construction site for designated use such as material and equipment storage areas, construction vehicle parking areas, vehicle/equipment maintenance areas, labor camps	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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			(if any onsite), temporary spoil storage areas etc. which shall be approved by the MC • Parking, repairing vehicles, machinery and equipment shall be stationed only within the work site and/or in any other designated areas by the MC • The contractor should provide instruction and advice to drivers and operators to park vehicles and store equipment at the designated area Traffic Safety and Management Plan- VII. The contractor will prepare a Traffic management plan in consultation with the city traffic committee approved by the MC and duly disclosed to the public in a timely manner VIII. Carryout a road safety assessment in order to establish traffic control and safety measures such as road humps, fixing of signage etc. prior to commencement of construction IX. Based on the initial road safety analysis a monitoring and management plan shall be prepared and submitted to the MC by contractor and Road Management Plan to be placed at the prominent places X. In order to ease traffic within the city, transport of construction material and machinery will be done prior to 6.00 am and after 8.00 pm XI. During school traffic hour's transportation of construction materials and heavy machinery shall not be done.				

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			XII. Provide information and boards at each strategic location indicating basic info – times of closure, diversion routes etc III. Special consideration shall be given in the preparation of the traffic management plan ensuring the safety of pedestrians and workers at night. IV. Personnel used for traffic control by the contractor shall be properly trained, provided with proper gear including communication equipment, luminous jackets for night use. All signs, barricades, pavement markings used for traffic management should be to the standards and approved by the City Traffic Police Road Safety Monitoring Plan shall be implemented throughout the construction period. • Monitoring incidents and accidents and monthly reporting shall be ensured. • Appropriate safety improvement measures shall be implemented avoiding incidents due to movement of construction vehicles based on the periodic review of reports. Environment, Health and Safety of Labor and Communities and Implementation of ESMMP VI. The contractor will employ a qualified Health and Safety Specialist in his team for a period of 06 months. He/she will submit to the engineer a comprehensive Health and Safety Plan for the site which will be based on an				

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			assessment of OSH/EHS and public safety risks in relation to various types of construction activity and which covers the entire construction period. VII. The H&S specialist will oversee its implementation regularly assessing the risk of various hazards and adopting mitigation measures. VIII. He shall ensure the all reasonable precautions will be taken to prevent danger of the workers and the public from accidents such as fire, explosions, blasts, falling to excavated pits, chemical sprays, unsafe power supply lines etc. IX. The Contractor shall comply with requirements for the safety of the workmen as per the international labor organization (ILO) convention No. 62 and EHS SOPs of PMDFC to the extent that those are applicable to this contract. X. The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, boots, etc., to the workers and staff. Community Safety Management Plan- I. All debris, waste generation from construction activity, labor camps etc. will be disposed only at locations approved by the MC for such purpose				

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			II. The debris and spoil shall be disposed in such a manner that; (i) waterways and drainage paths are not blocked (ii) the disposed material should not be washed away by runoff and (iii) should not be a nuisance to the public. (iv) The contractor shall do what is necessary in the minimum to ensure the disposal sites are made safe after disposal of the waste (level the waste, ensure drainage and safety) (v) The contractor shall as much as possible dispose waste on daily basis (or as necessary given the waste quantities generated and onsite stockpiling space) without allowing to stockpile onsite, at identified locations for debris disposal, recommended by the MC. (vi) During transportation, dispose materials should be covered with tarpaulin				
Excavation and Construction Activities	Dust/Air and noise	High	- All sedimentation and pollution control works and maintenance thereof are deemed, as incidental to the earthwork. Works to minimize cleared areas and exposed soils at a given time. - Barricades such as humps shall be erected around excavated areas for culverts, silt traps, foundations, sewerage pipes as some work in - The contractor shall effectively manage the dust generating activities such as handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultant of Supervision Consultants team

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			conditions with winds directed towards adjacent residences and other facilities. • The Contractor shall erect a dust/noise barrier has around the site. • All vehicles delivering materials shall be covered to avoid spillage and dust emission. • The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being carried to the roadway (particularly following wet weather). • The contractor should enforce vehicle speed limits to minimize dust generation. • The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of waste water / waste oil for dust suppression is prohibited) • All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. • Clearance shall be affected immediately by manual sweeping and removal of debris and ensure sprinkled water using appropriate equipment • Dust emissions should be controlled by wet spraying of construction sites and roads which are used for transportation of Construction materials at regular intervals. • Tarpaulin covering is mandatory on trucks /lorries which are used for transporting materials. • All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering.				

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			- Noise and Dust barriers with minimum height of 4m should be erected around entire working sites to control dust emission to the ambient air. Selection of the suitable material. - Contractor shall take appropriate action to ensure that construction works do not result in damage to the adjacent properties due to vibration. - Contractor shall pay due consideration on vibration impacts of construction on adjoining structures. In the event vibration levels are found to be exceeding national standards, he shall modify the method of construction until compliance with stipulated national vibration standards is met. - Vehicles should be maintained in good condition regularly so that noise and emission generating from wear and tear will be minimal - Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the DPO-ESM to keep noise and air emissions from these at a minimum				
	Soil and Vegetation Cover Loss		- Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the MC Kot Addu. - Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover. - The contractor shall include in the construction site layout plan indicating various areas identified for designated use including parking areas. - Contractor should provide necessary instructions to drivers/operators and other construction workers not to destroy ground vegetation cover unnecessarily.				

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			• Designated vehicle parks and maintenance yards must be informed to labor force. • Top soil of productive areas where it has to be removed for the purpose of this project shall be stripped to a specified depth of 150mm and stored in stockpiles of height not exceeding 2m, if directed by the MC. If the contractor is in any doubt on whether to conserve the topsoil or not for any given area he/she shall obtain the direction from the MC in writing • Removed top soil could be used as a productive soil when replanting/establishing vegetation under landscaping plans Stockpiled topsoil must be returned to cover the areas including cut slopes where the topsoil has been removed due to project activities. • Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the MC. • Waste oil, lubricants and other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil by spillage of petroleum/oil products from storage tanks and containers • Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work				
	• Water and Soil Contamination		• The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the MC at his own cost.				

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			- The contractor shall indicate on a site layout plan the drainage network and strategic locations in which soil erosion control devices will be installed. The contractor shall, to the extent possible, schedule/stage these sections will have to be stopped during heavy rains due to heavy erosion. - Work that lead to heavy erosion shall be avoided during the raining season. If such activities need to be continued during rainy season prior approval must be obtained from the MC by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion.				
	Damage to archeological sites		Chance Find Procedure will be adopted in case any such discovery of archeological property, the contractor shall take reasonable precaution to prevent his workmen or any other persons from removing/damaging any such article and shall immediately inform the MC and immediately stop construction activities. (Chance Find Procedures are attached as Annexure C)				
	Management of Hazardous Waste		- Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/ material that will be used in the project work to the MC. - Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful Asbestos Containing Materials (ACM) shall not be used for any temporary and permanent work on the SEWERAGE site.				
	Disturbance to Flora and Fauna and		All construction works shall be carried out in a manner that the destruction to flora and their habitats is minimized.				

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	vegetation cover		At current, no trees are found at the proposed site of sewerage but if all such cases of tree removal contractor shall take prior approval from the MC and DPO-ESM prior to removal with a justification as to why the removal is unavoidable and plantation will be carried out with 1:10 removal ratio				
	Wastage of Water		- Arrange adequate supply of water for the project purpose throughout the construction period in consultation with the MC Kot Addu. - The contractor should discuss the daily requirement for potable and non-potable water and confirm with the MC Kot Addu that the demand can be met through their supply connection. - Do not extract water from surface water bodies or water sources without the permission from MC & relevant authority. Obtain permission for extracting ground water, if needed, prior to the commencing of the project, from the relevant authority - The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc. - The contractor shall maintain a record of usage of water for various purposes and sources tapped. - The contractor will adopt measures that are technically and financially feasible that avoid or minimize water usage throughout the construction period.				
	Traffic Jams and Congestion		The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the Site to avoid disturbance				

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	and Road accidents		to site mobility, traffic and stored away from drainage paths • Efficient use of all construction material in order to reduce waste generation. • All use of chemicals and hazardous materials will be subject to national and international regulations and requirements. Their use will be minimized and their release will be controlled				
Construction Material Storage, Handling and Use	Spillage Odor	Low	• Contractor shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odor and offensive smell emanating from chemicals and processes applied in construction works or from labor camps. • In a situation when/where odor or offensive smell does occur, contractor shall take immediate action to rectify the situation • Contractor is responsible for any compensation involved with any health issue arisen out of bad odor and offensive smells	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team
Construction Machinery/ Equipment Use	• Emissions from Construction Vehicles, Equipment and Machinery • Noise from Vehicles, Plants and Equipment	Low	• The emission standards promulgated under the Punjab Environmental Quality Standards (PEQs) shall be strictly adhered to all vehicles, equipment and machinery used for construction shall be regularly serviced and well maintained to ensure that emission levels comply with the relevant standards. • The contractor shall maintain the average noise levels within the construction site during the day time to 65 dB and night time to 55 dB Punjab Environmental Quality Standards (PEQs). • Noise barriers (cum dust) with minimum height of 4m shall be installed around the site as shown in the following figures and the construction noise	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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	Health and Safety of Labor /Workers		levels outside the noise barriers should be maintained below 75dB during day time. - Within the site, the contractor shall measure noise levels on a monthly basis, or as per requirement, and report to the DPO-ESM through the contractor's monthly progress reports. Where, exceedances are noted, that can adversely affect construction workers, the contractor shall propose methods to control noise levels. - All machinery and equipment should be well maintained and fitted with noise reduction devices in accordance with manufacturer's instructions. - All vehicles and equipment used in construction shall be fitted with exhaust silences. - During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site - Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum. - Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall be provided with PPEs				
Electrical Works – Wiring,	Injuries/Incidents due to unsafe electric		The labor should be provided with safety shoes, gloves, Safety goggle as per nature of job of worker. • Quality of electric installations should not be compromised.	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence	Daily site visit during construction phase	DPO-ESM of PMDFC Regional

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switch, boards, lighting etc.	- installation s. - Short circuits due to quality compromised electric equipment /installations. - Fire accidents due to electric installations		- Wiring should be underground. - Fire retardant plastic wires should be used. - Fire extinguishers should be installed at appropriate places.		Monitoring Reports Implementation of GRM	Fortnightly/ Weekly	Office E&S Consultants of Supervision Consultants team
Impact on sensitive receptors	- A Muslim graveyard and a Shrine is observed in the vicinity where disposal station is proposed to be constructed. - Ganjshakar Sugar Mills is present in the	Low	- Disposal site will be 500 meter apart from the sensitive receptor and it will be ensured by contractor that no physical impact occur on sensitive receptor during construction activity. - Labor/workers will be sensitized to avoid any interference with the local communities who may be visiting the graveyard - Vehicle/machinery movement shall be strictly avoided from the passage of graveyard and alternate movement route (which is available) shall be used. - Sewerage lines will be ensured to be laid 100m away from the graveyard and MC will ensure it by	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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	surroundings of site A small zoo and school organized by Ganjshakar Sugar Mills is at 0.5km away from the proposed site of disposal station		the contractor and same is ensured in the design of the subproject. - Contractor will be instructed to avoid construction activities during religious practices days at shrine. - Public consultation with the administration of Ganjshakar Sugar Mills was carried out and they were briefed about the proposed project activities. - There will be no negative impact on the school and zoo during the construction activities as they are confined in the boundary of area owned by the mill. - An effective GRM shall be in-place to immediately resolve any complaint from the local communities.				
D. OPERATION PHASE							
Proposed sub project activity	Anticipated Environment and Social Issues	Magnitude of Impacts	Proposed Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency	Monitoring Responsibility
Water use activities taking place at buildings/shelters (Sanitation) of Labor Camp	Water/soil pollution	Low to medium	- Effluent from septic tanks used in the labor camps can pollute groundwater or surface water, particularly if piped to an open drain. - The contractor shall ensure that under no circumstances foul sewage flow can be diverted into the main sewerage system drains and vice versa. - Drinking water sample from the water tanks of nearby residents will be taken and analyzed in the EPA certified laboratory	MC Kot Addu	- Site Visits - Monitoring Reports - Implementation of GRM	Site visit	MC Kot Addu

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			- At least six samples will be taken (before =2, during=2, after=2) and results will be compared to check any negative impact of project activities on ground water. - Control to avoid Ground water contamination • Call plumbers for immediate repair. • Minor leakage control with tapes • Disposal of broken/waste pipes along in environment friendly way • Ensure drinking water analysis				
Seepage salinity /	Weaken the structure strength, produce watering and salinity condition.		- Runoff from the Site shall be controlled to ensure that adjacent areas are not affected and disturbance to the public is to minimum. - PPEs i.e. Masks & Ear plugs will be provided to workers - Ensure proper design, construction and operation of the structure and system to minimize seepage. - Anti-percolation material layer will be installed under the disposal station and open drain that no seepage into the soil occur				
Waste water storage and disposal	Odor		- Emission from disposal station during its decommissioning and connection to centralized sewerage system and when wastewater move through the open drain. - The Contractor shall ensure covering and sealing off all water collection tanks and septic tanks at the end of construction works. - At disposal Station worker will be provided with PPEs.				

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	Nuisance		- Heavy noise from generators to pump Wastewater from sewerage system to disposal station which opens up in an open drain which take wastewater to WWTP will be mitigated by installing Silencer and anti-vibrant mounds to reduce structural damage of disposal station. Noise will be monitored routinely. - Use of machineries & equipment having less noise. - Provision for personal protective equipment (PPE's), ear muffs/ear plugs to workers.				
	Emission of fumes		Ensure Workers use appropriate clothing. Lay concrete/Asphalt during dry periods				
	Unhygienic condition, public health risks		- Sewerage disposal connections to the periphery wastewater system shall be maintained properly with routine maintenance of plumbing/pumps diligently carried out. - Trees shall be managed properly that includes watering, fertilizing, weeding, pest controlling, pruning and training of trees timely. - MCJ shall take necessary actions to prevent the breeding of mosquitoes where stagnation of water in any areas along the sewerage system.				

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4.Estimated Budget			
Item	Quantity	Tentative Cost/Item-PKR./-	Total Cost
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	15	300	4500
Safety Hard Helmets	10	3,000	30000
Safety Shoes	10	3,000	30000
Hand Gloves	10	1,000	10000
Ear Plugs	10	500	5000
Reflective Safety Vest	10	1,000	10000
Safety Goggles	10	500	5000
B-Community Health and Safety			0
First Aid Box Complete	1	10,000	10000
Infrared Thermometer (Benetech GM-2200 or equivalent)	1	40,000	40000
Safety Signs	3	15,000	45000
Safety Cones	8	1,000	8000
Safety Tapes	10	1,500	15000
Portable Delineator with chain	5	2,200	11000
Emergency Portable Lights	5	3,000	15000
Solid Waste Collection Drums with Cover	5	12,000	60000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Hiring of Environmental Manager (for 03 months)	3	70,000	210000
Labor Campsite Management	1	100,000	100000
Water Sprinkling	1	100,000	100000

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Social and Behavior Change Campaign and Labor Awareness/Training	1	50,000	50000
Ambient Air Quality-Before, during, and after construction	3	85,000	255000
Noise Quality-Before, during, and after construction	3	1000	3000
Water Quality-Before, during, and after construction	3	22,000	66000
Total (PKR)-A+B			1,092,500

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7. **Construction of Waste Water Treatment Plant** (One Sullage channel, One Screening Chamber, 04 Anaerobic ponds, 04 facultative ponds, 4 sludge drying beds, one treated water pond, administrative block including site lab facility, floating plants covering the 20% of facultative ponds and one effluent water course from WWTP to the nearest water body)

A-Design Stage	Design Responsibility	Implementation Responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling to it environmentally and socially sustainable. 1. Wastewater Treatment - Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells - The sewerage system that conveys the wastewater discharge of the current population is connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQs and or re-used as per WHO and USEPA Guidelines. - Emergency Response Plan has been prepared for this project and is attached Annexure N. - The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. 2. Better Municipal services and sustainable water application after treatment.	Design Consultants	MC Kot Addu

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2.Permits, NOCs, Clearances		
Necessary consents, permits, and clearances shall be obtained before the start of civil works Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e.g. WAPDA in case of shifting of transmission lines.	PMDFC and MC	MC Kot Addu
3.Land Acquisition and Resettlement Issues		
- This component of subproject will be executed at MC owned ROW and existing systems - The contractor's temporary facilities will preferably be established on government owned land. Otherwise, such lands will be obtained on a rental or lease basis. - It will be ensured that no project works are carried out where AED activities have been or are being carried out	MC Kot Addu	MC Kot Addu
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Kot Addu
5. Preparation of Labor Management Procedures		
EHS SOPS for Labor workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractors term of reference and bid documents.	ESFPS	

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B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
e) Contractors Terms of Reference - The MC Kot Addu shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. - This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. - This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Kot Addu	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants
f) Grievance Redress Mechanism - Grievance Redress Mechanism has been developed under PCP - MC Kot Addu with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints - Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site - Provide sign boards for pedestrians to inform nature and duration of construction works - Provide alternative access road for residents via Peradeniya - Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM - Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Kot Addu Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

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C-Environmental and Social Issues Associated with Site at Construction Phase								
Project Stage /Affected Aspects	Project Activity	Potential Impacts	Impact Significance	Proposed Mitigation measures	Responsibility for Mitigation Implementation	Monitoring Indicators	Monitoring Frequency	Monitoring Responsibility
Excavation and Construction Activities	Soil stripping and limited cutting, filling and levelling activities to make the site topography suitable for setting up of the WWTP. The removal of vegetation cover and top soil can increase the potential for soil erosion during a short period	Surface runoff from the construction site may contain eroded earth, sand, aggregate, spilled oil, lubricant, paint residues etc., however the potential to reach drainage channel near and affecting the water quality.	Med.	- Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the MC Kot Addu. - Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover. - The contractor shall include in the construction site layout plan indicating various areas identified for designated use including parking areas. - Contractor should provide necessary instructions to drivers/operators and other construction workers not to destroy ground vegetation cover unnecessarily. - Designated vehicle parks and maintenance yards must be informed to labor force. - As construction of WWTP and Sewer lines structures required width according to design parameters. Excavation would be with the consideration of all available monitoring and analysis of water table level on the site to prevent the contamination of ground water and soil there. If the contractor is in any doubt on whether to	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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	of time till the site is levelled and then stabilized with fill materials like gravel, and sand.			conserve the topsoil or not for any given area he/she shall obtain the direction from the MC in writing. ▪ Removed top soil could be used as a productive soil when replanting/establishing vegetation under landscaping plans Stockpiled topsoil must be returned to cover the areas including cut slopes where the topsoil has been removed due to project activities. ▪ Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the MC. ▪ Waste oil, lubricants and other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil spillage petroleum/oil products from storage tanks and containers ▪ Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work ▪ Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/material that will be used in the project work to the MC. ▪ Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful Asbestos Containing				

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				Materials (ACM) shall not be used for any temporary and permanent work on the WWTP site. ▪ The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the MC at his own cost. ▪ The contractor shall indicate on a site layout plan the drainage network and strategic locations in which soil erosion control devices will be installed. The contractor shall, to the extent possible, schedule/stage these sections will have to be stopped during heavy rains due to heavy erosion. ▪ Work that lead to heavy erosion shall be avoided during the raining season. If such activities need to be continued during rainy season prior approval must be obtained from the MC by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion. ▪ Chance Find Procedure will be adopted in case any such discovery of archeological property, the contractor shall take reasonable precaution to prevent his workmen or another person's from removing/damaging any such article and shall immediately inform the MC and immediately stop construction activities. All sedimentation and pollution control work and maintenance there of a redeemed, as incidental to the earthwork. Works to minimize cleared areas and exposed soils at a given time.				

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				▪ Barricades such as humps shall be erected around excavated areas for culverts, silt traps, foundations, as some work in ▪ The contractor shall effectively manage the dust generating activities such as handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities. ▪ The Contractor shall erect a dust/noise barrier has around the site. ▪ All vehicles delivering materials shall be covered to avoid spillage and dust emission. ▪ The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being carried to the roadway (particularly following wet weather). ▪ The contractor should enforce vehicle speed limits to minimize dust generation. ▪ The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of wastewater / waste oil for dust suppression is prohibited) ▪ All existing roads used by vehicles aftercontraction, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres.				

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				▪ Clearance shall be affected immediately by manual sweeping and removal of debris and ensure sprinkled water using appropriate equipment. ▪ Dust emissions should be controlled by wet spraying of construction sites and roads which aroused for transportation of Construction materials at regular intervals. ▪ Tarpaulin coverings mandatory on trucks /lorries which are used for transporting materials. ▪ All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering. ▪ Noise and Dust barriers with minimum height of 4m should be erected around entire working sites to control dust emission to the ambient air. Selection of the suitable material. ▪ Contractor shall take appropriate action to ensure that construction works do not resulting damage to the adjacent properties due to vibration. ▪ Contractor shall pay due consideration on vibration impacts of construction on adjoining structures. In the event vibration levels are found to be exceeding national standards, he shall modify the method of construction until compliance with stipulated national vibration standards is met. ▪ Vehicles should be maintained in good condition regularly so that noise and emission generating from wear and tear will be minimal.				

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				▪ The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the Site to avoid disturbance to site mobility, traffic and stored away from drainage paths. ▪ Efficient use of all construction material in order to reduce waste generation. ▪ All use of chemicals and hazardous materials will be subject to national and international regulations and requirements. Their use will be minimized and their release will be controlled. ▪ Arrange adequate supply of water for the project purpose throughout the construction period in consultation with the MC Kot Addu. ▪ The contractor should discuss the daily requirement for potable and non-potable water and confirm with the MC Kot Addu that the demand can be met through their supply connection. ▪ Do not extract water from surface water bodies or water sources without the permission from MC & relevant authority. Obtain permission for extracting groundwater, if needed, prior to the commencing of the project, from the relevant authority. ▪ Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the DPO-ESM to keep noise and air emissions from these at minimum. ▪ The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the				

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				required amount of water for the construction works etc. ▪ The contractor shall maintain a record of usage of water for various purposes and sources tapped. ▪ The contractor will adopt measures that are technically and financially feasible that avoid or minimize water usage throughout the construction period. ▪ All construction works shall be carried out in a manner that the destruction to flora and their habitats is minimized.				
Visual and Aesthetics	Grading and cleaning of land for demolition activity Emptying of existing structures Demolition of existing structures Storage and disposal of demolition waste Storage and disposal of sludge/silt from	Loss of topsoil producing an offensive odor and visual impact The disposal of MSW in open area around the site can create odor nuisance.	Low	▪ Stacking of demolition waste, soil heaps and sludge/silt to be done away from settlements with provision of covers so that odor and fugitive emissions are restricted. ▪ All the construction activities will be restricted within the designated site. ▪ On completion of work, all temporary structures, surplus materials and wastes will be completely removed from the site and disposed of at a designated facility. ▪ Provision of storage facility for construction materials within the site designated by MC. ▪ Provision of temporary storage of wastes and collection will also be made at the site Sections excavated for pipeline route will be barricaded with tin sheets. ▪ Stacking of sections of pipeline to be done away from settlements with provision of wedges to	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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On-Site storage of excavated and construction materials; On-Site storage of construction waste; Off-Site disposal of construction waste; Earth work along the sewer pipeline route; De-silting of sewer pipelines; On-Site storage and Off-Site disposal of silt/sludge from sewer pipeline; and			ensure that rolling or movement of pipeline do not pose risks to passers-by. ▪ All the construction activities will be restricted within the designated site. ▪ On completion of work, all temporary structures, surplus materials and wastes will be completely removed from the site and disposed of at a designated facility. ▪ Construction and municipal solid waste temporarily stored at the site will be transported to the designated disposal facility at regular intervals.				

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	Renovation work at linked facilities.							
Soil Quality	Site clearing and preparation Fueling and operation of heavy machinery transport vehicles	Soil compaction Soil contamination through spills and leaks Soil contamination through	Medium to High	- Demarcation of routes for movement of heavy vehicles. - Stripping and placing soils when dry, and not when wet. - Preparation of guidelines and procedures for immediate clean-up actions following any spillages of oil, fuel or chemicals. - Storage areas for oil, fuel and chemicals to be surrounded by bunds or other containment devices to prevent any spilled oil, fuel or chemicals from contaminating soils, water or groundwater.	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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	Storage and handling of chemicals Storage, handling and disposal of construction waste Generation of sanitary effluent	spills and leaks		▪ Use of spill or drip trays to contain spills and leaks, and use of spill control kits to clean small spills and leaks. ▪ Installation of oil/water separators to treat surface run-off from bounded areas prior to discharge to the storm water system. ▪ Designated storage area with proper area arrangements. ▪ Design processes to prevent/ minimize quantities of wastes generated and hazards associated with the waste generated. ▪ Implement a construction materials inventory management system to minimize over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period. ▪ Segregate hazardous and non-hazardous waste and provide appropriate containers for the waste types generated (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimize odor nuisance). ▪ Store wastes in closed containers away from direct sunlight, wind and rain. ▪ Ensure storage area has an impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container. ▪ Dispose of waste by authorized vendor. ▪ The waste management plan (including C&D waste as well as Liquid waste) also should contain aspects of adequate storage, disposal,		tation of GRM		

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				transportation route, training and record keeping for different categories of waste i.e. hazardous waste, non-hazardous waste, solid waste, e-waste, bio-medical waste, municipal solid waste and chemical waste. ▪ Adequate sanitary facilities, i.e. toilets and showers, will be provided for the construction workforce. ▪ Septic tank and soak pit will be provided to treat domestic waste water.				
Surface Water Quality	Erosion from excavation, levelling, filling and other activities Fueling and operation of heavy machinery and transport vehicles Storage and handling of chemicals Generation of sanitary effluent	Increased sediment content of surface water Contamination of surface water Contamination of surface water by sanitary effluent generated from on-site labor accommodation.	Medium	▪ Provision of channels, earth bunds or sand bag barriers on site to direct storm water to silt ▪ Protection of stockpiles by plastic sheeting to ensure that they are suitably secured against the wind at the end of each working day if rain is forecasted; ▪ Appropriate surface drainage will be designed and provided where necessary; ▪ Drainage systems, erosion control and silt removal facilities will be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit will be removed regularly; ▪ Any temporarily diverted drainage will be reinstated to its original condition when the construction work has finished or when the temporary diversion is no longer required; Temporary and permanent drainage pipes and culverts will be provided to facilitate runoff	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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	from on-site labor accommodation.			discharge. These will be designed for the controlled release of storm flows. - Vehicle servicing areas, vehicle wash bays and lubrication bays will, as far as practical, be located within roofed and cemented areas. The drainage in these covered areas will be connected to sewers via an oil/water interceptor; Any oil leakage or spillage will be contained and cleaned up immediately. Waste oil will be collected and stored for recycling or disposal; Any surplus wastewater from the concrete batching plant will be treated to comply with discharge standards before it is discharged to final destination; - Designated storage area with proper boundary				
Ground Water	- Fueling and operation of heavy machinery and transport vehicles - Wastewater standing in ponds for treatment	Contamination of Ground water	High	- Proper SOP has to be followed during such kind of activity - Appropriate sub-surface geotechnical and/or hydro-geological explorations should be undertaken to establish the suitability of proposed materials to meet anticipated conditions. - Groundwater information below the lagoon site including water quality, water levels, direction of flow and gradient may be required for establishing lining requirements and monitor well requirements and locations if these are required.	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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				▪ ponds should be relatively impermeable in accordance with the needs for functional treatment and protection of surrounding land and ground water. ▪ It is recommended that field and/or laboratory tests be carried out to establish the hydraulic conductivities of soils at the WWTP site and any proposed soil lining materials. ▪ At least one hydraulic conductivity test per 2 hectares of WWTP area should be carried out. For in-situ materials or soil liners an on-site permeability of 10 times the laboratory value should be used to calculate seepage losses. ▪ Adequate provisions for monitoring and for seepage control measures such as cutoffs, subsurface drainage interceptors, etc. should be considered. ▪ Pre-filling the pond(s) or other techniques should be considered in order to protect the liner, prevent weed growth and to protect against desiccation of the seal material. ▪ Highest quality geomembrane will be used to protect ground water resources and ecological environment having advantages of: ○ 1.Low cost ○ 2.good anti-seepage ability ○ 3.High strength ○ 4.Good ductility ○ 5.Good chemical stability				

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				6. good resistance to ultraviolet light aging, and 7. resistance to rodent and microbial attack To ensure the ideal installation and construction quality, the base layer will be further inspected to ensure that the surface of the base layer is flat and smooth, and there is no debris that may damage the geomembrane, such as rocks, tree roots, and sharp objects. There should be no right-angle rigid structure at the bending part of the geomembrane, and it should be made into an arc shape				
Air Quality	Operation of heavy machinery and transport vehicles C&D waste management and Sludge Handling	Exhaust Emissions Dust	Medium	- Minimize movement of construction vehicles and enforce a speed limit around the construction site; - Regularly maintain all diesel-powered equipment and reduce idling time to avoid emissions of NOx, PM10 and SO2; - Where available use low Sulphur diesel (LSD) in HGVs and diesel-powered equipment in collaboration with best management practices; Implement best practice procedures to control vehicle / equipment air emissions (such as turning off equipment when not in use); and Vehicle / equipment exhausts observed to be emitting significant black smoke from their exhausts should be serviced/ replaced. - As far as possible, locate the concrete batching plant away from sensitive receptors;	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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				Implementation of a periodic watering and sprinkling regime in particular during the dry season, at least two times during the day; Minimize the height from which fill materials are unloaded during site backfilling as far as possible. Where possible, this should be below the height of the hoarding around the Project site boundary; - During construction, the approach road will be regularly maintained to keep it clean, free from mud and slurry. The approach road will be properly shaped and compacted by rolling to an even and uniform surface to receive pavement. Totally enclose any skips for material transport with impervious sheeting; and - No waste will be burnt on or around the Project site.				
Noise	Heavy machinery operations for construction works	Increase in ambient noise levels	Low to medium	- Normal working hours of the contractor will be in day light hours from Monday to Sunday. If work needs to be undertaken outside these hours, it should be limited to activities that do not lead to exceedance of the noise criteria at nearby sensitive receptors; - Regular maintenance of equipment including lubricating moving parts, tightening loose parts and replacing worn out components should be conducted; - Low noise equipment should be used as far as practicable;	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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				▪ The number of equipment operating simultaneously should be reduced as far as practicable; ▪ Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby sensitive receptors settlement as far as practicable; ▪ Acoustic enclosure should be erected around DG sets and other stationary noise generating equipment; ▪ There would be proper monitoring to avoid any discomfort.				
Occupational Health and Safety	General construction activities	Health and safety of construction workforce	Moderate	▪ Personal Protective Equipment (PPE) shall be worn at all times on the Site. ▪ If labor will be working in the hazard prone areas, then the contractor needs to ensure proper outfit and PPEs. ▪ Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order; ▪ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ▪ All scaffolding will be erected and inspected in conformity with the Factories Act and the appropriate records maintained by the Contractor;	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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				Safety hoops or cages will be provided for ladders with a height in excess of two meters; When there is a risk of drowning lifejackets shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding; The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress.				
Desilted Material	- Traffic/pedestrians hindrance - Smell		Moderate	- Desilted material needs to be disposed off within 24 hours at MC designated site - To avoid mobility of the local community, alternate routes will be provided in the main roads while local community will be informed well before time about this activity		Visual/Pictures	Daily site visit during construction phase Fortnightly/Weekly • Once during the construction phase	- ESFPs - Construction Supervision Consultant - DPO ESSs

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Community Health and Safety	Influx of construction workers Road transportation	Increased prevalence of disease Traffic safety	Low	- Barriers will be provided to prevent ingress of persons into the construction site and also to protect the public from exposure to hazards associated with the construction activities; Screening, surveillance and treatment of workers, through the provision of medical facilities and, where required, immunization programmed; Undertaking health awareness and education initiatives among workers; - Avoiding collection of stagnant water; - Road safety awareness building for residents living along the transportation route.	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team
Loss of Existing Workers	Prior to construction of the WWTP.	The existing workers engaged under the contracting agencies at the WSP and associated facilities, may be laid off during the new phase.	Low to medium	- If retrenchment is necessary, to reduce the adverse impacts of retrenchment on the workers, a Retrenchment Plan should be developed, meeting PMDFC requirements. - The client should comply with all legal and contractual requirements related to notification of public authorities, and provision of information to, and consultation with workers and their organizations. - The client should ensure that all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. - All outstanding payments and social security benefits and benefits should be paid: (a) on or before termination of the working relationship				

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				to the workers, (b)where appropriate, for the benefit of the workers, or (c)Payment will be made in accordance with a timeline agreed through a collective agreement. (d)Where payments are made for the benefit of workers, workers will be provided with evidence of such payments. ▪ The Retrenchment Plan is required to be prepared prior to the closure of the contract of the workers, which has to be conducted in consultation with the affected parties and the Concessionaire.				
Access Disruption	Repair and Laying of new sewer line.	Access disruption for both residential, commercial and business operation during excavation work for laying of new rising mains, replacement and construction work.	Low to medium	▪ Inform all the stakeholders well in advance) at least 15 days (before the start of the construction work to enable shop owners to stock up and remain unaffected if goods vehicles are unable to reach them during construction; ▪ Providing provision of wooden planks to ensure pedestrian access, signage with project details and contact details for grievance redress; and proper traffic management ▪ Providing assistance to mobile vendors if any present during construction, to shift nearby locations if any; ▪ The contractor should provide proper barricading and signage or notices to indicate the ongoing work. In case by-lanes towards	MC Kot Addu Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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				the residential areas/shops are located from the replacement stretches, contractor to provide proper barricading and temporary alternate route for people to access their houses/shops Alternative access route to be provided for the community to access their residential places and in case of any medical emergency.				
Structure Loss	Construction Phase	Trees	Moderate	13 trees are found at the proposed site of sewer lines and contractor shall take prior approval from the MC and DPO-ESM prior to removal with a justification as to why the removal is unavoidable and plantation will be carried out with 1:10 removal ratio				
Gender Empowerment including Employment of Women	Civil construction during the construction phase of the project.	The civil construction work to be taken place at the WWTP can provide employment opportunities for women residing in the project area.	Low	- Ensure the implementation of the Gender Action Plan (GAP) for the project, which has been developed as a stand-alone document. - Ensure equitable distribution of employment opportunities between men and women through encouraging contractors to employ local workers including women for labor-based work. - Ensure availability of gender sensitive facilities such as toilets, resting areas, crèches for children, and a policy against sexual harassment. - Women should be encouraged to participate in public meetings, discussions and	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	- DPO-ESM of PMDFC Regional Office - E&S Consultants of Supervision Consultant's team

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				consultations especially with regard to their entitlements. Women should be made aware of the Grievance Redressal Mechanism (GRM) and the Grievance Redressal Committee should also comprise 50% of women members.				
Intra-state Migrant Workers & Labourers	Inflow of Migrant laborer's & workers expected during construction phase of the project	- Availability of Land - Security - Environment, Health and Safety of Labor at Camp site - Community Concerns regarding	Moderate	- Contractor will prepare Occupational Health and Safety Plan and get approval from MC before the execution of work - Contractor will be instructed (will be included in his term of reference and in the form of EHS SOPs) strictly implement the PMDFC SOPs for EHS of labor/construction workers - Contractor will be instructed to prefer the local labor to be engaged. Anyhow, for labor site management, following mitigation measures will be provided: IX. Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor if they will be hired from outstation. X. Good housekeeping will be ensured inside campsite XI. Labor will be provided with hygienically good quality food. XII. During winter hot water will be provided for bathing and likewise as per the weather condition. Labor Training and Code of Conduct-	MC Kot Addu Contractor	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	- Daily site visit during construction phase - Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

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		ding privac y of wome n and GBV⁴³ • Sustai nable Use of Envir onme ntal Reso urces		▪ The contractor shall develop a laborore conduct management procedure applicable to different categories of workers including short time and full-time workers. The labor code of conduct shall be consistent with and part of the overall EHS SOPs for Labor developed by the PMDFC. ▪ The labor Code of Conduct shall be translated into Urdu language upon clearance from the MOI of MC Kot Addu and DPO-ESM of regional office of PMDFC. Theodor conduct must be made available to all staff and displayed in the work site in local languages ▪ Labor awareness programs to educate the laborers about the code of conduct, general conduct, the Environmental and Social Management and Monitoring Plan, Public and Occupational Health and Safety Planned sustainable use of local environmental resources etc. should be conducted throughout the contract period as per the Labor management plan and ESH plan approved by the MOI and DPO-ESM. ▪ The contractor shall give priority selecting labor from project influenced areas so as to minimize the need for erecting labor camps and minimizing labor influx.				

⁴³ Gender Based Violence

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				▪ Frequent supervision laborer's' activities, labor welfare needs, and action to ensure hygienic conditions in the work sites/ camps ▪ Avoid social conflicts among contactor's labor force and the surrounding community or tension and prevalence of gender- based violence through the implementation offlap. ▪ Conduct awareness program on Gender Based Violence (GBV), good hygienic practices and dangers of sexually transmitted diseases such as HIV/AIDS and sensitize them to avoid interference and consider the privacy of local community women and vulnerable groups. ▪ Introduce code of conduct collaborates to prevent alcohol and drug abuse, violence, sexual abuse etc. ▪ Regular consultation and interaction with host community ▪ Prepare an inventory (including names/ National ID numbers/addressees.) of entire labor force employed by contractor, and share with the Resident Supervision Consultants. This inventory shall be updated at each recruitment or resignation of labors.					
D-Environmental & Social issues related Operational phase									
Visual and Aesthetics	Physical presence of the WWTP	Visual Odor	Minor to mod	▪ Appropriate shading of lights to prevent scattering	MC Kot Addu	• Site Visits	• Visits after	MC Kot Addu	

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	Illumination from the WWTP facility. Operation and Storage of Sludge increasing the Odor Price fall in property rates		erate	- Tree plantation and odor Monitoring - Scum that builds up on the pond surface should be regularly removed. - Floating wetlands will introduce that will stop eutrophication and algal growth within the body of our WWTP. - Floating wetland will also help to minimize odor and the flies in ponds. - The anaerobic pond must be de-sludged approximately once every 2 to 5 years, when the accumulated solids reach one third of the pond volume. - Proper implementation of flies especially (psychoda) and other breeding habitat control strategies at site - Proposed site for WWTP is already away from the urban area and nearby lands are being used for crops cultivation while downstream is facing severe water shortages which will be recovered after availability of treated water to be used for irrigation purposes which will enhance the productivity.		- Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	regular interval	
Surface and ground water quality	Wastewater seepage into ground water	Impact on soil and ground water and environme	Moderate to high	In order to monitor WWTP performance, continuous evaluation and monitoring of discharge parameters will be undertaken at the outlet and inlet point of WWTP.	MC Kot Addu	- Site Visits - Visual Inspection and	Visits after regular interval	MC Kot Addu

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		nt Occupati onal health and safety hazard Impact on Ground water quality	h	•To avoid ground water contamination, highest quality <i>smooth surface HDPE</i> geomembrane will be used to protect ground water resources and ecological environment having advantages of: ○ Low cost ○ good anti-seepage ability ○ High strength ○ Good ductility ○ Good chemical stability ○ good resistance to ultraviolet light aging, and ○ resistance to rodent and microbial attack To ensure the ideal installation and construction quality, the base layer will be further inspected to ensure that the surface of the base layer is flat and smooth, and there is no debris that may damage the geomembrane, such as rocks, tree roots, and sharp objects. There should be no right-angle rigid structure at the bending part of the geomembrane, and it should be made into an arc shape.		pictorial evidence • Monitorin g Reports Implemen tation of GRM		
Air Quality	Stack emissions Emission of H2S Methane gases from Anaerobic ponds	Impact on ambien t air quality GHG emissions	Lo w to Me diu m (Ne gati ve)	▪ Comply with the Emission guidelines In PEQs. ▪ Monitor ambient air quality in and around the Project site as per the Environment Monitoring Program formulated for the Project which will comply with National Regulatory requirements.	MC Kot Addu	• Site Visits • Visual Inspectio n and pictorial evidence • Monitorin g Reports Implemen	• Visits after regular interval	MC Kot Addu

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						tation of GRM		
Noise	Plant operations	Impact on health of workers and staff	Low (Negative)	- Noise monitoring along with health check-up on a regular interval - All noise generating units would be acoustically enclosed; - Use of rubber padding underneath high noise and vibration generating machines; - Personnel working on-site in high noise generating areas will use ear plugs /ear muffs;	MC Kot Addu	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	Visits after regular interval	MC Kot Addu
Community Health and Safety and other issues	Plant operations	Impact on community assets such as water due to water intake and cooking water discharge Increased vehicular traffic in the region Exposure to	Low to Medium	- Comply with the Community health and safety guidelines EHS Guidelines by World Bank. - Formulate and implement an On-site Emergency Management Plan (attached as Annexure) in consultation and collaboration with local government authorities to streamline the emergency management response and strategy. - Institute and operate a Community Grievance Redress System in line with PMDFC performance that pertains to Community Health, Safety and Security aspects; - If required, Project Security personnel will be	MC Kot Addu	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	Visits after regular interval	MC Kot Addu

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		site accidents and incidents Traffic Movement in newly constructed site approach road		engaged and trained in line with the recommendations of IFC Performance Standard - Awareness campaign among the community residing adjacent to the road Maintaining healthy relationship with community through BCC (Behavioral change campaigns) 100 meters of Buffer zone is provided to avoid any odor and noise related issues at community level and massive plantation will be ensured in the buffer zone (List of plant species is provided in the annexure)				
Occupational Health and Safety	Project Operation Phase	Risk of accident and fatality to worker	Med.	- On job training for the workers shall be carried out; - Work permit system shall be followed; - PPEs to be provided and use of PPEs shall be encouraged; - SOPs to be developed for operation and maintenance of the project site.	MC Kot Addu	- Site Visits - Visual Inspection and pictorial evidence - Monitoring Reports Implementation of GRM	Visits after regular interval	MC Kot Addu
Monitoring of overall performance of WWTP	Project operation phase	Lab analysis of all parameters All inlet and outlets flow data management	Med.	- A specialized lab will always onboard for the analysis of treated water parameters and to ensure its availability to reuse or mixing with water channel will be safe - There will be the hiring of a skilled team for the management of WWTP throughout	MC Kot Addu	- Site Visits - Visual Inspection and pictorial evidence	O&M Manuals	MC Kot Addu

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		nt Data managemen t of the reuse of treated water by community people around		the sub-project working span. ▪ Management of all related data of WWTP plant working efficiency, flow rate and characteristics of inlet and flow rate and characteristic of outlets, species of plants used for the floating wetland purpose will be assured. ▪ There will be proper maintenance of all machinery and equipment's used during the operation phase. ▪ Regular analysis report of the structure of WWTP will be made to assure that compatibility of structure and to avoid any accident like seepage or any other contact of highly contaminated water present in ponds with other resources.		• Monitorin g Reports Implemen tation of GRM			
Re-use and discharg e of Treated water into surface water body	Project Operatio n Phase	Ecological and health hazards		▪ WWTP facility shall ensure BOD, temperature, flow and other parameters monitoring at entry point (influent) to the last exit (effluent) after treatment through anaerobic ponds, facultative ponds and through bioremediation by introducing floating wetlands. ▪ Sludge dry beds will be used to prepare the compost for further selling to the local farmers which will be a source of revenue generation for the MC.	MC Addu	Kot	Monitoring Reports Effectiveness of GRM Well- established reporting and documentatio n mechanism	Visits after regular interval	• MC Addu Kot

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				▪ After disinfection and chlorination and helminths and pathogens removal, treated water will be reused for irrigation purposes and during monsoon or no irrigation usage seasons, treated water shall be pumped through watercourse to the nearest canal which is 4-5 km away from the WWTP. ▪ For discharge of treated water into surface water body, PEQSS⁴⁴ shall be strictly followed (Attached as Annexure B) ▪ As Pakistan has no Guidelines/Standards for treated water re-use, so WHO, FAO and USEPA Guidelines and Standards (attached as Annexure L) shall be used to ensure the environmental and ecological safety				
Security	At operation phase	Vandalism Theft Encroachment		• Boundary Wall will be provided around the WWTP • Security cameras will be installed • Guards and watchmen will be deputed • Admin block is included in the WWTP auxiliary facilities	MC Kot Addu	Best administration practices	Throughout the operation	MC Kot Addu

⁴⁴ . As per PEQSS, Biochemical Oxygen Demand (BOD₅) at 20° C for inland water discharge is 80

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				Buffer zone of 100m will be maintained				
Energy Efficiency	At operation phase	Over-exploitation of energy resources		Solar energy system is introduced for energy efficiency and safe use of energy	MC Kot Addu	Energy Audits O&M Manuals	Annual	MC Kot Addu

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5.Estimated Budget⁴⁵			
Item	Quantity	Tentative Cost/Item-PKR. /-	Total Cost
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	50	300	15000
Safety Hard Helmets	30	3,000	90000
Safety Shoes	30	3,000	90000
Hand Gloves	30	1,000	30000
Ear Plugs	30	500	15000
Reflective Safety Vest	30	1,000	30000
Safety Goggles	30	500	15000
B-Community Health and Safety			0
First Aid Box Complete	4	10,000	40000
Infrared Thermometer (Benetech GM-2200 or equivalent)	1	40,000	40000
Safety Signs	20	15,000	300000
Safety Cones	19	1,000	19000
Safety Tapes	20	1,500	30000
Portable Delineator with chain	20	2,200	44000
Emergency Portable Lights	20	3,000	60000
Solid Waste Collection Drums with Cover	20	12,000	240000
Fire Fighting Equipment Purchase and refilling	3	10,000	30000
Hiring of Environmental Manager (for 02 years)	24	60,000	1,440,000
Pole Hanging Waste Bins	8	12,000	96000

⁴⁵. **Estimated Cost of 1.5mm Smooth Surface HDPE geo-membrane** is made part of BOQ items of civil works of WWTP

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Labor Campsite Management	1	1,030000	1,030000
Water Sprinkling	1	300,000	300000
Social and Behavior Change Campaign and Labor Awareness/Training	1	250,000	250,000
C- Environment Quality Testing during Construction Phase			0
Ambient Air Quality-Before, during, and after construction	12	85000	1020000
Noise Quality-Before, during, and after construction	12	1000	12000
Water Quality-Before, during, and after construction	12	22000	264000
D -Monitoring cost			0
Water Quality Analysis Lab Establishment at site to ensure treated water quality as per WHO/PEQSS	Estimated Cost has been incorporated in the BOQ of Civil works of WWTP		
Total (PKR)-A+B+C+D			5,500,000

6.5. EIA/ESIA IMPLEMENTATION BUDGET

ESMMP budget details are shown hereunder:

Table 16: EIA/ESIA Implementation Budget in PKR

Subproject Component	Estimated Cost
Rehabilitation of Existing Sewerage System Part I A (Missing Sewers and replacement of existing lines, Desilting of Sewer lines, manhole covers, pumping machinery replacement)	287,500
Rehabilitation of existing Sewerage System Part I B (Desilting, replacement of disposal stations pumping machinery)	155,400
Improvement of Sewer Network -13km	961,000
Construction of Disposal Station and rehabilitation of 3km nullah from disposal station to WWTP	1,092,500

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Construction of Waste Water Treatment Plant (One Sullage channel, One Screening Chamber, 04 Anaerobic ponds, 04 facultative ponds, 4 sludge drying beds, one treated water pond, administrative block including site lab facility, floating plants covering the 20% of facultative ponds and one effluent water course from WWTP to the nearest water body)	5,500,000
Total Estimated Cost for Implementation of ESMMP	7,996,400

CHAPTER 07

STAKEHOLDER CONSULTATION & CAPACITY BUILDING PROGRAM

7.1. General

This Section outlines the consultation and participation activities that have been undertaken as part of the impact of sub-project. Early and ongoing consultation, disclosure and meaningful stakeholder meetings is a key requirement of developing a sub-project. The logic behind the consultation is to get feedback from stakeholders and address their concerns about the Sub-project. The consultation process consists of initiating dialogues among all the stakeholders. The process covers, starting from awareness campaign to the identification, inclusion and participation of Sub-project affected communities. Stakeholders including institutions and concerned communities are generally able to understand the implications of the Sub-project activities.

The present report has been prepared by consulting local communities and concerned government departments/ organizations to ensure that their views and concerns about the sub-project have been considered in the study. The consultation process involves initiating dialogues among all stakeholders, encompassing activities such as raising awareness through campaigns and ensuring the identification, inclusion, and participation of those affected by the project

The present study report has been prepared by consulting with local communities and concerned government departments/ organizations dealing particularly with related fields and to ensure that their views and concerns have been considered in the study.

7.2. Consultant's Perspective

The present multi-sectorial and multi-dimensional strategy for the sub-project rests on the consultation process including participation, inclusion, ownership and equity of genuine development of national resources on a sustainable basis has been designed keeping in view the following essentials;

- a) Social acceptability,
- b) Technical appropriateness,
- c) Financial viability,
- d) Environmental friendliness,
- e) Pro-poverty reduction,

- f) Gender positive and
- g) Long-term sustainability prospects.

7.3. Consultation Requirements

7.3.1. Overview

This sub-section provides an overview of the international consultation, disclosure and stakeholder engagement requirements of the national, provincial and World Bank Guidelines for consultation.

7.3.2. National and Provincial Consultation Requirements

The Government of Pakistan (GOP) and Government of Punjab places great importance on involving institutional and community stakeholders for determining the impacts associated with the sub-project implementation. In order to understand Sub-project affected stakeholder's perceptions regarding impacts and mitigations of the sub-project and participation of stakeholders has been taken as integral part of the Study. An attempt has been made to consult with a full range of stakeholders to obtain their views on sub-project interventions and impacts thereon.

7.3.3. Specific Objectives of Consultation Process

The consultation process provides a meaningful understanding of local social issues for the environmental and social impact analyses. The consultation process helps to minimize adverse environmental and social impacts, reduces the expected conflicts, minimizes the risk of sub-project delays and enables to make the Sub-project more economical and socially acceptable. Moreover, public consultations create a sense of ownership among the stakeholders regarding the Sub-project and ensure the transparency in sub-project activities. The consultative process for the "ESIA" has included not only the institutional stakeholders, but also the local community of the area. Meetings with institutional stakeholders like government departments, and line agencies has been organized and conducted to discuss Sub-project interventions and potential impacts on the local communities and environment. Public consultations have been carried out with the stakeholders keeping in view the overall objective of evolving their participation. The public consultation aimed to achieve following specific objectives.

- ❖ Information disclosure to create awareness among various stakeholders about Sub-project development objectives and proposed interventions
- ❖ To start interaction process with stakeholders
- ❖ To elaborate environmental and social impacts to the stakeholders
- ❖ To establish communication and an evolving mechanism for the resolution of social and environmental issues at local and Sub-project level

- ❖ To involve Sub-project stakeholders in an inclusive manner at every stage of Sub-project implementation
- ❖ To receive feedback from all types of stakeholders on adopting mitigation and enhancement measures for environmental and social impacts

7.4. Identification of Stakeholders

Stakeholders include all those who can affect and are being affected by policies, decisions or actions while implementing any development project. Stakeholders can be individuals, group(s) of people, organizations and institutions. During consultation meetings stakeholders reveal their concerns, apprehensions and demands regarding the adverse project impacts mitigation and enhancement of project benefits to the stakeholders. Stakeholders can be broadly divided into primary and secondary stakeholders.

7.4.1. Primary Stakeholders

The primary stakeholders are the intended beneficiaries or communities expected to be affected directly by the project interventions. In this case, people living within Project area are considered as Primary Stakeholders. Primary stakeholders identified and consulted include local leaders/influential, community members (men and women), local representatives, imams, teachers, union council and village council members.

7.4.2. Secondary Stakeholders

This category of stakeholders pertains to those who may not be directly affected but have interests that could contribute to the initiation, implementation at some stage, or affect decision making on Project aspects. The Secondary Stakeholder include, federal/provincial government departments and organizations dealing with education, health, irrigation, agriculture, forest, wildlife, fisheries, and transport etc. Stakeholder consultations meetings were conducted in two stages:

7.5. Public Consultation

Consultations mainly in form of “Focus Group Discussions” (FGD) with Primary Stakeholders in those communities which is near to the sub-project at public places. It was important to provide meaningful input for the public into the decision-making process through consultation. Representatives of the communities, potential vulnerable groups such as women and youth has been consulted to understand their specific issues and concerns. The findings and recommendations have been discussed and disclosed in an open and transparent manner with the communities in order to solicit their comments and suggestions on the sub-project interventions.

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Participants were first briefed about the Sub-project objectives and major interventions associated with the sub-project implementation. Afterward, people were asked to express their views regarding the proposed Sub-project. In general participants appreciated the Sub-project and offered comments & suggestions to enhance the expected environmental and social benefits and to mitigate the adverse impacts. The community perception of the Sub-project is very good but most of the people wish to implement the sub-project in a sustainable and safety manner. The number of participants involved in each locality and major issues raised by communities during meetings are provided in Table 12 and Table 12. below:

Table 17: Consultation with Stakeholders (Local Communities)

Sr. No.	Settlement	Tehsil	Number of Participants
1.	Muhalla Mariwala	Kot Addu	13
2.	Muhalla Qazi Qaleemullah		19
3.	Awan Factory Muhalla		12
4.	Ansar Colony		09
5.	Sabzi Mandi Town		07
6.	Ward No. 10		09
7.	Sindhi Basti		17
8.	Basti Gadion Wali		13
9.	Basti Mandi Maweshian		11
10.	City Marriage Hall		10

Pictorial View of Public Consultation



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Table 18: Feedback and Concerns

Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
Queries	
What is the main purpose of this Proposed project?	Addressing the significant sewerage challenges in Kot Addu demands the imperative construction of a Wastewater Treatment Plant (WWTP). This critical component is essential for both the improvement and rehabilitation of the existing sewerage system, as well as the installation of a new one. The WWTP plays a pivotal role in mitigating the prevailing sewerage issues and contributes to overall improvements in the sanitation infrastructure of Kot Addu.

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Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
Then what will be the benefit to the residents to the nearby community of WWTP.	The prevailing method involves irrigating crops with untreated sewage, posing significant health risks and contributing to various diseases within the community. With the implementation of the Wastewater Treatment Plant (WWTP), municipal wastewater will undergo treatment to meet the acceptable levels set by both National and International standards. This ensures that the treated water is safe for use in irrigating crops, mitigating health concerns associated with the current practice.
What is the main reason to select the site?	The ESM and Design team of PMDFC have conducted a thorough survey, analyzing various sites through visits. Based on this comprehensive assessment, it has been concluded that the selected site is the most suitable and feasible for the project.
As the main occupation of this area is agriculture and community meet their bread and bread with very difficult is there any chance to provide the jobs for locals.	Certainly, the project places a strong emphasis on hiring local individuals during the construction phase.
Can we use the treated water for irrigation?	Indeed, as mentioned earlier, treated water that complies with International and National standards is deemed safe for agricultural use.
How we shall get an information about the construction related activities?	- The contractor will put in place measures to minimize effects and provide regular information to local residents on construction activities and their impacts. - Local communities will be informed about the upcoming construction related activities well before time and salient information will be displayed at prominent places of construction sites

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Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
What are the objectives of this consultation?	This consultation process was held with the objectives of sharing information with stakeholders on proposed improvement works and expected impacts on the physical, biological and socio-economic environment; understanding stakeholder concerns regarding various aspects of the project; providing an opportunity to the public to influence project design in a positive manner; and creating a sense of ownership of the proposed activities.
Is there any complaints mechanism in-place and will it be effective to respond timely?	Yes, there is a well-established grievance redress mechanism in place which will work effectively and resolve the public complaints with no times.
What is the objective and scope of the study for which this public consultation is carrying out?	- Identify and assess the potential environmental and social impacts that the Project may have on the environment and communities within its area of influence (AOI). - To help avoid, or where avoidance is not possible, minimise, mitigate or compensate for adverse impacts on the environment and communities - To know the feedback from local communities to better manage the project activities.
What is the need of this project? Particularly WWTP?	- In the absence of the project towards improvement of the sewerage situation in the zone, the circumstances are worsening over the period and public had to suffer inconvenience on account of routine sewage overflows and heavy flooding during rains. If the project is not initiated; the situation will exacerbate specially during monsoon season and due to flooding, the socio-economic activities of the project area will be affected and several other problems will arise including odour and vector borne diseases which will further create health issues i.e. dengue. - It is an offense and non-compliance of local legal framework to dispose of the untreated waste water into surface water bodies or to use for direct

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Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
	irrigation purposes, Moreover, it has severe health hazards and environmental damages. WWTP facility will provide treated water and compost to the local farmers and will be a source of revenue generation for MC Kot Addu.
• What is the potential risk and impacts?	• Local communities may face traffic hinderances during sewerage network rehabilitation activities and desilting activities. However, traffic management plan and alternate access routes will be provided to minimize the traffic hinderances • Risks and impacts associated with the construction of disposal station and WWTP are site-specific and urban population will not be affected • The risks and impacts of the Project have been summarised in the chapter 5 and 6 of ESIA report which will be disclosed for public.
Suggestions/Recommendations	
• Job opportunities for local residents should be created.	• The contractor will be contractually bound to disclose the "Recruitment Policy" that specifically includes a requirement to prioritise local employment for unskilled and semi-skilled positions that become available.
• HSE awareness should be provided to the local public as well.	• Comment are incorporated in the ESIA report and it may be shared with MC Kot Addu to make local communities the part of HSE awareness sessions during labour awareness sessions.
• Contractor should be bound to hire the local labour.	• The contractor will be contractually bound to disclose the "Recruitment Policy" that specifically includes a requirement to prioritise local employment for unskilled and semi-skilled positions that become available. • Comment has been incorporated in the ESIA report

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Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
Overall this project will have positive impacts towards the health, environment, women & children.	Comments were applauded by the team
The participants requested that all vehicles, machinery, equipment and generators used during construction activities shall be in good condition and shall be properly tuned and maintained in good working conditions in order to minimize air and noise emissions.	It is recognised that a project of this scale and duration has the potential to impact the environment and the community, both in a beneficial and adverse way. Chapter 5 and 6 cover all such impacts and their mitigation measures and implementation of mitigation measures will be made part of contractors' term of reference and he will ensure the implementation throughout the execution of the subproject. Moreover, contractor shall hire the services of an EHS/Environment Manager throughout the course of execution and he/she will ensure the implementation of mitigation measures as per ESMMP. Moreover, site-specific mitigation measures will be monitored and supervised by the supervision team, MC Kot Addu and PMDFC regional team.
One of the participants told that before start of construction activities for the project, The contractor should inform residents of the area about detail of work, likely disturbances and their duration and as to whom they should address their complaints.	- Prior to starting of work, the contractor shall prepare a method statement for major construction activities and share with all stakeholders. This shall be simple and explain the contractor's work process that is actually conducted on site, with safety and safeguard concerns. - Comment has been incorporated in the ESIA report
One of the participants said that the safety of the public at all stages of the construction should be ensured.	- During the project implementation stage, measures will be prepared that will include GRM and institutional arrangements. - Comment has been incorporated in the ESIA report

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Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
Safety while crossing the road especially students/pupils, old and women.	- To avoid any safety related incidences and ensure well-being of the local residents, the construction work will be fenced at the edge of the RoW to prevent any pedestrian and animal crossings through the passages. - To facilitate the movement of locals across the road, adequate number of underpasses at appropriate distances will be provided. - Chapter 5 and 6 cover impacts and mitigation
Sewerage blockage and sewage water scattering all around the streets has become a nuisance for the public in day-to day life. In a recent incident, two children died due to uncovered manholes and slippery roads	All the issues related to sewerage system failure are being addressed in this subproject and it would be a big relief for the local communities.
MC Kot Addu should take measure to complete the subproject in a timely and effective manner. Due to unnecessary delays in such projects, local inhabitants have to suffer due to open and excavated sites, roads blockage and scattered sewerage water in the streets and it becomes nuisance for the public in rainy seasons.	Relevant staff of MC Kot Addu replied that they will take all the necessary measures to avoid such circumstances and ensure that contractor may complete the work as per scheduled work plan and no delay will be acceptable in this regard.
It was mentioned that the relevant Government personnel must ensure the contractor staff is cooperative with the general public and try to facilitate them instead of being confrontational.	Before the project implementation stage, labour and contractors' awareness and sensitization sessions will be conducted in this regard. However, in case of any complaint, GRM is in place and local inhabitants may raise their complaints through it.
The rehabilitation of the sewerage system will be beneficial for the entire area and also beneficial for social and a significant environmental enhancement is also expected.	- Applauded the remarks - Comment incorporated in the ESIA report

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Community Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
MC Kot Addu should take special measures during replacement of manhole covers to avoid any accident particularly restrictions for children.	Mitigation measures have been incorporated in the ESMMP of ESIA report and communicated to MC Kot Addu. During replacement or of providing new manhole covers, prior information will be disseminated to the local peoples and respective area will be cordoned off to avoid any accident. Instructions will also be displayed at the working area and labor will be instructed to complete the work in minimum possible hours and in one go to avoid the manholes uncovered.
People were of the apprehension that during replacement of sewerage lines, mobility may be affected.	- The Contractor will take proper safety measures (placing warning tapes around excavations) to avoid people, especially children, accidentally falling into excavations and during all the construction activities. - Environmental impacts on local communities related to traffic, air quality and noise have been assessed and mitigation measures are provided in detail in the chapter 5 and 6 of the ESIA. - Moreover, contractor shall hire the facilities of EHS/Environment Manager throughout the execution of project to ensure all the E&S requirements as per ESMMP. Traffic Management Plan will be developed and after approval from the MC Kot Addu, shall be displayed at the prominent places to facilitate the local communities. - Subproject shall ensure to handle all such issues related to E&S and an effective GRM is also developed where such complaints may be raised.
Old Sewerage pipes have collapsed and blocking the sewerage lines. Most of city's sewer pipes are old, and have outlived their potential utility.	- This project will improve the city Sewerage system problems and overall well-being of the city. - Comments are incorporated in the ESIA report.

7.6. Consultation with Nearby Industries

Public Consultation Session with followings industries were done:

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- KAPCO
- Lalpir Power Plant Ltd
- Fatima Sugar Mill
- Sheikhu Sugar Mill
- Shoaib Flour Mill

Public consultation session with KAPCO, Lalpir Power Plant Ltd and Shoaib Flour Mill was conducted at their respective offices while consultation session with representatives of Sheikhu Sugar Mill and Fatima Sugar Mill was held at DC Office Kot Addu. List of attendance is attached as Annex K.

ESM Wing PMDFC briefly informed about project details, objectives, and components of projects, nature of activities, sponsoring agency, execution agency and importance of consultation, disclosure and meaningful stakeholder meetings with representatives of all above mentioned industries:

Industry	Question	Responses
Fatima Sugar Mill & Shiekhu Sugar Mill Kot Addu	What is jurisdiction of this sub project?	The sub project lies within boundary of MC Kot Addu. Proposed land for WWTP is state land and it would be transferred to MC.
	What is exact location of WWTP. Is it away from city?	WWTP is proposed in Chak 153/ML Kot Addu and its away from city.
	Have you conducted any analysis of water and wastewater samples?	Yes, Pak Green Consultants are conducting analysis of water, wastewater, air and noise before the execution of project.
	What is capacity of treatment plant?	Design capacity would be around 7 MGD.
	What type of wastewater treatment plant you are suggesting?	Waste Stabilization Ponds (WSP), type of secondary wastewater treatment is recommended for comprehensive sewerage scheme of Kot Addu city.
KAPCO	It was asked that water table is too high for Kot Addu. What measure you have proposed?	For WWTP, Geomembrane would be included in design parameters which would not allow to mix wastewater with water table.

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Industry	Question	Responses
	How you will ensure the sustainability of WWTP?	PMDFC would take care for lab as well as WWTP for a period of 3 Years after the completion of project. After that, it would be in jurisdiction of MC Kot Addu who will be responsible for its O&M.
	How transparency of funds and quality of work would be ensured?	Third Party External Consultant has been hired for inspection. Besides that, PMDFC and MC Engineers would check quality and quantity during the execution of project. Donor along with their hired consultant team would also monitor on transparency of funds and quality of work.
	What is purpose of new disposal station if already 6x disposal exist under MC?	Among 6x disposal station, 3x disposal are not functional. Rest of 2x have less power machinery. Keeping in view the importance and magnitude of flux of sewerage, 1x new disposal is proposed.
	How PMDFC is enhancing capacity building of MC Kot Addu?	PMDFC is enhancing capacity building of MC Kot Addu by providing necessary trainings regarding Infrastructure, Environmental and Social Management and Safeguarding the Environment, Municipal Development, IT and other sectors.
Lalpir Power Plant Ltd	Have you any SOP Policy for health and safety?	Yes, PMDFC has developed its own Health and Safety Guideline.
	How wastewater would be treated in wastewater treatment plant?	Waste or Wastewater Stabilization Ponds (WSPs) are large, man-made water bodies in which blackwater, greywater or faecal sludge are treated by natural occurring processes and the influence of solar light, wind, microorganisms and algae.

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Industry	Question	Responses
	How smell for WWTP would be reduced as there are anaerobic ponds? How many zones are for Kot Addu city. How many are being covered in that project? Who will look after the lab and WWTP after its construction? Where the effluent of WWTP would be discharged? Why the areas of Zone-3 is not included in currently proposed project?	Buffer zones for 500-1000 meter would be provided where tapered tree plantation would be done after the construction of WWTP. Smell absorbing specie of plant like Typha would be planted. Out of 3 zones, Zone 1 and Zone 2 is being covered by this sub project. PMDFC would look after the lab and WWTP for period of three years. After which, its O&M would be done by MC Kot Addu. Effluent of Maturation ponds would be discharged for irrigating nearby agricultural land. PHED is working in Zone-3 due to which this zone is not included.
Shoaib Flour Mill	MC Kot Addu have less SWM machinery? Is there any solid waste machinery included in this project? Are you taking any approval from local body of Environment for said project? Dupsari Disposal Station is non-functional from last 3 years and water ponding which are not safe for Environment and Public Health? Have you included in approved scheme?	1x set of sucker and jetting winch machine is proposed in cost of project. Besides that, under same donor project, MC Kot Addu has purchased some new machinery as well. Yes, we are seeking NOC from Environmental protection Department (EPD). Dupsari Disposal Station is included in sub project. Its new machinery as well as overall maintenance is covered under this project.

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Industry	Question	Responses
	How existing manholes in choked form would be functionalized?	1x set of Jetting & Winching Machines has been provided under same funded project which would work for desilting of choked sewers.

Pictorial View of Consultation Sessions with Rep of Industries

1. Consultation with Representative of Fatima Sugar Mill & Sheikho Sugar Mill



2. Consultation with Representative of Shoaib Flour Mill



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3. Consultation with Representative of Kot Addu Power Company (KAPCO)



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4. Consultation with Representative for Laalpir Thermal Power Company



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7.7. Institutional Consultation

The consultant environmental and social team visited various organizations and offices located in the tehsil and district level for information disclosure and to get feedback. Institutional stakeholder consultations were more formal as they involved government personnel and non-governmental organization, who were consulted. They were briefed on the ESIA process, the proposed Sub-project, proposed interventions and the potential negative and positive impact of the Sub-project on the area's environment.

The public sector representatives of the different line departments expressed their complete support towards the sub-project development and mentioned the intent to ensure the sub-project was completed at the earliest to the highest quality standards. In addition, these officials expressed the commitment to ensuring the support and would adhere to all environmental and social compliance standards with no leniency in this regard to be expected from the relevant Government line departments. The digest of comment and suggestions received is given as

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under, whereas, complete list of offices visited, official consulted and feedback received is provided below in Table 20. List of attendance regarding Institutional Consultation is attached as Annexure K.

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Table 19: Consultation with Institutional Stakeholders

Sr. No	Department/ Organization	Name	Designation	Contact No.
1	MC, Kot Addu	Mr. Hafiz Muhammad Usman Mr. Malik Mehboob Mr. Nadeem	Municipal Officer (Infrastructure), Municipal Officer (Planning), Sub Engineer	
2	Rescue 1122	Mr. Osama Zeeshan	Assistant Director	
3	Irrigation Department	Mr. Muhammad Asif	S.D.O	
4	Agriculture Department	Mr. Muhahid Iqbal	Agriculture Department	
5	Social Welfare Department	Mr. Ahmad Riaz Mr. Raees Ali Arif Naeem	Senior Area Manager SPO Program Manager SPO Social Welfare Officer	
6	Forest Department	Mr. Ghulam Akbar	Range Officer	
7	Environment Protection Department	Mr. Adnan Khan	Senior Inspector	
8	Wildlife Department	Mr. Naeem Ashraf	Assistant Director	
9	AC Office	Mr. Ghulam Akabr	Patwari	
10	Madni Women NGO	Ms. Waheeda Rani	President	
11	DC Office	Munawar Abbas Bukhari	DC Kot Addu	
		Mr. Yousaf Jamal	PS to DC	

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Pictorial View of Institutional Consultation



Table 20: Feedback and Concerns

Departments	Question/Suggestion	Responses
Forest, Wildlife, and Fisheries Depart	How to reduce odor/smell of WWTP? Assistant Director elaborated that a linear plantation of Sufaidda at distance of 6x6 foot is usually performed.	Buffer zone would be provided within 100-500 meter where various native trees would be planted. Plants like Typha would be planted in wetland reducing BOD as well odor/smell. SPO (ESM) asked various indigenous species and costing of plants required for buffer zone of 100-500

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Departments	Question/Suggestion	Responses
	Data regarding native species would be shared as and when required.	meter around WWTP Site. SPO (ESM) asked for providing the details of those plant species that remove smell/odor and wouldn't impact the water table of respective area. Hence, it was decided that ESM Team of PMDFC will coordinate with Forester Officer to identify the indigenous species that will help in pollution control.
DC/ MO Staff	1. According to earlier study of SPBUSSP Project, NESPAK conducted geotechnical investigation. According to that report, water table is high. Don't you think WWTP ponds wastewater would deteriorate water quality? 2. Also it was requested to do analysis of water and wastewater before the installation of WWTP? 3. DC Kot Addu inquired from SPO (ESM) that in case of non-availability of nearby canal, what would be the solution.	5. SPO (ESM) answered that depth of ponds would be adjusted accordingly and geo membrane would be provided at the bottom of WWTP ponds which would block seepage of wastewater to groundwater. Its cost has been included in PC-1. 6. Pak Green Consultants would visit in next week to visit for analysis of water and wastewater parameters. 7. SPO (ESM) briefed about secondary and tertiary treatment of waste water. It was told that for disposing off the effluent of secondary treatment, dilution of minimum of 1:10 factor is allowed which is usually done in case of availability of nearby disposing off canal and our design team has worked for installation of secondary treatment ponds for which 30 Acre land if WWTP was requested for MC. In case of non-availability of nearby canal for dilution, secondary treatment plant effluent is further treated through tertiary unit which required another 10–12-acre land. For that case, design team has to work again for its feasibility.
Agriculture	Assistant Director Agriculture asked treated effluent of WWTP may be used for irrigating crops.	SPO (ESM) briefed that treated effluent of secondary treatment would reduce Biochemical Oxygen Demand meeting WHO and FAO standards and it can be used for irrigating the crops.

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Departments	Question/Suggestion	Responses
MC	WWTP would serve to treat industrial wastewater and municipal wastewater as sewerage system includes open drain in some areas?	This project would serve to treat the municipal sewage only. Industries are outside main city. We are in planning to conduct consultations with main industries of Kot Addu like Power plants, Sugar Mills, Floor Mills.
Patwari	It was asked from Patwari that about some settlement at proposed WWTP site?	Patwari briefed that there are 13-15 houses that are settled illegally. Further, he endorsed that in proposed land, there is school as well mosque as well. SPO (ESM) requested DC Kot Addu to send notices through AC Kot Addu for vacating the land

Women Stakeholders Consultation

Gender issues are gaining importance in development sub-projects because female members of the community are generally neglected while designing, assessing and implementing such sub-projects. Females are generally more vulnerable than male members of the society. This Sub-project is also no exception to it. Conducting women consultations in the Sub-project area was a challenging task. However, the process has been carried out by holding consultation sessions with women of local communities randomly. A participatory and consultative approach has been employed for information gathering and data collection.

Female participants were briefed about the sub-project objectives and interventions and then were requested to give their views. Women's main concerns were generally related to the existing hardships they are facing and suggestions, as under:

- One of the participants told that they are fed up with the stench of wastewater and mosquito-borne diseases like malaria and dengue fever.
- Proper sanitation infrastructure has not been the priority of the Government due to which women households are affecting badly.
- Women are not allowed to leave the house without permission of head of family, most of women are not aware of hygienic practices and products.
- The waste water from households converted into wastewater ponds because of sewerage blockage in some of areas of the city, the water level raises and enters into household cause water borne diseases and damages the foundations of houses.
- Waste dumping is major issue faced by local communities, lack of awareness and lack of proper waste management system has resulted in waste dumps in the middle of the town which is major source of diseases like diarrhoea and malaria especially in

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summers.

Pictorial View of Women Consultation



CHAPTER 08

GRIEVAENCE REDRESS MECHANISM (GRM)

To receive and facilitate the resolution of affected people concerns, compliments, and grievance about the sub-project's environmental and social performance an Environmental Grievance Redress Mechanism (GRM) has been established. The GRM will address affected people's concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate and readily accessible to all segments of the affected people at no costs and without retribution.

The GRM will be accessible to diverse members of the communities, including women, senior citizens, and people with disabilities, laborers/workers, and other vulnerable groups. The subproject GRM will follow the PCP's overall program GRM.

8.1. GRM At Sub-Project Site

Grievance Redress Mechanism (GRM) is to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the local level. In case of any complaint, E&S expert of supervision consultant team will act as focal person of GRC who may be contacted at site and his contact details will be provided at project site.

8.1.1. The first tier of GRM.

The PMU is the first tier of GRM which offers the fastest and most accessible mechanism for the resolution of grievances. The PMU staff for the environment and social safeguards will be designated as the key officers for grievance redressal. Resolution of complaints will be completed within seven (7) working days. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, the public, etc.). Grievances will be documented and personal details (name, address, date of the complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

- Initial grievance sheet (including the description of the grievance), with an acknowledgment of receipt handed back to the complainant when the complaint is registered;
- Grievance monitoring sheet, mentioning actions taken (investigation, corrective measures);

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- Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed off.
- The updated register of grievances and complaints will be available to the public at the PMU office, construction site and MC in the project area. If the grievance remains unresolved, it will be escalated to the second tier.

8.1.2. 2nd Tire of GRC

GRC has been notified under the umbrella of the Punjab Cities Program (PCP) comprising of the following members and TORs.

Chief Officer MC Kot Addu	Chairperson
Municipal Officer (Infrastructure Development)	Convener
Municipal Officer (Planning)	Member
Municipal Officer (Regulation)	Member

TORs of GRC- MC Kot Addu are as followed:

- The ESFPs with the support of DPO-ESM will play an instrumental role in steering the GRC functions both at the city and regional levels.
- CO MC Kot Addu will be responsible to share monthly recorded grievances data with regional GRC.
- The contractor will have observer status on the committee.
- If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the 3rd Tire of GRC before going to Government's judicial remedies.

8.1.3. 3rd Tire of GRC at Administration/PMDFC Level

A Grievance Redress Committee (GRC- PMDFC/LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly reviews. It will be headed by the DS/AS LG &CDD.

- The committee will be responsible to oversee the overall functions of the GRM at a strategic level including monthly reviews.
- The committee will maintain an electronic database at the PMDFC that will provide a summary of complaints received and mitigations.
- The committee will also provide an analysis of the grievances at each sub-project location using a pre-designed M&E template that will give insight into the type of complaints received and a qualitative and quantitative review of grievance redressal.
- The committee will also be responsible for uploading the actions and results for each grievance for each Sub-project location on a periodic basis to the PMDFC/PCP website.

Grievance Redress Committee (GRC)- MC Kot Addu

ESFPs of MC Kot Addu will be focal persons and responsible for handling the GRM at MC level.

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GRC AT Administrative Level

Administrative of each MC will chair the GRC at Administrative level

Types of Grievances

The following are some of the environmental and social issues could be subject for grievance from the affected people.

Environmental Issues	Social Issues	EHS Issues
- Noise Pollution - Air Pollution - Fugitive Dust - Water Pollution - Solid Waste Management - House Keeping - Cutting of Trees - Borrow Areas Management - Protection of Wildlife - Campsite Management	- Accidental Insurance for labor - Non-Provision of PPEs to labor as per nature of their jobs - Loss of any public infrastructure - Protection of sensitive receptors - Compensation for any economic losses - Traffic Management - Labor grievance redressal - Gender discrimination - Security Arrangements - Impacts on livelihood - Irregular Traffic Movement - Obstruction in access - Intensive schedule of construction activities - Child Labor - Unsafe conditions for the community (Community Health and Safety, CHS)	- First Aid - Fire Safety - Workplace Safety - Tools Box Talks - Provision of PPEs - Work at Height Safety - Excavation Safety - Heavy Machinery Issues

CHAPTER 09

CONCLUSION AND RECOMMENDATIONS

9.1. Conclusion

The present report presents the EIA/ESIA of Improvement of Sewerage System in Kot Addu City and Construction of WWTP. During the preparation of EIA /ESIA report for the proposed developmental project, it is observed and established that the negative environmental and social impacts are temporary and moderate to high in nature. No depletion, deterioration or exploitation of local natural resources is expected to be caused by the proposed project activities. It is accordingly recommended that the Environmental Approval for the project may be issued by the Punjab Environmental Protection Agency, subjected to the payment of requisite scrutiny fee by the proponent of the project. The project does not pose any serious negative environmental impacts. Adequate mitigation measures have been proposed in the ESMMP of this report to address the negative environmental and social impacts that may emerge at execution or operation phase.

In addition, the improvement of sewerage system in Kot Addu city and construction of WWTP would be beneficial for the community in multiple ways. This project is unique and need of the hour to improve air quality, traffic congestion and safety issues of the public of MC Kot Addu. It will generate revenue for MC Kot Addu.

9.2. Recommendations

The EIA/ESIA report as well as the public consultation results are finally evaluated to recommend the following:

- Adherence to the ESMMP as proposed in this report is mandatory by making it the part of bid documents and contractors' terms of reference.
- During the construction phase of this project, all the required PPEs should be provided to the workers.
- All the safety precautions for the EHS of labor/workers including women labor and communities should be followed as proposed in the ESMMP of this report and EHS SOPs developed by PMDFC.
- Proper safety signage and information sign boards must be placed at prominent places.
- Adequate training of workers must be done to deal with the emergency situations.

• Glossary

Act	Act means the Pakistan Environmental Protection Act, 1997
Affected Household	All members of a household operating as a single economic unit, who are affected by a project.
Affected Households	All members of a household operating as a single economic unit, who are affected by a project.
Biological Oxygen Demand (BOD)	BOD is a measurement of oxygen required by bacteria to oxidize (stabilize) the organic matter in the wastewater
Blackwater	Blackwater is wastewater from toilets and latrines containing feces or body fluids and water from sinks used for food preparation or disposal of chemical or biological ingredients.
Contamination	Contamination introduction of impurities in the environment
Compensation	Payment in cash or in kind for an asset or a resource that is acquired or affected by a project due to land acquisition at the time the asset needs to be replaced.
Drain	A channel or pipe along which liquid drains away; esp. (a) a pipe for leading away rainwater etc.; (b) an open channel made to drain an area of land; an artificial river
Disease Vectors	insects or small mammals carrying disease-causing germs
Displaced persons	The titleholders / the persons in whose name the project-affected businesses registered/who run the business and who are authorized to receive the resettlement assistance granted for the loss business locations.
Environment	Environment means (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms;

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	(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 inter-relationships between any of the factors in sub-clause (a) to (f).
Entitlement	Resettlement entitlements with respect to a particular eligibility category are the sum total of resettlement and rehabilitation assistance provided to displaced persons in the respective eligibility category.
Environmental Assessment	Environmental Assessment is a technique and a process by which information about the environmental effects of a project is collected, both by the developer and from other sources, and taken into account by the planning authority in forming their judgments on whether the development should go ahead.
Ecosystem	Ecosystem is a biological community plus the surrounding physical environment
Endangered Species	Endangered Species are species in danger of becoming extinct
Greywater	Greywater is the water that has been used once in a house or building for washing clothes, shower, bathing, hand washing, or dishwashing and can therefore be used again in toilets or to water gardens and landscaping.
Household	Household means all persons living and eating together as a single social unit and cooking from the same kitchen whether or not related to each other.
Impact on Environment	Impact on Environment means any effect on land, water, air or any other component of the environment, as well as on wildlife harvesting, and includes any effect on the social and cultural environment or on heritage resources.

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Infiltration	seepage of water into ground
Invasive Non-native Species	a species that is introduced into an area or region from outside
Income restoration assistance	Support to restore and/or improve the incomes of displaced persons through allowances and provision of alternative means of income generation.
Involuntary Resettlement	Resettlement is involuntary when it occurs the displaced persons give their consent without having the power to refuse resettlement.
Implementing agency	Agency, public or private, that is responsible for planning, design, and implementation of a development project.
Income Restoration	Income Restoration means re-establishing income sources and livelihoods of DPs to a minimum of the pre-project level.
Involuntary resettlement	Development project results in unavoidable resettlement losses that such as those for the vendors that have been displaced and have no option but to rebuild their lives, incomes and asset bases elsewhere.
Kanal	A kanal is a traditional unit of land area in Pakistan. This is equivalent to about 505.857 square meters.
Land acquisition	Land acquisition means the process whereby a person is compelled by a public agency to alienate all or part of the land she/he owns or possesses, to the ownership and possession of that agency, for public purposes in return for fair compensation.
Mitigation Measure	Means a measure for the control, reduction or elimination of an adverse impact of a development on the environment, including a restorative measure.
Meaningful consultation	A process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii)

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	provides timely disclosure of relevant and adequate information that is understandable and readily accessible to displaced persons; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of displaced persons and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.
Pathogens	the microorganisms that are capable of producing disease
Potable water	is water that is safe for drinking and cooking
Regulations	means the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environment Impact Assessment Regulations, 2000
Rehabilitation assistance	Support provided to displaced persons to supplement their income losses in order to improve, or at least achieve full restoration of, their pre-project living standards and quality of life.
Relocation assistance	Support provided to persons who are physically displaced by a project. Relocation assistance may include transportation, food, shelter, and social services that are provided to the displaced persons during their relocation. It may also include cash allowances that compensate displaced persons for the inconvenience associated with resettlement and defray the expenses of a transition to a new locale, such as moving expenses and lost work days.
Replacement Cost	Cost of replacing lost assets and incomes, including cost of transactions. It is the open/fair market value of a project affected property. For agriculture land, this includes reference to land of equal size, type and productive potential in the vicinity of the affected land and land preparation costs where required. For houses and other buildings,

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	this includes reference to the market price of materials and labour, and the cost of transporting materials to the building site. The replacement cost further includes the cost of any registration and transfer taxes for land and buildings.
Resettlement	Resettlement is a general term related to land acquisition and compensation for loss of asset whether it involves actual relocation, loss of land, shelter, assets or other means of livelihood.
Sanitation	treatment and disposal of sewage
Soakway	a pit into which wastewater flows in order to drain slowly out into the surrounding soil
Septic Tank	a tank (associated either with a sewage works or with a residence not connected to a sewer) in which the solid content of sewage is allowed to settle and accumulate and is purified by the action of anaerobic bacteria
Sewer	a conduit that carries away sewage or wastewater
Stabilization Ponds	shallow ponds or lagoons constructed to treat domestic wastewater
Sludge	any muddy or slimy matter or deposit; a thick suspension of fine particles or gel in a liquid, esp. one formed as waste in any of various industrial and mechanical processes
Soil Erosion	physical removal of soil, either by wind or by running water
Sedimentation	Deposition of material in the form of sediment, as a geological process, or in a liquid in a tank, centrifuge, etc
Suspended Solids (SS)	organic and inorganic particles, which do not dissolve in the wastewater but remain suspended

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Vulnerable Household	The households disproportionately affected by land acquisition and resettlement, including non-titleholders/informal users of land, marginal farmers/agriculture tenants or those who become marginal as a result of land acquisition that include the affected households below the poverty line, the landless, informal business operators/vendors, refugees, internally displaced persons, elderly, disabled and female headed households.

Annex A: Environmental and Social Screening Checklist

Environmental & Social Screening Checklist								
Instructions: Environmental and Social Focal Persons (ESFPs)⁴⁶ nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each sub-project proposed to be executed under the Program. Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs use this Checklist for screening. The Checklist will be attached with the main document⁴⁷ of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used. (iii) The purpose of this E&S Screening Checklists is to identify potential “Negative” impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the “remarks” section to discuss any anticipated mitigation measures.								
Name of ESFP:	Hafiz Usman MOI&S Mehboob Alam- MOP							
Name of MC:	Kot Addu							
Sub-Project Sector:	Sewerage							
Sub-Project Title:	Construction of Waste Water Treatment Plant (WWTP)							
Sub- Project Categorization:	<table> <tbody> <tr> <td>E-1 ✓</td> <td>S-1</td> </tr> <tr> <td>E-2</td> <td>S-2✓</td> </tr> <tr> <td>E-3</td> <td>S-3</td> </tr> </tbody> </table>		E-1 ✓	S-1	E-2	S-2✓	E-3	S-3
E-1 ✓	S-1							
E-2	S-2✓							
E-3	S-3							
Date of Screening:	11-12-2023							

⁴⁶ In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.

⁴⁷ It is meant as PC-I and/or engineering estimates of sub-project

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Anticipated Project Activities	➤ Excavation and backfilling involved, the excavation would be carried out either by manual labor or by machines like power shovels, track excavators. Transport excavated material to fix disposal sites. ➤ Pipe Laying Activities. ➤ Construction of Inlet and outlet Drains structure. ➤ Construction of Boundary wall. ➤ Construction of Retaining ponds Beds. ➤ Electric Installations. ➤ Back Filling: Lastly, the trenches will be filled up with the excavated earth in layers about 15 cm thick. Each layer will be properly watered and rammed. ➤ Staff Quarters+ Security Guard Room, Lab facility ➤ Buffer zone and tree plantation
Estimated Cost of Subprojects	PKR 1211.556 million
Completion Time/Duration	12 months

CHECKLIST

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Sub-Project area adjacent to or within any of the following?			
Environmentally sensitive areas?			
Legally protected Area		✓	No legally protected area lies within 100 meters jurisdiction of sub-project.
Any surface water body (river, canal, stream, lake, wetland) within 200 meters of the proposed sub-project		✓	No surface water body (river, canal, stream, lake, wetland) exists within 200 meters of the proposed sub-project
Estuarine		✓	Not observed in sub-project area
Special area for protecting biodiversity		✓	No Wild life park or other biodiversity areas observed during site E & S investigations
Buffer zone of protected area		✓	No buffer zone for fauna and flora exists surrounding the sub-project area
Mangroves Forest		✓	No mangrove forest in the sub-project area.

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Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Sub-project area is predominantly sandy and located outside the Kot Addu city. Sub-project is located in an open land and it is not in use for entitled agriculture.
Socially sensitive /important areas/communities/ people?			
Physical Cultural Resources (PCRs) and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, Gordwarah, Temple, Fort, archeological/historical site) within 100 m of the proposed sub-project		✓	No PCR observed in this area's 100 meters vicinity where sub-project interventions are proposed so have no direct/indirect significant environmental & social impact.
Sensitive receptors (Schools, colleges, Shrine, Mosque, Church, hospitals and clinics) within 100 meters of the proposed sub project		✓	No sensitive receptor observed in the 100 meters of the sub-project interventions so have no direct/indirect significant environmental & social impacts on sensitive receptors during construction phase.
Any graveyard of local community (Muslims or Christians)		✓	Not observed in sub-project area
Any demographic or socio-economic aspects of the sub-project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments ⁴⁸ of the society and women or children)?			No Negative impact is envisaged on vulnerable groups

⁴⁸ Due to caste, creed, religion or gender e.g. transgender

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Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	Existing infrastructure or public amenities are not required to be dismantled or may be temporarily affected by any mean as this area is away from the urban population
B. Potential Environmental Impacts Will the sub-project cause...			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	No habitats, biodiversity and protected area are observed in the area which may be disturbed
Cutting of trees?	✓		Cutting of trees involved during construction phase. Number of trees are 30 Massive plantation in the buffer zone of 100m is proposed and made part of EIA/ESIA ⁴⁹
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No disturbance to habitats/biodiversity of environmentally sensitive or protected areas is envisaged as no such area is found at the proposed project site.
Generation of wastewater during construction or operation?	✓		During construction, wastewater will be generated from contractor's camp etc., The generated wastewater will require proper disposal and mitigation measures will be provided in the ESMMP of EIA/ESIA During operational phase, significant adverse impacts on environment and surrounding

⁴⁹ Provision of 100m buffer zone in the form of raised walls and plantation is proposed

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			settlements of the sub-project area will occur i.e. odor and breeding site for the mosquitos. Accordingly, mitigation measures will be proposed in the ESMMP of the EIA/ESIA. The municipal wastewater will be drained into the Wastewater Treatment Plant (WWTP) through a sewerage conveyance system. The treated wastewater will essentially comply the the PEQSS. WWTP will be exclusively designed for the municipal wastewater and wastewater from all the localities will be discharged into the WWTP. There will be no chance of mixing industrial wastewater and storm water with the municipal wastewater before treatment.
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of wastewater?	✓		Wastewater will be generated during construction phase by contractor camp and construction activities. Wastewater from contractor camp will require proper treatment and management before disposal to the sewerage system or natural drain. At operational phase, due to leakage and clogging of the sewerage system, and overflow at WWTP may result in seepage and pondage. This might result contamination of groundwater. Mitigation measures will be provided in the ESMMP of EIA/ESIA and these will be made part of the sewerage system and WTP designs. Emergency Plan will also be developed.

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			1.5mm thick geomembrane beneath the ponds will be placed to mitigate seepage of wastewater to the groundwater. Wastewater after treatment and PEQS compliance will be released into the nearby water body and will be used for irrigation after compliance of US EPA Guidelines.
Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No such impact foreseen, as the sub-project is located away from the surface water bodies. No other significant adverse impacts on alteration of surface water hydrology of waterways and increase in sediment of streams/rivers during construction phase.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction.	✓		Un-skilled local labor will be preferred to be hired from the nearby human settlements. For construction of labor camp, PMDFC SOPs will be followed and mitigation measures will be provided in the ESSMP of EIA/ESIA Report Chemical storage facilities will be regularly monitor.
Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping/pumping involved in the scope of proposed project activities. However, for labor camp management, provisions for water availability will be made in the ESMMP of EIA
Serious contamination of soil due to construction works?		✓	Construction materials will be stored properly. Mitigation will be provided in the ESMMP of EIA/ESIA.
Aggravation of solid waste problems in the area?		✓	No aggravation of solid waste problems in the area is anticipated.

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			The waste construction material will be collected and disposed at designated place on daily basis. For solid waste of labor camp, mitigation measures shall be provided in the ESMMP of EIA Report
Generation of hazardous waste?	✓		Hazardous waste generated during construction activities in terms of oils, rubber lining, sealants will be managed with precautions and mitigation measures will be provided in the ESMMP of EIA/ESIA An Environmental Quality Testing laboratory will be managed by the MC Kot Addu at site to ensure effective monitoring of treated wastewater to ensure that treated wastewater is in compliance with the PEQSS and WHO Guidelines to be reused for the agricultural activities.
Increased air pollution due to sub-project construction and operation?	✓		The sub-project construction and operational phases will result in air pollution. Air pollution control measures during construction and operational phases will be included in the design of the sub-project and these will be described in detail in EIA/ESIA and ESMMP.
Noise and vibration due to sub-project construction or operation?	✓		Noise and vibration will be generated during construction and operational phases. Mitigations will be included in the design of the sub-project. EIA /ESIA and ESMMP will cover noise and vibration aspects, impacts and mitigations in detail.
Creation of temporary breeding habitats for diseases such as those transmitted	✓		In the proposed wastewater treatment technology, waste stabilization ponds will be used and further bio-remediation (floating

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by mosquitoes and rodents due to solid/liquid?			wetlands) will be introduced in which minimal chances of mosquito breeding are anticipated During construction and operational phases breeding habitats of mosquitoes and rodent might be created. Accordingly, mitigations will be developed and made part of the design, EIA/ESIA and ESMMP.
Use of chemicals during construction?	✓		Multiple chemicals will be used during construction and operational phases. Chemical management system for the safe use of chemicals will be made part of the EIA/ESIA and ESMMP.
C: Potential Social Impacts Will the Sub-Project cause...			
Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No impairment/damage to any PCR envisioned as per scope of construction activities. However, during construction of sewerage system and WTP chance find may happen. Chance Find Procedure will be applied during the project construction phase.
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)	✓		ARAP will be developed for award compensation.
Disproportionate impacts on the poor, women and children and or other		✓	There will be no impact on the poor women, children and or other vulnerable groups.

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vulnerable groups 50(mentioned above)?			
Temporary impediments in movements of people/transport and animals?	✓		There may be hindrance in the mobility of people during construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic and providing a temporary access route.
Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Not to be envisaged during construction phase. Local unskilled labor will be preferred by the Contractor.
Social conflicts if workers from other areas are hired.	✓		Contractor will hire local workers for unskilled construction activities Training/awareness raising sessions will be conducted for labor to avoid social conflicts
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Contractor will follow EHS SOPs which will be made part of bid documents to avoid physical hazards and risks related to OHS
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel, and other chemicals during construction and operation?	✓		There would be safety issues during material transportation, during construction phase. The SOPs for health and safety will be included in the bid documents that have to be followed by the contractors

⁵⁰ Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line.

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Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning.	✓		There would be safety issues during construction and operational phases due to storage of fuel and other chemicals and transport. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors and MC during WWTP operations
Any impact on sensitive receptors (mentioned above)		✓	No impact on sensitive receptors is observed as explained above.
Any impact of negative nature on already existing infrastructure including public amenities	✓		One tube well

Endorsed By:

Name: Hafiz Usman

Designation: Municipal Officer Planning (MOI)

Organization: MC Kot Addu

Signature

Date: 11-12-23

Reviewed By:

Name: Muhammad Irfan

Designation: Deputy Program Officer ESM

Organization: PMDFC

Signature:

Date: 11-12-23

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INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Kot Addu

Sub-Project Sector: Sewerage

Sub-Project Title: Construction of Waste Water Treatment Plant (WWTP)

Sub- Project Categorization: S-2

Date of Screening: 11-12-23

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		No, this project required no Land Acquisition as proposed site for construction of WWTP is State owned land which will be transferred to the MC Kot Addu
If yes, then describe the type of land being acquired from the categories below:		✓		No, this project required no Land Acquisition.
Has any AED been conducted at the proposed location by the government ¹ ? Yes/No		✓		Not observed in subproject area and also confirmed by MC Staff and during public consultation with the nearby communities.
Land (Quantify and describe types of land being acquired in "remarks column".		✓		30 Acres of land is required for WWTP and land is already owned by Government.
Government and LG owned land free of occupation (agriculture or settlement)	✓			It is Government owned land there is 10 settlements agriculture crops and 30 trees
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)	✓			It is Government owned land there is 10 settlements agriculture crops and 30 trees
Private land		✓		
Residential		✓		
Commercial		✓		

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Agricultural		✓		
Communal		✓		
Others (specify in "remarks").		✓		It is Government owned land there is 10 settlements agriculture crops and 30 trees
Name of owner/owners and type of ownership document if available.	✓			Land is owned by Government.
If land is being acquired, describe any structures constructed on it		✓		
Land-based assets:		✓		No land-based assets present on this land other than trees.
Residential structures		✓		
Commercial structures (specify in "remarks")		✓		
Community structures (specify in "remarks")		✓		
Agriculture structures (specify in "remarks")		✓		
Public utilities (specify in "remarks")		✓		
Others (specify in "remarks")		✓		
If agricultural land is being acquired, specify the following:		✓		
Agriculture related impacts		✓		
Crops and vegetables (specify types and cropping area in "remarks").		✓		
Trees (specify number and types in "remarks").	✓			20 small trees. Trees and types are Sheesham and Keekar)
Others (specify in "remarks").		✓		
Affected Persons (APs)		✓		No APs
Will any people be displaced from the land when acquired? Yes/No		✓		No displacement will occur

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Number of APs		✓		
Males		✓		
Females		✓		
Titled landowners		✓		Land is owned by Government
Tenants and sharecroppers		✓		
Leaseholders		✓		
Agriculture wage laborers		✓		
Encroachers and squatters (specify in remarks column)		✓		Not observed when first E&S Survey was conducted on 23-02-2023.
Vulnerable APs (e.g., women headed households, minors and aged, orphans, disabled persons, and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		Not observed when first E&S Survey was conducted on 23-02-2023
Others (specify in "remarks")		✓		

Endorsed By:

Name: Mehbob Alam

Designation: Municipal Officer Planning (MOP)

Organization: MC Kot Addu

Signature

Date: 11-12-23

Reviewed By:

Name: Humaira Ali

Designation: Deputy Program Officer ESS

Organization: PMDFC

Signature:

Date: 11-12-23

Annex B: Punjab Environmental Quality Standards (PEQS) 2016

Punjab Environmental Quality Standards for Ambient Air			
Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
Sulfur Dioxide (SO ₂)	Annual Average*	80 µg/m ³	Ultraviolet Fluorescence method
	24 hours**	120 µg/m ³	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m ³	Gas Phase Chemiluminescence
	24 hours**	40 µg/m ³	
Oxides of Nitrogen as (NO ₂)	Annual Average*	40 µg/m ³	Gas Phase Chemiluminescence
	24 hours**	80 µg/m ³	
Ozone (O ₃)	1 hour	130 µg/m ³	Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m ³	High Volume Sampling, (Average flow rate not less than 1.1 m ³ /min).
	24 hours**	500 µg/m ³	
Respirable Particulate Matter PM ₁₀	Annual Average*	120 µg/m ³	Preferably B-Ray Absorption method
	24 hours**	150 µg/m ³	
Respirable Particulate Matter PM _{2.5}	Annual Average*	15 µg/m ³	Preferably B-Ray Absorption method
	24 hours**	35 µg/m ³	
	1 hour	15 µg/m ³	
Lead (Pb)	Annual Average*	1 µg/m ³	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5 µg/m ³	

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Punjab Environmental Quality Standards for Ambient Air			
Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
Carbon Monoxide (CO)	8 hours**	5 mg/m ³	Non-Dispersive Infra-Red (NDIR) method
	1 hour	1.5 mg/m ³	

Note:

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly / 8 hourly values should be met 98% of the year. 2% of the time, it may exceed but not on two consecutive days.

Punjab Environmental Quality Standards for Water Quality

Punjab Environmental Quality Standards for Drinking Water

Properties / Parameters	Standard Values	WHO Standards	Remarks
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E. Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Most Asian countries also follow WHO standards
Colour	≤ 15 TCU	≤ 15 TCU	
Taste	Non Objectionable / Acceptable	Non Objectionable / Acceptable	
Odour	Non	Non	

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Properties / Parameters	Standard Values	WHO Standards	Remarks
	Objectionable / Acceptable	Objectionable / Acceptable	
Turbidity	<5 NTU	<5 NTU	
Total hardness as CaCO ₃	< 5000 mg/l	--	
TDS	< 1000	< 1000	
pH	6.5 – 8.5	6.5 – 8.5	
Essential Inorganic	mg/Liter	mg/Liter	
Aluminum (Al) mg/l	≤ 0.2	0.2	
Antimony (Sb)	≤ 0.0005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	< 250	250	
Chromium (Cr)	< 0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	Mg/l	Mg/l	
Cyanide (CN)	< 0.05	0.07	Standard for Pakistan similar to most Asian developing countries
Fluoride (F)*	≤ 1.5	1.5	
Lead (Pb)	≤ 0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤ 0.001	0.001	

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Properties / Parameters	Standard Values	WHO Standards	Remarks
Nickel (Ni)	≤ 0.02	0.02	
Nitrate (NO ₃)*	≤ 50	50	
Nitrite (NO ₂)*	≤ 3 (P)	3	
Selenium (Se)	0.01 (P)	0.01	
Residual chlorine	0.2 – 0.5 at consumer end 0.5 – 1.5 at source		
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries
Organic			
Pesticides mg/l			PSQCA No. 4639-2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted **
Phenolic compounds (as Phenols) mg/l			
Poly-nuclear aromatic hydrocarbons (as PAHs) g/l		0.01 (By GC/MS method)	
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

Note:

* Indicates priority health related inorganic constituents, which need regular monitoring.

** . PSQCA: Pakistan Standards Quality Control Authority.

Punjab Environmental Quality Standards for Noise

No.	Category of Area / Zone	Effective from 1 st July, 2010		Effective from 1 st July, 2013	
		Limits in dB(A) Leq*			
		Day Time	Night Time	Day Time	Night Time
1.	Residential Area (A)	65	50	55	45
2.	Commercial Area (B)	70	60	65	55
3.	Industrial Area (C)	80	75	75	65
4.	Silence Zone (D)	55	45	50	45

Note:

1. Day time hours; 6:00 am to 10:00 Pm
2. Night time hours; 10:00 pm to 6:00 am.
3. Silence Zone: Zones which are declared as such by the Competent Authority and are comprising not less than 100 meters around, educational institutions and courts.
4. Mixed categories of area may be declared as one of the four above mentioned categories by the competent authority.
5. dB(A) Leq: Time weighted average of the level of sound in decibel on scale A which is relatable to human hearing.

Punjab Environmental Quality Standards for Industrial Gaseous Emissions

No.	Parameter	Source of Emission	Standard
1.	Smoke	Smoke opacity not exceed.	40% or 2 Ringlemann Scale or equivalent smoke number
2.	Particulate matter	(a) Boiler and furnaces:	
		(i) Oil fired	300
		(ii) Coal fired	500
		(iii) Cement Kilns	300
		(b) Grinding, crushing, clinker cooler and related processes, metallurgical processes, converters, blast furnaces and cupolas.	500
3.	Hydrogen Chloride (HCl)	Any	400
4.	Chlorine (Cl ²)	Any	150
5.	Hydrogen Fluoride (HF)	Any	150
6.	Hydrogen Sulphide (H ₂ S)	Any	10
7.	Sulphur Oxides (2x3)	Sulfuric acid / Sulfonic acid plants	5000
		Other plants except power plants operating on oil and coal	1700
8.	Carbon Monoxide (CO)	Any	800
9.	Lead (Pb)	Any	50
10.	Mercury (Hg)	Any	10
11.	Cadmium (Cd)	Any	20
12.	Arsenic (Ar)	Any	20
13.	Copper (Cu)	Any	50
14.	Antimony (Sb)	Any	20
15.	Zinc (Zn)	Any	200

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No.	Parameter	Source of Emission	Standard
16.	Oxides of Nitrogen	Nitric acid manufacturing unit	3000
		Other plants except power plants operating on oil or coal:	
		Gas fired	400
		Oil fired	600
		Coal fired	1200

Explanations:

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent sulfur content in fuel oil. Higher content of sulfur will cause standards to be pro-rated.
3. In respect of emissions of sulfur dioxide and nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to the Punjab Environmental Quality Standards (PEQS) specified above, comply with the following standards:

A. Sulfur Dioxide

Sulfur Dioxide Background levels Microgram per cubic meter (ug/m ³) Standards				
Background Air Quality (SO ₂ Basis)	Annual Average	Max, 24 hours Interval	Criterion 1 Max. SO ₂ Emission (Tons per Day per plant)	Criterion II. Max. Allowable ground level increment to ambient (ug/m ³) One Year Average
Unpolluted Moderated Polluted*	< 50	< 200	500	50
Low	50	200	500	50
High	100	400	100	10
Very Polluted**	> 100	> 400	100	10

* For intermediate values between 50 and 100 ug/m³ linear interpolations should be used.

** No Projects with Sulfur dioxide emissions will be recommended.

B. Nitrogen Oxide

Ambient air concentrations of Nitrogen Oxides, expressed as NO_x should not exceed the following:

Annual Arithmetic Mean	100 ug/m ³ (0.05 ppm)

Emission levels for stationary source discharges before mixing with the atmosphere, should be maintained as follows:

For Fuel fired steam generators, as Nano-gram per joule (10⁻⁹ g/J) of heat input:

Liquid fossil fuel	130

Solid fossil fuel	300

Lignite fossil fuel	260

Note: Dilution of gaseous emission to bring them to the NEQS limiting value is not permissible through excess air mixing blowing before emitting into the environment.

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Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents

No.	Parameter	Into Inland Waters	Into Sewage Treatment
1	2	3	4
1.	Temperature or Temperate increase *	$\leq 3^{\circ} \text{C}$	$\leq 3^{\circ} \text{C}$
2.	pH value (H^+)	6-9	6-9
3.	Biochemical Oxygen Demand (BOD_5) at 20°C ⁽¹⁾	80	250
4.	Chemical Oxygen Demand (COD)	150	400
5.	Total suspended solids (TSS)	200	400
6.	Total dissolved solids (TDS)	3500	3500
7.	Grease and Oil	10	10
8.	Phenolic compounds (as phenol)	0.1	0.3
9.	Chloide (as Cl^-)	1000	1000
10.	Fluoride (as F^-)	10	10
11.	Cyanide (as CN^-) total	1.0	1.0
12.	An-ionic detergents (as MBAs) ⁽²⁾	20	20
13.	Sulfate (SO_4^{2-})	600	1000
14.	Sulfide (S^{2-})	1.0	1.0
15.	Ammonia (NH_3)	40	40
16.	Pesticides ⁽³⁾	0.15	0.15
17.	Cadmium (Cd) ⁽⁴⁾	0.1	0.1

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No.	Parameter	Into Inland Waters	Into Sewage Treatment
18.	Chromium (Trivalent and hexavalent) ^{(4) (1)}	1.0	1.0
19.	Copper (Cu) ⁽⁴⁾	1.0	1.0
20.	Lead (Pb) ⁽⁴⁾	0.5	0.5
21.	Mercury (Hg) ⁽⁴⁾	0.01	0.01
22.	Selenium (Se) ⁽⁴⁾	0.5	0.5
23.	Nickel (Ni) ⁽⁴⁾	1.0	1.0
24.	Silver (Ag) ⁽⁴⁾	1.0	1.0
25.	Total Toxic metals	2.0	2.0
26.	Zinc (Zn)	5.0	5.0
27.	Arsenic (As) ⁽⁴⁾	1.0	1.0
28.	Barium (Ba) ⁽⁴⁾	1.5	1.5
29.	Iron (Fe)	8.0	8.0
30.	Manganese (Mn)	1.5	1.5
31.	Boron (B) ⁽⁴⁾	6.0	6.0
32.	Chlorine (Cl ₂)	1.0	1.0
Explanations: 1. Assuming minimum dilution 1:10 on discharge, lower ration would attract progressively stringent standards to be determined by the Provincial Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of water for dilution of this effluent. 2. Methylene Blue Active Substances; assuming surfactant as biodegradable. 3. Pesticides include herbicides, fungicides and insecticides.			

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No.	Parameter	Into Inland Waters	Into Sewage Treatment
4.	Subject to total toxic metals, discharge should not exceed level given at S.N 25.		
5.	Applicable only when and where sewage treatment is operational and BOD ₅ =80 mg/l is achieved by the sewage treatment system. The effluent should not result in temperature increase of more than 30 ⁰ C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge. ** The value for industry is 200 mg/l		

Note:

- (1). Dilution of liquid effluents to meet to the PEQS limiting value is not permissible through fresh water mixing with the effluent before discharging in the environment.
- (2). The concentration of pollutants in water being used will be subtracted from the effluent for calculating the PEQS limits

Annex C: Chance Find Procedure

Chance Find procedures which will be used during this Project are as follows:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the Ministry in charge of Department of Archaeology take over;
- Notify the supervisory Engineer who in turn will notify the responsible local authorities and the Ministry immediately (within 24 hours or less);
- Responsible local authorities and the Ministry in charge of Department of Archaeology would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the Department of Archaeology and Museums (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- Decisions on how to handle the finding shall be taken by the responsible authorities and the Ministry in charge of Department of Archaeology. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Ministry in charge of Department of Archaeology; and
- Construction work could resume only after permission is given from the responsible local authorities and the Ministry in charge of Department of Archaeology concerning safeguard of the heritage.
- These procedures will be referred to as standard provisions in construction contracts, when applicable. During project supervision, the Site Engineer will monitor the above regulations relating to the treatment of any chance find encountered are observed.

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Punjab Municipal Development Fund Company (PMDFC)

Annex E: Ambient Air Reports



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. #: PGG/IMS/FF/063 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-1019/AA

Issue date: 06-Mar-23

Name of Project: PMDFC
Site Location: Jhang City
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Monitoring Location: Disposal (Proposed Site) Toba Road Sugar Mill
Coordinates: N 31° 11' 51.5" E 72° 20' 48.61"
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 1-Mar-23 to 2-Mar-23

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	SPM	O ₃
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	4:00 PM	1.206	0.03	12.73	20.67	160.1	74.5	359.24	81.7
2.	5:00 PM	1.231	0.29	13.53	19.23	161.5	77.9		
3.	6:00 PM	1.292	0.82	17.81	19.77	138.9	65.4		
4.	7:00 PM	1.068	1.40	13.62	20.62	122.3	91.0		
5.	8:00 PM	1.105	0.74	16.03	20.87	150.5	60.8		
6.	9:00 PM	1.129	0.88	16.04	20.98	161.7	92.6		
7.	10:00 PM	1.166	0.81	15.82	21.23	149.5	82.4		
8.	11:00 PM	1.191	0.69	15.21	20.67	147.9	67.0		
9.	12:00 AM	1.240	0.43	14.61	19.54	166.4	61.0		
10.	1:00 AM	1.277	0.03	13.79	18.98	150.2	62.6		
11.	2:00 AM	1.326	0.16	14.40	18.37	137.6	95.6		
12.	3:00 AM	1.387	0.50	13.36	18.00	138.8	89.1		
13.	4:00 AM	1.301	0.29	14.37	20.26	149.8	89.1		
14.	5:00 AM	1.314	0.82	13.59	21.36	160.8	91.8		
15.	6:00 AM	1.215	0.84	14.81	21.57	148.9	98.4		
16.	7:00 AM	1.117	1.48	15.82	25.54	163.8	81.7		
17.	8:00 AM	1.043	0.88	16.04	19.52	159.4	57.8		
18.	9:00 AM	1.006	0.54	15.35	20.34	180.6	68.1		
19.	10:00 AM	0.982	0.93	14.38	20.47	160.0	60.1		
20.	11:00 AM	1.232	0.78	14.80	18.93	155.3	56.1		
21.	12:00 PM	1.195	1.17	14.28	21.26	196.1	69.3		
22.	1:00 PM	0.969	0.84	15.90	20.01	194.2	73.0		
23.	2:00 PM	1.006	0.52	11.64	21.26	131.1	50.8		
24.	3:00 PM	1.031	0.91	14.88	20.29	164.6	79.8		
Average (24 Hours)		1.168	0.70	14.87	20.41	156.24*	74.83*		
NEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	500 24hours	130 1 hour



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PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. #: PGG/IMS/FF/063 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2023-1019/AA

Issue date: 6-Mar-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with * are exceeding with PEQS Limits.

Terms & Conditions:

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 - The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations

Field Analyst	Chief Analyst	Laboratory



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Annex F: Noise Reports



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc.#: PGG/IMS/FF/063 Rev. Date: 27-Jan-22 Rev.# 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2023-1017/AA

TEST REPORT

Issue date: 06-Mar-23

Name of Project: PMDFC
 Site Location: Jhung City
 Nature of Monitoring: Ambient Air
 Monitoring By: Pak Green Laboratories
 Monitoring Location: WWTP Proposed Site (point-1)
 Coordinates: N 31° 12' 45.1" E 72° 20' 21.98"
 Name of Sampling Person: Mr. Adil
 Monitoring Instrument: AQMS
 Monitoring Duration: 24 hours
 Monitoring Date: 23-Feb-23 to 24-Feb-23

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	SPM	O ₃
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	4:00 PM	1.409	0.24	8.02	8.68	134.1	42.4		
2.	5:00 PM	1.434	0.50	8.84	9.24	144.5	45.8		
3.	6:00 PM	1.495	1.03	13.10	11.78	125.9	33.3		
4.	7:00 PM	1.471	1.61	13.91	12.63	211.3	68.9		
5.	8:00 PM	1.508	0.95	14.32	14.88	167.5	38.7		
6.	9:00 PM	1.532	1.09	15.33	17.99	148.7	95.0		
7.	10:00 PM	1.569	1.69	14.11	20.24	147.5	25.3		
8.	11:00 PM	1.594	0.90	13.50	19.68	130.9	44.9		
9.	12:00 AM	1.643	0.64	12.90	18.55	149.4	38.9		
10.	1:00 AM	1.680	0.24	12.08	17.99	133.2	26.5		
11.	2:00 AM	1.729	0.37	12.69	16.58	103.6	197.8		
12.	3:00 AM	1.790	0.71	9.65	16.01	261.5	67.0		
13.	4:00 AM	1.704	0.50	10.66	18.27	200.9	67.0	375.29	81.1
14.	5:00 AM	1.717	1.03	11.88	21.37	205.0	69.7		
15.	6:00 AM	1.618	1.43	13.10	25.60	235.6	87.5		
16.	7:00 AM	1.520	1.69	14.11	27.57	211.9	59.6		
17.	8:00 AM	1.446	1.09	15.33	29.55	133.4	35.7		
18.	9:00 AM	1.409	0.75	16.96	32.37	154.6	46.0		
19.	10:00 AM	1.385	1.14	18.99	33.50	134.0	38.0		
20.	11:00 AM	1.335	2.20	20.41	30.96	129.3	34.0		
21.	12:00 PM	1.298	2.99	25.89	29.27	170.1	47.2		
22.	1:00 PM	1.372	1.05	27.51	27.01	178.2	50.9		
23.	2:00 PM	1.409	0.73	23.05	24.47	105.1	28.7		
24.	3:00 PM	1.434	1.12	16.75	8.96	199.9	57.7		
Average (24 Hours)		1.521	1.07	15.13	20.54	163.17*	56.10*		
NEQS		5 8hours	40 24hours	60 24hours	120 24hours	150 24hours	35 24hours	500 24hours	130 1 hour



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. #: PGG/IMS/FF/063 Rev. Date: 27-Jan-22 Rev. #: 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2023-1016/AA

Issue date: 06-Mar-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with * are exceeding with PEQS Limits.

Terms & Conditions:

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 - The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
 - The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations

Field Analyst	Chief Analyst	Laboratory Incharge



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Annex G: Groundwater Sampling Reports


PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref#: PGG/LAB/2024-0052/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

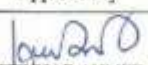
Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point I, Near MEPCO Office N 30.451216° E 70.963276°
Sample source	Hand Pump
Sample Code	GW-2904
Date of sampling	14-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

Terms & Conditions:

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- Report cannot be used to comply with any complaint, EPO or other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QERAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Punjab Municipal Development Fund Company (PMDFC)



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref#: PGG/LAB/2024-0052/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.229 at 22.8°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.28	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	796	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	380	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	54	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.8	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0543*	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0281	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.012	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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EIA/ESIA of Comprehensive Sewerage Scheme of Kot Addu City

Punjab Municipal Development Fund Company (PMDFC)



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref#: PGG/LAB/2024-0052/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl_2)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	BDL	APHA-Cl-B
26.	Zinc (Zn^{+2}) ^	mg/L	3.0	5.0	0.0001	BDL	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	0.002	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na)^	mg/L	-	-	0.0100	35.3870	APHA-3111 B
29.	Potassium (K)^	mg/L	-	-	0.0100	9.9009	APHA-3111 B
30.	Iron (Fe)^	mg/L	-	-	0.0010	0.0015	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0053/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 2, Near Furqan Dairy Farm N 30.459035° E 70.959515°
Sample source	Tube Well
Sample Code	GW-2905
Date of sampling	15-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

Terms & Conditions:

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- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref: PAB/2024-0053/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.278 at 22.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	430	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	280	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.005	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	15	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.4	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.1257*	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	1.3229*	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.3235*	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2024-0053/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	3.9737*	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	37.9199	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	9.6400	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0054/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 3, Near Kot Sultan Road N 30.466932° E 70.955548°
Sample source	Hand Pump
Sample Code	GW-2916
Date of sampling	16-Dec-23

Summary of Test Result:

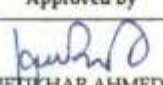
Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with PEQS & WHO Standards.

Terms & Conditions:

Analysis was conducted on the request of the project proponent for his own use/PEQS Compliance.

- Report cannot be used to comply with any complaint, EPO, or other court case.
- This report should be reproduced as a whole and not in parts.
- The values represent the sample conditions when sampling/monitoring was carried out.
- The Environmental Conditions while performing testing activities are (Temp=22-25°C) and (RH=50-60%)
- The Sampling was done as per the sampling and preservation protocol method APHA 1060-B&C
- The responsibility of the ethical use of the results reported in this report lies with the client.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Dually calibrated instruments were used during monitoring and testing activities

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref: PGG/LAB/2024-0054/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.369 at 22.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.28	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	510	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	320	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	49	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.4	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0202	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0321	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.015	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤ 3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref: PGG/LAB/2024-0054/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0345	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na)^	mg/L	-	-	0.0100	51.9328	APHA-3111 B
29.	Potassium (K)^	mg/L	-	-	0.0100	11.5356	APHA-3111 B
30.	Iron (Fe)^	mg/L	-	-	0.0010	0.0012	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0055/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 4, Near Sarwar Shakir Jamia Mosque N 30.476245° E 70.954126°
Sample source	Motor Pump
Sample Code	GW-2917
Date of sampling	17-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref: PGG-ELAB/2024-0055/GW

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Physical Parameters Analysis Results:

Date: 03-Jan-24

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.457 at 22.3°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	970	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	540*	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	93	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.8	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0139	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0183	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.146	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.010	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref: PG/14B/2024-0055/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ⁺²) ^	mg/L	3.0	5.0	0.0001	0.0001	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na)^	mg/L	-	-	0.0100	97.3687	APHA-3111 B
29.	Potassium (K)^	mg/L	-	-	0.0100	15.0708	APHA-3111 B
30.	Iron (Fe)^	mg/L	-	-	0.0010	0.0284	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0056/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

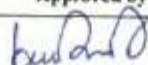
Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 5, Punjab College Road N 30.483283° E 70.960558°
Sample source	Hand Pump
Sample Code	GW-2918
Date of sampling	18-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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EIA/ESIA of Comprehensive Sewerage Scheme of Kot Addu City

Punjab Municipal Development Fund Company (PMDFC)



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref: PGC/LAB/2024-0056/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.460 at 22.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	855	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	470	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	69	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.7	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0101	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.1140	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.020	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/CAB/2024-0056/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0075	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na)^	mg/L	-	-	0.0100	91.0473	APHA-3111 B
29.	Potassium (K)^	mg/L	-	-	0.0100	18.3658	APHA-3111 B
30.	Iron (Fe)^	mg/L	-	-	0.0010	0.0168	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0057/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

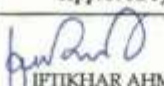
Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 6, Pattal Road N 30.483375° E 70.966683°
Sample source	Hand Pump
Sample Code	GW-2932
Date of sampling	19-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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EAB/2024-0057/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.381 at 23.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.38	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	840	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	380	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	73	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.7	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0038	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0826	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.264	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤ 3	0.001	0.010	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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EPAC/2024-0057/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	BDL	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	96.7306	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	41.1941	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0016	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

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LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0058/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 7, Near City Marriage Hall N 30.472585° E 70.977793°
Sample source	Motor Pump
Sample Code	GW-2961
Date of sampling	20-Dec-23

Summary of Test Result:

Physical Parameters	Partially Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref: PEG/1948/2024-0058/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	8.561* at 22.5°C	APHA-4500-H* B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.38	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	1170*	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	330	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	132	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	1.0	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0432	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.260	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤ 3	0.001	0.010	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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BPA/2024/0058/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.02	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.1399	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	90.5852	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	11.9752	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0016	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

[^]PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGC/LAB/2024-0059/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 8, Near Noor Shah Road N 30.461322° E 70.981467°
Sample source	Motor Pump
Sample Code	GW-2964
Date of sampling	21-Dec-23

Summary of Test Result:

Physical Parameters	Partially Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
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Ref: PEG/LSH/2024-0059/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.552 at 22.7°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.35	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	1030 [*]	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	190	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	83	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	1.0	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0091	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.146	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤ 3	0.001	0.010	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Punjab Municipal Development Fund Company (PMDFC)



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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

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Ref: H-56/MEAB/2024-0059/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ⁺²) ^	mg/L	3.0	5.0	0.0001	0.0857	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	126.7296	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	11.6087	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

[^]PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0060/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 9, Sindhi Basti Road N 30.455821° E 70.977593°
Sample source	Motor Pump
Sample Code	GW-2991
Date of sampling	22-Dec-23

Summary of Test Result:

Physical Parameters	Partially Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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EPA Certificate
REV: PGG/194/2024-0060/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.709 at 22.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.29	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	1400*	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	280	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	181	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	1.2	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.268	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.015	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref: PEQS/2024-0060/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ⁺²) ^	mg/L	3.0	5.0	0.0001	0.0096	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	124.9986	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	27.3075	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.1238	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

^PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0061/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Point 10, Near Railway Quarters N 30.471252° E 70.963006°
Sample source	Motor Pump
Sample Code	GW-3007
Date of sampling	23-Dec-23

Summary of Test Result:

Physical Parameters	Partially Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	
Parameters with * are not in compliance with PEQS & WHO Standards.	

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- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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EPA Certificate/2024-0061/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.357 at 22.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.35	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	1170*	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	460	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	137	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	1.0	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	1.246	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤ 3	0.001	0.266	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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BPA/2024/0061/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0517	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na)^	mg/L	-	-	0.0100	104.2650	APHA-3111 B
29.	Potassium (K)^	mg/L	-	-	0.0100	66.0258	APHA-3111 B
30.	Iron (Fe)^	mg/L	-	-	0.0010	0.0146	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

^PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2024-0051/GW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Proposed Site N 30.489245° E 71.013706°
Sample source	Motor Pump
Sample Code	GW-2881
Date of sampling	13-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref: PGG/LSAB/2024-0051/GW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.719 at 22.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	<5	<5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	<1000	<1000	10	850	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	400	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	0.01	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	93	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.8	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.05	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.148	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.025	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-5114-C



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ERA-GC/01/2024-0051/GW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ⁺²) ^	mg/L	3.0	5.0	0.0001	0.0863	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	96.9154	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	27.8610	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0264	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

[^]PNAC Accredited
LDL: Lowest Detection Limit



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Annex D: Wastewater Analysis Reports



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 Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref #: PGG/LAB/2024-0037 / WW Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

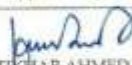
Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates	Zia Colony N 30.46247° E 70.960922°
Sample source	Zia Colony Disposal Station
Sample Code	WW-3001
Sample Type	Composite
Date of sampling	21-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance

Remarks:
Parameters with * are not in compliance with PEQS Limit.

- Analysis was conducted at the request of the proponent for his own use.
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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN	 MUHAMMAD RAZAULLAH	 IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge








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EIA/ESIA of Comprehensive Sewerage Scheme of Kot Addu City

Punjab Municipal Development Fund Company (PMDFC)



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref: PGC/LAB/2024-0037/WW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	22.9	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.610 at 22.9°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) [^]	mg/L	80	1	238*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) [^]	mg/L	150	0.4	380*	APHA-5220 B
5.	Total Suspended Solids (TSS) [^]	mg/L	200	1	440*	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	1150	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.005	0.005	APHA-5530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	132	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	1.0	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.060	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	88	APHA-4500-SO ₄ C
13.	Sulphide (S ²⁻)	mg/L	1.0	0.1	0.1	APHA-4500-S ²⁻ F
14.	Ammonia (NH ₃) [^]	mg/L	40	0.1	50.6*	APHA-4500-NH ₃ C
15.	Cadmium (Cd) [^]	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium [^] (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0235	APHA-3111 B
17.	Copper (Cu) [^]	mg/L	1.0	0.0001	0.0001	APHA-3111 B
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B



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Ref: PMDC/LAB/2024-0037/WW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn) [^]	mg/L	5.0	0.0001	0.1103	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe) [^]	mg/L	8.0	0.0010	0.0116	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.0680	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl) ₂	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.0235	-
31.	Sodium [^]	mg/L	-	0.0100	102.1621	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

End of Report

PEQS: Punjab Environmental Quality Standards
LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PGG/LAB/2024-0036/WW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates	Railway Chowk N 30.469514° E 70.96307°
Sample source	Railway Chowk Disposal Station
Sample Code	WW-3002
Sample Type	Composite
Date of sampling	22-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PFQS Limit.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTICHAH AHMED Laboratory Incharge



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LAB/2024-0038/WW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	22.8	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.626 at 22.8°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD) ₅ at 20 °C [^]	mg/L	80	1	362*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) [^]	mg/L	150	0.4	580*	APHA-5220 B
5.	Total Suspended Solids (TSS) [^]	mg/L	200	1	650*	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	1410	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.005	0.005	APHA-3530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	206	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	1.1	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.108	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	78	APHA-4500-SO ₄ C
13.	Sulphide (S ²⁻)	mg/L	1.0	0.1	0.1	APHA-4500-S ²⁻ F
14.	Ammonia (NH ₃) [^]	mg/L	40	0.1	88.1*	APHA-4500-NH ₃ C
15.	Cadmium (Cd) [^]	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium [^] (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0274	APHA-3111 B
17.	Copper (Cu) [^]	mg/L	1.0	0.0001	0.0001	APHA-3111 B
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B



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Date: 03-Jan-24

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn) [^]	mg/L	5.0	0.0001	0.1955	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe) [^]	mg/L	8.0	0.0010	0.0075	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.1221	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl ₂)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.0274	-
31.	Sodium [^]	mg/L	-	0.0100	110.8840	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

End of Report

PEQS: Punjab Environmental Quality Standards
LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PCG/LAB/2024-0039/WW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Kot Addu

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates	Noor Shah Chowk N 30.466703° E 70.968653
Sample source	Noor Shah Chowk Disposal Station
Sample Code	WW-3008
Sample Type	Composite
Date of sampling	23-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS Limit.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref #: PGG/LAB/2024-0039/WW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	22.2	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.426 at 22.2°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) [^]	mg/L	80	1	270*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) [^]	mg/L	150	0.4	436*	APHA-5220 B
5.	Total Suspended Solids (TSS) [^]	mg/L	200	1	540*	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	1140	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.005	0.005	APHA-5530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	132	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	1.0	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.028	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	85	APHA-4500-SO ₄ C
13.	Sulphide (S ²⁻)	mg/L	1.0	0.1	0.1	APHA-4500-S ²⁻ F
14.	Ammonia (NH ₃) [^]	mg/L	40	0.1	75.6*	APHA-4500NH ₃ C
15.	Cadmium (Cd) [^]	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium [^] (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0232	APHA-3111 B
17.	Copper (Cu) [^]	mg/L	1.0	0.0001	0.0001	APHA-3111 B
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B



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EPA Certified LAB/2024-0039/WW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method/Technique
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn) [^]	mg/L	5.0	0.0001	0.1205	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe) [^]	mg/L	8.0	0.0010	0.0084	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.0454	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl ₂)	mg/L	1.0	0.01	0.02	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.0232	-
31.	Sodium [^]	mg/L	-	0.0100	107.6577	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

End of Report

PEQS: Punjab Environmental Quality Standards
LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PGG/LAB/2024-0040/WW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates	Mandi Mawashian N 30.460354° E 70.971578°
Sample source	Mandi Mawashian Disposal Station
Sample Code	WW-3012
Sample Type	Composite
Date of sampling	24-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with FEQS Limit.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Ref: PUES/LAB/2024-0040/WW

Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	22.9	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.360 at 22.9°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) [^]	mg/L	80	1	228*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) [^]	mg/L	150	0.4	360*	APHA-5220 B
5.	Total Suspended Solids (TSS) [^]	mg/L	200	1	200	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	1360	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.005	0.005	APHA-5530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	176	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	1.0	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.104	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	98	APHA-4500-SO ₄ C
13.	Sulphide (S ²⁻)	mg/L	1.0	0.1	0.1	APHA-4500-S ²⁻ F
14.	Ammonia (NH ₃) [^]	mg/L	40	0.1	46.9*	APHA-4500NH ₃ C
15.	Cadmium (Cd) [^]	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium [^] (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu) [^]	mg/L	1.0	0.0001	0.0074	APHA-3111 B
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B



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Ref: PGG/LAB/2024-0040/WW

Date: 03-Jan-24

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn) [^]	mg/L	5.0	0.0001	0.0917	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe) [^]	mg/L	8.0	0.0010	0.0045	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.0988	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl ₂)	mg/L	1.0	0.01	0.02	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.0074	-
31.	Sodium [^]	mg/L	-	0.0100	118.5797	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

End of Report

PEQS: Punjab Environmental Quality Standards
LDL: Lowest Detection Limit

[^]PNAC Accredited



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Punjab Municipal Development Fund Company (PMDFC)



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref #: PGG/LAB/2024-0041/WW

Date: 03-Jan-24

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Kot Addu

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates	Pattal Chowk N 30.480475° E 70.968693°
Sample source	Pattal Chowk Disposal Station
Sample Code	WW-3013
Sample Type	Composite
Date of sampling	25-Dec-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS Limit.

- Analysis was conducted at the request of the proponent for his own use.
- Report cannot be used to comply with any complaint, EPO or other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



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Date: 03-Jan-24

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	22.8	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.413 at 22.8°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) [^]	mg/L	80	1	278*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) [^]	mg/L	150	0.4	448*	APHA-5220 B
5.	Total Suspended Solids (TSS) [^]	mg/L	200	1	350*	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	1310	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.005	0.005	APHA-5530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	147	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	1.0	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.096	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	155	APHA-4500-SO ₄ C
13.	Sulphide (S ²⁻)	mg/L	1.0	0.1	0.1	APHA-4500-S ²⁻ F
14.	Ammonia (NH ₃) [^]	mg/L	40	0.1	56.8*	APHA-4500NH ₃ C
15.	Cadmium (Cd) [^]	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium [^] (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu) [^]	mg/L	1.0	0.0001	0.0198	APHA-3111 B
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B



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22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn) [^]	mg/L	5.0	0.0001	0.1577	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe) [^]	mg/L	8.0	0.0010	0.0012	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.1865	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl ₂)	mg/L	1.0	0.01	0.03	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.0198	-
31.	Sodium [^]	mg/L	-	0.0100	129.8878	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

End of Report

PEQS: Punjab Environmental Quality Standards

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LDL: Lowest Detection Limit



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Annex E: Land Ownership Documents

Annex F: Plantation Plan

Table 21: Tree Plantation plan for Buffer zone

Sr#	Scientific Name of Pollutant Absorbent Plants ⁵¹	Other name	Family	Details
1.	Acacia modesta Wall 	Phulahi	Mimosaceae	A deciduous, thorny moderate-size tree, 3 to 9 m tall. A moderate intolerant, drought resistant tree that grows on a variety of soils, including dry shallow soils, It prefers a semi-arid, sub-humid climate within a temperature range of -5 to 40 °C
2.	Acacia nilotica (Linn.) Delile. 	Desi Kikar		An evergreen, thorny, moderate-size tree, 6 to 13 m tall. An intolerant, drought resistant tree that grows on a variety of textured soils. It will tolerate saline, sodic sites if adequate soil moisture is available. Also Having ability to fix nitrogen makes it good farm forestry tree. It prefers Subtropical/ tropical environment
3.	Albizia lebbeck (Linn.) Benth.	Siris		A fast-growing deciduous tree 12 to 30 m tall. A moderately intolerant, tree that grows on a variety of moist sites t prefers a sub-humid, cool, warm, subtropical and tropical

⁵¹ <https://fwf.punjab.gov.pk/system/files/Forest%20and%20Environmental%20Species.pdf>

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				climate with a temperature range of 4 to 40 °C The wood is very strong, resilient. The flowers are yellow or greenish white appear in April and May.
4.	Morus nigra Linn. 	Tut siah		A medium size, deciduous tree, 9 to 15 m tall. It is monecious. Reproduced both from seed and by vegetative means. The berries are white to pinkish to purple to red to black. Fruiting period is between March and Jun
5.	Ficus religiosa Linn. 	Peepal	Moraceae	A large deciduous tree that is leafless for a short period during hot seasons. t grows well within a temperature range of 0 to 40 °C in a semi-arid, warm, subtropical climate. The growth rate of this tree is fast. Height growth of 1 m/yr has been reported. T
6.	Melia azedarach Linn.	Bakiain	Meliaceae	A medium to small size, 97 deciduous tree, 6 to 12 m tall. The wood is light, moderately hard, resilient. Flowers are small, lilac colored and fragrant

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				appears between March and May
7.	<i>Azadirachta indica</i> (Linn.) A. Juss. 	Neem		A medium to large, usually evergreen tree, 12 to 25 meter tall. It grows on soils which vary from rich loams to nutrient deficient sites which are not saline or waterlogged and where the water table is above 18 m. The wood is heavy, hard and resilient. Flowers are small, white and with the fragrance of honey, appear between March and April.
8.	<i>Pongamia pinnata</i> (Linn.) Merrill 	Sukhechain	Fabaceae	A medium size glabrous evergreen tree with a short bole and spreading crown up to 18 m high.

Annex G: Disease Vector Preventive Plan

To develop a disease preventive plan for a wastewater treatment plant (WWTP), it's essential to focus on minimizing the risk of microbial and chemical exposures for both workers and the surrounding environment. Here's a comprehensive plan to help prevent the spread of diseases in a WWTP:

Employee Training and Hygiene:

Conduct regular training sessions on personal hygiene practices, including handwashing techniques, proper use of personal protective equipment (PPE), and respiratory hygiene.

Promote a culture of hygiene and awareness among employees by displaying posters, distributing educational materials, and organizing workshops.

Encourage sick employees to stay home and establish a sick leave policy that supports responsible behavior.

Personal Protective Equipment (PPE):

Assess the potential hazards in different work areas and provide appropriate PPE to employees, such as gloves, goggles, face shields, respirators, and protective clothing.

Train employees on the correct use, maintenance, and disposal of PPE.

Regularly inspect and replace damaged or worn-out PPE to ensure effectiveness.

Vaccination Programs:

Encourage and facilitate vaccination programs for employees, particularly for diseases that may pose a risk in the WWTP environment (e.g., hepatitis A and B, tetanus, etc.).

Collaborate with local healthcare authorities to provide vaccinations or support vaccination campaigns.

Waste Management:

Establish proper waste management procedures, including the segregation, containment, and disposal of hazardous waste.

Implement measures to prevent accidental exposure to waste materials and ensure compliance with relevant regulations.

Cleaning and Disinfection:

Develop a regular cleaning and disinfection schedule for work areas, equipment, and frequently touched surfaces.

Use appropriate disinfectants recommended for wastewater treatment facilities.

Train employees on proper cleaning procedures and provide them with necessary cleaning supplies.

Monitoring and Testing:

Implement a regular monitoring program to assess microbial and chemical contamination levels in the WWTP.

Monitor employees' health by conducting periodic medical check-ups and screenings.

Collaborate with local health authorities to track any disease outbreaks or emerging health concerns in the area.

Emergency Response Plan:

Develop an emergency response plan to address potential incidents, including disease outbreaks, chemical spills, or accidents.

Train employees on emergency procedures and conduct regular drills to ensure preparedness.

Collaboration and Communication:

Foster communication and collaboration between the WWTP management, employees, and local health authorities.

Establish a reporting system for incidents, near misses, or potential health risks.

Communicate preventive measures, updates, and educational materials to employees and relevant stakeholders.

Remember to regularly review and update the preventive plan based on emerging risks, new guidelines, and technological advancements. Consulting with local health and environmental agencies can provide valuable insights and support in developing an effective disease prevention plan for a WWTP.

Annex H: Effluent quality guidelines by WHO (1989) Technical Report on 'Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture'
RECOMMENDED MICROBIOLOGICAL QUALITY GUIDELINES FOR WASTEWATER USE IN AGRICULTURE

Category	Reuse condition	Exposed group	Intestinal nematodes ^b (arithmetic mean no. of eggs per litre ^c)	Faecal coliforms (geometric mean no. per 100 ml ^c)	Wastewater treatment expected to achieve the required microbiological quality
A	Irrigation of crops likely to be eaten uncooked, sports fields, public parks ^d	Workers, consumers, public	□ 1	□ 1000 ^d	A series of stabilization ponds designed to achieve the microbiological quality indicated, or equivalent treatment
B	Irrigation of cereal crops, industrial crops, fodder crops, pasture and trees ^e	Workers	□ 1	No standard recommended	Retention in stabilization ponds for 8-10 days or equivalent helminth and faecal coliform removal
C	Localized irrigation of crops in category B if exposure of workers and the public does not occur	None	Not applicable	Not applicable	Pretreatment as required by the irrigation technology, but not less than primary sedimentation

^a In specific cases, local epidemiological, socio-cultural and environmental factors should be taken into account, and the guidelines modified accordingly.

^b *Ascaris* and *Trichuris* species and hookworms.

^c During the irrigation period.

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^d A more stringent guideline (<200 faecal coliforms per 100 ml) is appropriate for public lawns, such as hotel lawns, with which the public may come into direct contact.

^e In the case of fruit trees, irrigation should cease two weeks before fruit is picked, and no fruit should be picked off the ground. Sprinkler irrigation should not be used.

Source: WHO (1989)

Water quality guidelines for maximum crop production by FAO 1985:

Traditionally, irrigation water is grouped into various quality classes in order to guide the user to the potential advantages as well as problems associated with its use and to achieve optimum crop production. Thus, the classification of water for irrigation will always be general in nature and applicable under average use conditions. The effect of sodium ions in irrigation water in reducing infiltration rate and soil permeability is dependent on the sodium ion concentration relative to the concentration of calcium and magnesium ions (as indicated by SAR) and the total salt concentration, as shown in the guidelines.

GUIDELINES FOR INTERPRETATION OF WATER QUALITY FOR IRRIGATION

	Units	Degree of restriction on use		
		None	Slight to moderate	Severe
Salinity				
EC _w ¹	dS/m	< 0.7	0.7 - 3.0	> 3.0
or				
TDS	mg/l	< 450	450 - 2000	> 2000
Infiltration				
SAR ² = 0 - 3 and EC _w		> 0.7	0.7 - 0.2	< 0.2
3 - 6		> 1.2	1.2 - 0.3	< 0.3
6-12		> 1.9	1.9 - 0.5	< 0.5
12-20		> 2.9	2.9 - 1.3	< 1.3
20-40		> 5.0	5.0 - 2.9	< 2.9
Specific ion toxicity				
Sodium (Na)				
Surface irrigation	SAR	< 3	3 - 9	> 9
Sprinkler irrigation	me/l	< 3	> 3	
Chloride (Cl)				
Surface irrigation	me/l	< 4	4 - 10	> 10
Sprinkler irrigation	m ³ /l	< 3	> 3	
Boron (B)	mg/l	< 0.7	0.7 - 3.0	> 3.0

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Miscellaneous effects				
Nitrogen (NO ₃ -N) ³	mg/l	< 5	5 - 30	> 30
Bicarbonate (HCO ₃)	me/l	< 1.5	1.5 - 8.5	> 8.5
pH	Normal range 6.5-8			

¹ EC_w means electrical conductivity in deciSiemens per metre at 25°C

² SAR means sodium adsorption ratio

³ NO₃-N means nitrate nitrogen reported in terms of elemental nitrogen

Source: FAO(1985)

US EPA (2012) suggested regulatory guidelines for irrigation wastewater reuse

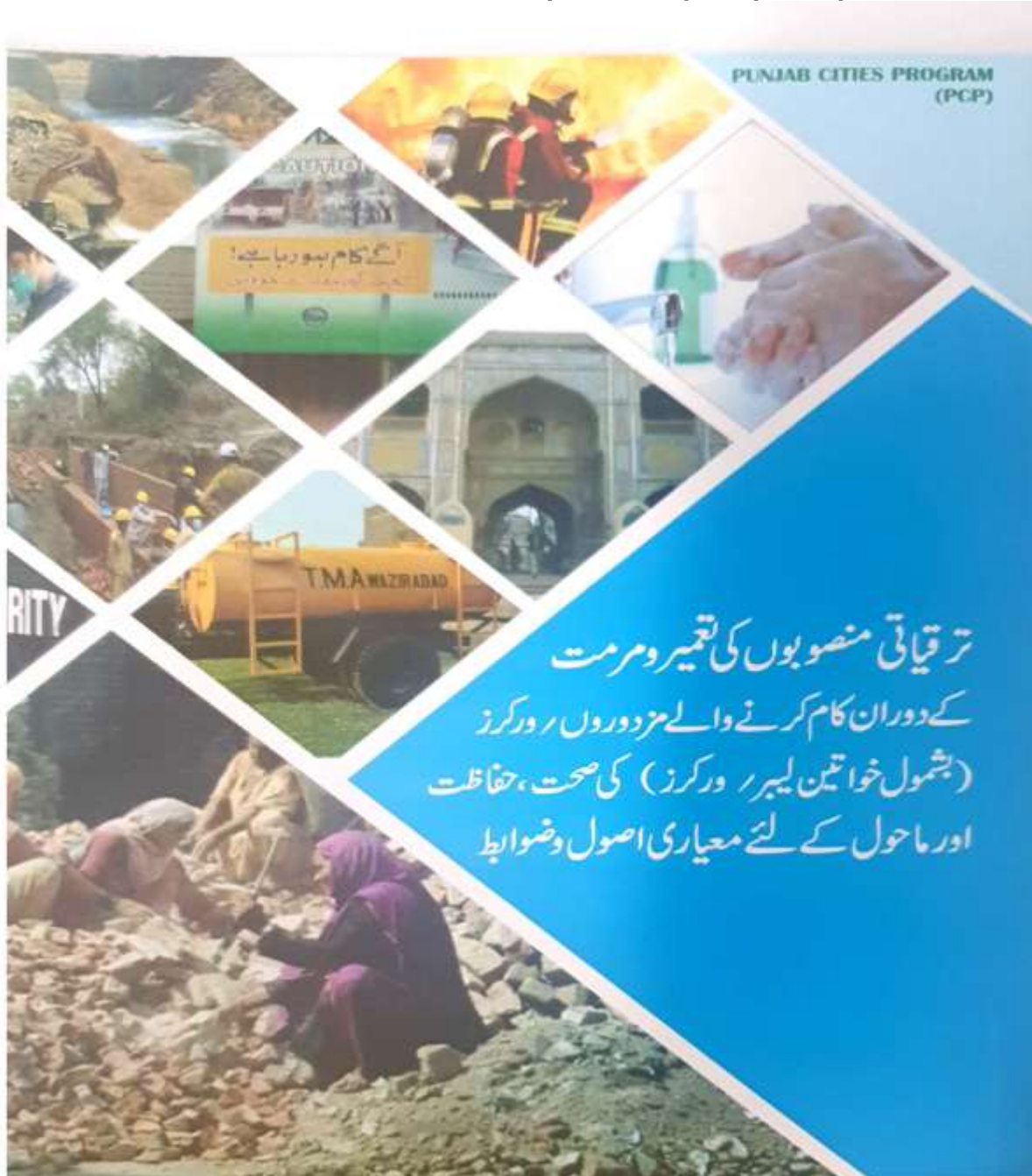
Reuse Category	Treatment	Water Quality	Monitoring	Setback Distances
Unrestricted Urban Reuse	Secondary + Filtration + Disinfection	pH 6.0–9.0 BOD ₅ 10 mg/L Turbidity 2 NTU Fecal coliform 0/100 mL Cl ₂ residual 1.0 mg/L (min)	pH weekly BOD ₅ weekly Turbidity continuous Fecal coliform daily Cl ₂ residual continuous	15 m from potable water supply wells
Restricted Urban Reuse	Secondary + Disinfection	pH 6.0–9.0 BOD ₅ 30 mg/L TSS 30 mg/L Fecal coliform 200/100 mL Cl ₂ residual 1.0 mg/L (min)	pH weekly BOD ₅ weekly TSS daily Fecal coliform daily Cl ₂ residual continuous	90 m from potable water supply wells 30 m to public access areas
Agriculture Food Crops	Secondary + Filtration + Disinfection	pH 6.0–9.0 BOD ₅ 30 mg/L TSS 30 mg/L Fecal coliform 0/100 mL Cl ₂ residual 1.0 mg/L (min)	pH weekly BOD ₅ weekly Turbidity continuous Fecal coliform daily Cl ₂ residual continuous	15 m from potable water supply wells

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Reuse Category	Treatment	Water Quality	Monitoring	Setback Distances
Agriculture Processed Food Crops Non-Food Crops	Secondary + Disinfection	pH 6.0–9.0 BOD ₅ 30 mg/L TSS 30 mg/L Fecal coliform 200/100 mL Cl ₂ residual 1.0 mg/L (min)	pH weekly BOD ₅ weekly TSS daily Fecal coliform daily Cl ₂ residual continuous	90 m from potable water supply wells 30 m to public access areas

Annex I: EHS SOPS for Labors/Workers (Including Women Labor/worker) for Construction of Development Project, (URDU)



Scanned with CamScanner

حق اشاعت

جملہ حقوق محفوظ ہیں۔

اس اشاعت کا کوئی بھی حصہ پی ایم ڈی ایف سی (PMDFC) کی پیشگی اجازت کے بغیر کسی بھی شکل میں الیکٹرانکس، مکینیکل، فوٹوکاپی، ریکارڈنگ یا کسی اور طرح سے دوبارہ بنایا یا منتقل نہیں کیا جاسکتا۔





اغراض و مقاصد

۱۔ مجوزہ معیاری اصول و ضوابط پنجاب سینیٹیز پروگرام (PCP) کے تحت پنجاب میونسپل ڈیولپمنٹ فنڈ کمپنی (PMDFC) کے ماہرین ماحولیات نے پروگرام ڈائریکٹر (PCP) اور ڈپٹی پروگرام ڈائریکٹر (PCP) کی زیر نگرانی تشکیل دیئے ہیں۔

۳۔ شہری ترقی کے ترقیاتی منصوبہ جات کی تعمیر و مرمت میں مزدور ورکرز بنیادی کردار ادا کرتے ہیں۔ ان (SOPs) کا بنیادی مقصد مزدور ورکرز (بشمول خواتین لیبر ورکرز) کو تعمیراتی جگہوں (Construction sites) اور لیبر کیمپس میں ماحولیاتی اور سماجی تحفظ فراہم کرنا اور صحت، ماحولیات اور کسی خطرناک صورتحال سے بچنے کے لئے حفاظت فراہم کرنا ہے۔

۳۔ یہ SOPs (PCP) پنجاب سینیٹیز پروگرام کے تحت 16 شہروں کی میونسپل کمیٹیز/کارپوریشنز میں تعمیر و مرمت کے تمام پراجیکٹس پر لاگو ہوں گے۔

۴۔ یہ SOPs مزدوروں کو کام کرنے والوں کو دیہاڑی دار (بشمول خواتین) پر بلا تخصیص لاگو ہوں گے۔

۵۔ ان SOPs کو موثر اور یقینی بنانے کے لئے انھیں تشکیل دہندگان کے کنٹریکٹ کا حصہ بنانا اور ان پر عمل درآمد کرنا میونسپل کمیٹیز/کارپوریشنز کی ذمہ داری ہے۔ جسے پی ایم ڈی ایف سی کی متعلقہ پروگرام ٹیم یقینی بنائے گی۔

پیغام

پاکستان کی ترقی میں تعمیراتی کاموں کے دوران کام کرنے والا مزدور طبقہ نہایت اہمیت کا حامل ہے۔ اور اسے صحت و مند ترقی سے متعلق مسائل کا مؤثر حل انتہائی ضروری ہے۔ ”ترقیاتی منصوبوں کی تعمیر و مرمت کے دوران کام کرنے والے مزدوروں و ورکرز (بشمول خواتین لیبر ورکرز) کی صحت، حفاظت اور ماحول کیلئے بنیادی اصول و ضوابط“ کی اشاعت و ترویج اور ان پر بروقت عمل درآمد سب سے حد ضروری ہے جس سے اس طبقے کے بنیادی حقوق کا تحفظ یقینی بنایا جاسکے گا اور اس طرح اس طبقے کی کارکردگی میں بھی بہتری نظر آئے گی۔ ان اصولوں کے تحت ہر تھکیلہ دار کو ورکرز کی صحت اور حفاظت کی ذمہ داری دی گئی ہے۔ مزدور تعمیراتی کاموں کے دوران خطرات کے مطابق ذاتی حفاظتی سامان بھی استعمال کریں گے جس سے دوران کام حادثات میں بھی نمایاں کمی نظر آئے گی۔ ماحولیات اور صحت کے اصولوں کو مد نظر رکھتے ہوئے ہر سطح پر ہم اس بات کو یقینی بنانے کی کوشش کریں گے کہ ہماری پالیسیاں اور طرز عمل فعال ہوں۔ ماحولیات، صحت اور حفاظت (EHS) کے اصولوں کو اپنانے میں کسی بھی قسم کا سمجھوتہ نہیں کیا جائے گا۔ میں امید کرتا ہوں کہ ان اصول و ضوابط کی روشنی میں مزدور ورکرز (بشمول خواتین لیبر) کے حقوق کی پاسداری کو ایک نیا رخ ملے گا اور حکومتی عہدیداران اور تھکیلہ داران بھی اپنی ذمہ داریوں کا احساس کریں گے۔ اور اس سلسلے میں پی ایم ڈی ایف سی اور پنجاب سٹیٹیو پروگرام کی انوائزمنٹ اینڈ سوشل سیف گارڈز (ESSs) ٹیم بلاشبہ مہار کیاو کی مستحق ہے اور یہ توقع کی جا سکتی ہے کہ وہ مستقبل میں ان قواعد و ضوابط کی نگرانی کے لئے بھرپور اقدامات کریں گے۔



محمد عامر نذیر
 پروگرام ڈائریکٹر
 پنجاب سٹیٹیو پروگرام (PCP)

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(۱) لیبر کیمپس کے لئے معیاری اصول و ضوابط

سرگرمیاں

۱. مزدور / لیبر کیلئے عارضی کیمپ / رہائش گاہ کے انتظام و قیام کے لئے جگہ کا انتخاب

مسائل

- ♦ مقامی آبادی کے مسائل پر اضافی بوجھ
- ♦ مقامی آبادی سے تنازعات کا خدشہ
- ♦ سہائی، مذہبی، اور سکیورٹی کے مسائل۔

حفاظتی اقدامات

ٹھیکیدار لیبر کیمپس کے قیام کے وقت مندرجہ ذیل باتوں کا خیال رکھے گا :

- ♦ کیمپس ایسی جگہوں پر لگائے جائیں جو ماحولیاتی، مذہبی، سماجی اور ثقافتی نقطہ نظر سے قابل قبول ہوں۔
- ♦ مقامی آبادی کے ساتھ کسی تنازعہ سے بچنے کے لئے آبادی سے دور جگہ کا انتخاب کیا جائے
- ♦ لیبر کیمپ کی جگہ اور سہولیات سے متعلق ایک تفصیلی نقشہ تیار کر کے متعلقہ میونسپل کونسل اور پولیس میں جمع کرایا جائے۔
- ♦ دیگر مقامی ادارے جیسے صحت، سکیورٹی، وغیرہ کو لیبر کیمپ کے مقام اور مدت کے بارے میں مطلع کیا جائے تاکہ کسی ناگہانی صورتحال سے بچا جاسکے۔
- ♦ لیبر کیمپس کے قیام کیلئے عارضی جگہ زمین کا حصول زمین کے مالک کی مرضی، ملے کردہ کرایہ اور باقاعدہ تحریری معاہدے کی صورت میں کیا جائے۔
- ♦ لیبر کیمپس سے ملحقہ بنیادی سہولتوں جیسے پینے کا پانی اور نکاسی آب کے انتظامات سے ماحولیاتی آلودگی میں اضافہ نہ ہو





انوائرنمنٹ اینڈ سوشل سیف گارڈز ٹیم

پی ایم ڈی ایف سی



سرگرمیاں

۲. لیبر کیمپ میں مہیا کی جانے والی سہولیات

مسائل

- ◆ مناسب انفراسٹرکچر کی کمی
- ◆ بنیادی ضروریات اور سہولیات جیسے پانی اور بجلی کی فراہمی، صفائی سہولیات اور نکاسی آب کی فراہمی

حفاظتی اقدامات

تھیکیدار کیمپ سائٹس پر درج ذیل باتوں کا خیال رکھے گا:

- ◆ ہوادار اور صاف ستری رہائش گاہ
- ◆ عارضی کمروں کیلئے ایسے میٹرل کا استعمال جو جلد آگ نہ پکڑیں۔
- ◆ تھانے، دھوئے اور پانی پینے کیلئے صاف اور مناسب پانی کی فراہمی۔
- ◆ تمام مزدوروں کیلئے مناسب چھلکی موجودگی اور محفوظ ماحولیاتی معیار۔
- ◆ صاف ستری و اش رومز اور نکاسی آب کا مناسب انتظام۔
- ◆ خواتین لیبر کیلئے پروئے اور پرائیویسی کا انتظام اور الگ کمروں کا قیام مزید برآں خواتین لیبر کی موجودگی کی صورت میں ان کے لیے علیحدہ ٹوائلٹس برواش رومز کا انتظام۔
- ◆ بین الاقوامی معیار کے مطابق ہر دس افراد کیلئے مطلوبہ ٹوائلٹ کی سہولت کی تعداد ایک ہے۔
- ◆ اگر لیبر کیمپ طویل مدت کیلئے لگایا جانا ہو تو پارشوں رسیاب کے پانی سے بچنے کیلئے مناسب انتظامات کا ہونا اور نکاسی آب کی فراہمی سبب ضروری ہے۔
- ◆ ٹوائلٹس اور عارضی رہائش گاہوں میں بجلی کی فراہمی کو یقینی بنایا جائے۔

سرگرمیاں

۳. لیبر کیمپ سے پیدا ہونے والا سالت اور لیکوٹڈ ویسٹ

مسائل

- ◆ تھفن اور ہڈیو
- ◆ صحت کے لئے نقصان
- ◆ ماحولیات کے لئے نقصان
- ◆ مقامی آبادی کے لئے نقصان
- ◆ بیماریاں پیدا کرنے والے بکٹیریا اور وائرسوں کا ذریعہ



انوائٹمنٹ اینڈ سوشل سیف گارڈ ٹیم

پی ایم ڈی ایف سی کے

حفاظتی اقدامات

روزمرہ پیدا ہونے والے گولا کرکٹ اور ہانگ کے گولا کرکٹ کے لئے الگ الگ گولا کرکٹ کا انتظام
 میونسپل کھلی کارپوریشن کی جانب سے منتخب کردہ جگہ پر روزانہ کی بنیاد پر گولے کو اٹھانے اور تلف کرنے کا انتظام۔
 عارضی نوٹلکس سے پیدا شدہ فضلے اور ٹیکو ویسٹ کو حفظان صحت کے اصولوں کے مطابق ٹوکنا لگانے کا انتظام۔
 فضلے کو ٹوکنا لگانے کے لئے رہائش گاہ سے کم از کم 500 میٹر دور جگہ کا انتخاب کیا جائے جس سے ارد گردی کے لوگوں کی رہائش نہ ہو۔
 عارضی نوٹلکس سے پیدا شدہ فضلے کو ٹوکنا لگانے لگانے کے لئے منتخب کردہ جگہ کے ارد گرد یا لڑائی جانے یا درست لگانے سے جانیں نہ لگ جائیں اور دیگر
 رہائشی داخل نہ ہوں اور چھتر اور بدبو بھی پیدا نہ ہو۔

سرگرمیاں

۴. کھانا پکانے کے لئے ایندھن کی فراہمی

مسائل

گیس اور دیگر ایندھن سے چلنے والے چولہوں کے پھٹنے کا اندیشہ
 ایندھن کے لئے گھڑی کے حصول کے لیے درختوں کی کٹائی

حفاظتی اقدامات

تھیکیدار کیمپ سائٹس پر درج ذیل سہولیات مہیا کرے گا۔

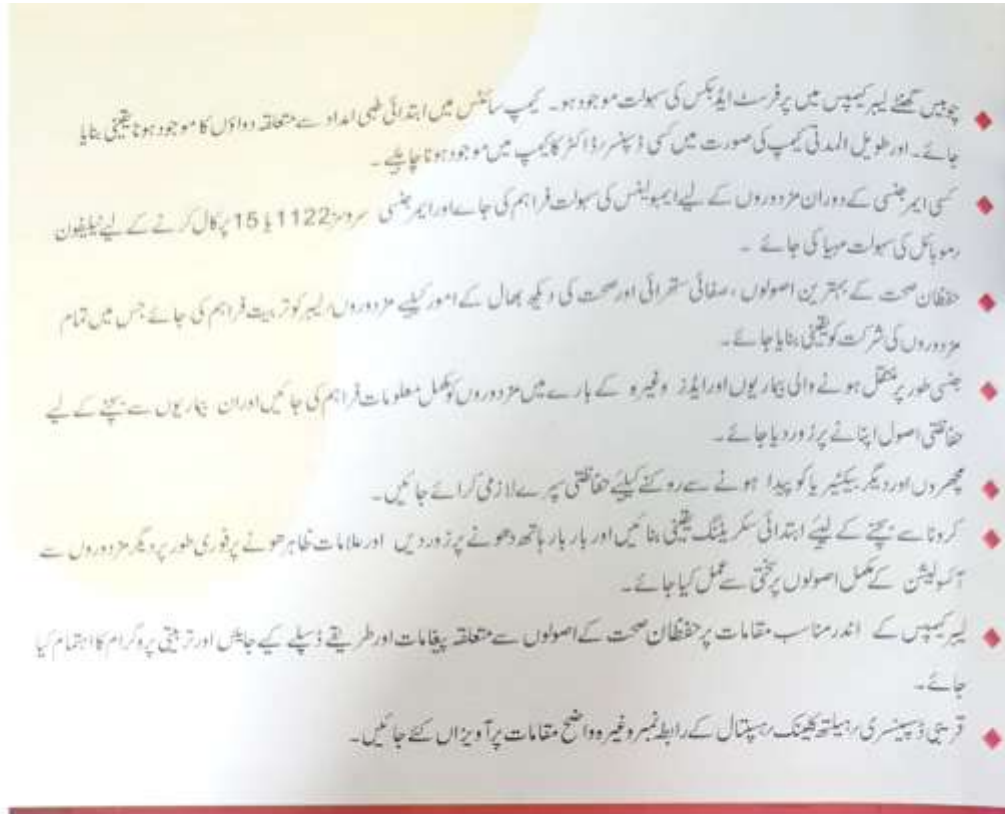
- لیبر کیمپس میں کھانا پکانے، کمروں کے گرم رکھنے نیز سردیوں میں نہانے اور دھونے کے لیے گرم پانی کے لیے ایندھن کی گھڑی یا دیگر بائیس گیس استعمال کرنے کی حوصلہ شکنی کریں اور ایندھن کیلئے درختوں کی کٹائی نہ کریں۔
- درختوں اور ارد گردی جنگلات کی حفاظت کیلئے مزدوروں/لیبر کو آگاہی دی جائے۔
- کھانا پکانے کے لئے قدرتی گیس یا مٹی کے تیل کے محفوظ چولہے استعمال کیے جائیں۔






EIA/ESIA of Comprehensive Sewerage Scheme of Kot Addu City

Punjab Municipal Development Fund Company (PMDFC)



Scanned with CamScanner





سرگرمیاں

۸. حفظانِ صحت کے اصولوں پر مبنی خوراک (Food Safety)

مسائل

- فوڈ پائیزنگ کا خدشہ
- بیماری کا ذر

حفاظتی اقدامات

- مزدوروں کو صاف پتھرے اور تازہ کھانے کی فراہمی کو یقینی بنایا جائے۔

سرگرمیاں

۹. مذہبی و سماجی میل جول

مسائل

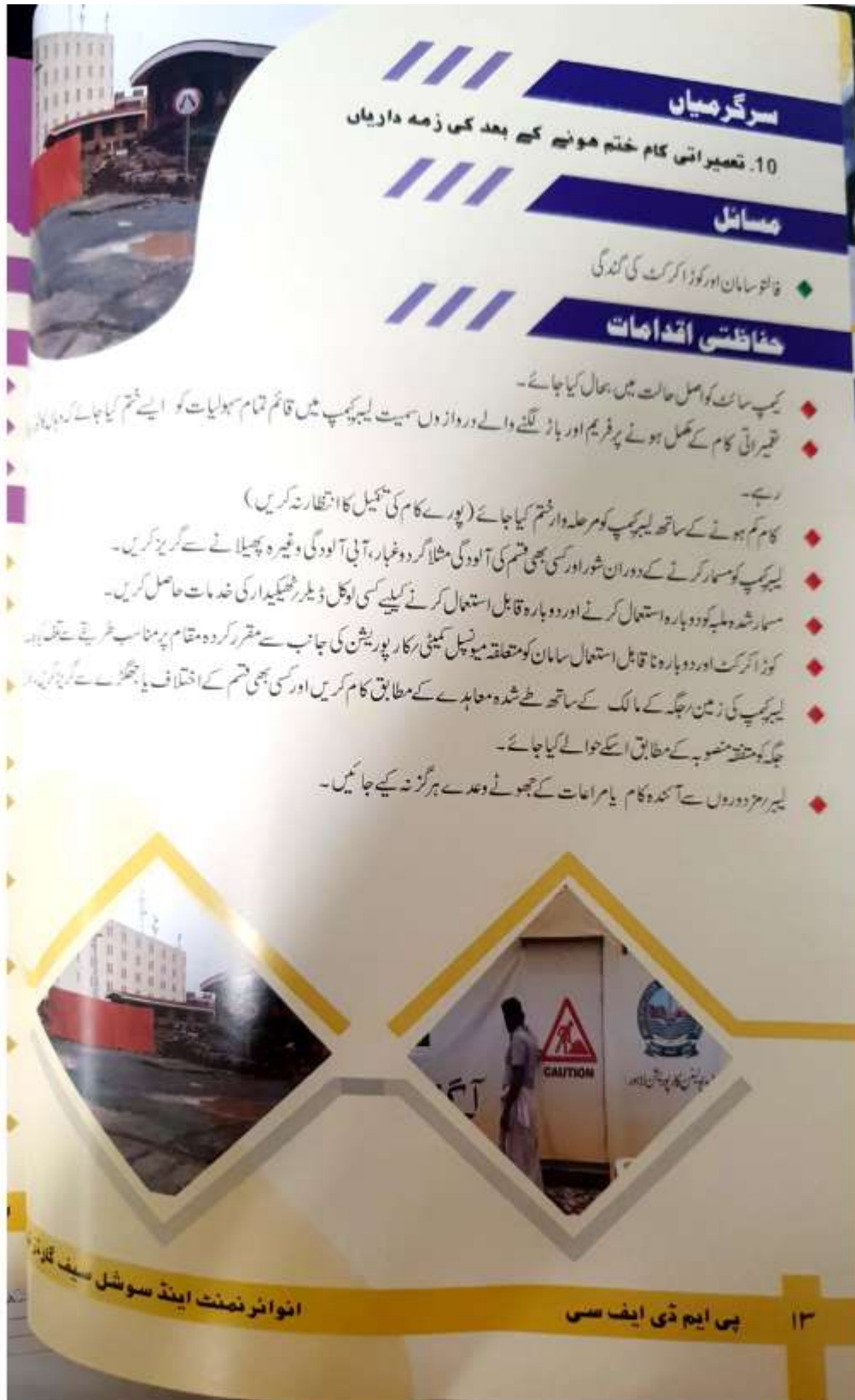
- مذہبی عبادات میں رکاوٹ
- سماجی تعلقات میں دشواری
- سماجی، ثقافتی اور مذہبی خیالات میں شدت پسندی یا لڑائی جھگڑا وغیرہ

حفاظتی اقدامات

- مزدوروں، رلیز کو ان کے مذہب اور فرقے کے مطابق مذہبی عبادات کی سہولیات فراہم کرنا۔
- خواتین لیبر کی موجودگی کی صورت میں ان کے لیے علیحدہ وضو، نماز اور پردے کا اہتمام کیا جائے۔
- تمام مزدوروں کی مذہبی، ثقافتی یا فرقے کی وابستگی سے قطع نظر غیر متعصبانہ اور برابری کا سلوک کیا جائے۔
- مزدوروں کو تعمیراتی کام کے دوران نماز میں شرکت کرنے یا دیگر عبادات کی اجازت دی جائے اور اس سلسلے میں مذہبی اور سکیورٹی امور کے ذمہ دار مقامی حکام کو تعمیراتی کاموں کے آغاز سے پہلے باضابطہ طور پر آگاہ کیا جائے تاکہ صحت عامہ، معاشرتی اور حفاظتی امور پر موثر نگرانی برقرار رہ سکے۔

انوائٹمنٹ اینڈ سوشل سیفنگ گارڈز ٹیم

پی ایم ڈی ایف سی ۱۲





سرگرمیاں

۱. تمام قسم کے تعمیراتی سرگرمیاں اور کام

مسائل

- انجریز اور چوٹیں وغیرہ
- نامناسب دیکھ بھال اور بروقت امداد نہ ملنے کی باعث ہلاکت
- دہشت گردی اور سیوریج سے متعلق خطرات

حفاظتی اقدامات

- تمام مزدوروں رلیبر سے مقامی زمین الاقوامی معیار کے مطابق مناسب حفاظتی اور قانونی ضوابط کی پیروی کروائی جائے۔
- کام کی جگہ پر ارد گرد کے علاقوں میں موجود دہشت گردی اور سیوریج کے خطرات کے مطابق حکمت عملی کی بروقت تیاری اور ایک محفوظ و صحت مند ماحول مہیا کیا جائے۔
- مزدوروں رلیبر کیلئے ذاتی حفاظت کے سامان (PPES) کی فراہمی مثلاً حفاظتی جوتے، ہیلمٹ، ماسک، دستاں، حفاظتی لباس، چشمے، چہرے اور کان کی حفاظت کے سامان وغیرہ کی فراہمی
- تمام مزدوروں رلیبر کو ذاتی حفاظت کے ساز و سامان کے بارے میں مکمل آگاہی اور استعمال کے طریقے کار کے بارے میں تربیت کا انتظام۔
- اگر تعمیراتی کام ایک ماہ سے زائد عرصہ کیلئے جاری رہتا ہو تو تمام مدت کے لیے صحت، صفائی اور تربیت یافتہ ماحولیات کی تعیناتی کی جائے جو مزدوروں کی صحت، صفائی اور ماحولیات کے امور کی نگرانی کرے اور انہیں تربیت و آگاہی فراہم کرے۔
- تعمیراتی کاموں کے دوران کسی چوٹ لگنے یا انجریز کی صورت میں مزدور رلیبر کے علاج معالجے کی سہولت مہیا کرنا اور بروقت ہسپتال رڈ سنسری وغیرہ پہنچانا ٹھیکیدار کی ذمہ داری ہے۔
- مزید برآں دوران تعمیراتی کام کی وجہ سے لگنے والی چوٹ یا انجریز کے نتیجے میں ہلاکت ہو جانے کی وجہ سے مزدور رلیبر کی انشورنس اور اس کی بروقت ادائیگی کو یقینی بنایا جائے۔
- ایمرجنسی رابطہ نمبر مثلاً 1122 یا 15 اور دیگر قریبی ہسپتالوں رڈ سنسری وغیرہ کے نمبر تعمیراتی جگہوں پر واضح درج ہونے چاہیں اور کال کی سہولت فراہم کی جائے۔
- شہری ترقی کے تعمیراتی منصوبہ جات کے آغاز سے قبل صحت، مذہبی امور اور شہری تحفظ رسیوریج فراہم کرنے والے مقامی اداروں کو آگاہ رکھا جائے اور اس سلسلے میں متعلقہ میونسپل کمیٹی رکارپوریشن کے تعاون سے موثر حکمت عملی تشکیل دی جائے۔

سرگرمیاں

۲. تمام قسم کی تعمیراتی سرگرمیاں اور کنسٹرکشن کے کام

مسائل

- ◆ 15 سال سے کم عمر بچوں کی صحت اور تعلیم کا نقصان
- ◆ 18 سال اور اس سے کم عمر بچوں کی صحت کا نقصان
- ◆ حاملہ مزدور عورتوں کی صحت سے متعلقہ خطرات

حفاظتی اقدامات

- ◆ دی پنجاب ریسٹرکشن آن ایمپلائمنٹ آف چلڈرن ایکٹ 2016 کے مطابق 15 سال سے کم عمر بچوں کو مزدوری یا کسی سرگرمی کے لیے کام پر نہیں رکھا جاسکتا۔
- ◆ ویسٹ پاکستان میٹرنیٹی جیفٹ آرڈیننس 1958 کے مطابق حاملہ خواتین یا ایسی خواتین جنہوں نے چھ ہفتے قبل بچے کو جنم دیا ہو، کو مزدوری یا کسی سرگرمی کے لیے کام پر نہیں رکھا جاسکتا۔
- ◆ دی پنجاب ریسٹرکشن آن ایمپلائمنٹ آف چلڈرن ایکٹ 2016 کے مطابق 18 سال اور اس سے کم عمر کے بچوں کو محنت مزدوری کے ایسے کام کے لیے نہیں رکھا جاسکتا جن میں صحت کو نقصان پہنچنے یا پوٹ لگنے یا کسی کیمیائی زہریلے مادے سے نقصان پہنچنے یا جہاں ہڈی ٹوٹنے کا اندیشہ ہو۔



انوائرنمنٹ اینڈ سوشل سیف گارڈز ٹیم

پی ایم ڈی ایف سی

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سرگرمیاں

۳. دوران تعمیر حادثات کا پیش آنا

مسائل

- ◆ فوری طبی امداد کی کمی
- ◆ ارد گرد کے علاقوں میں ابتدائی طبی سہولیات اور صحت عامہ کا فقدان

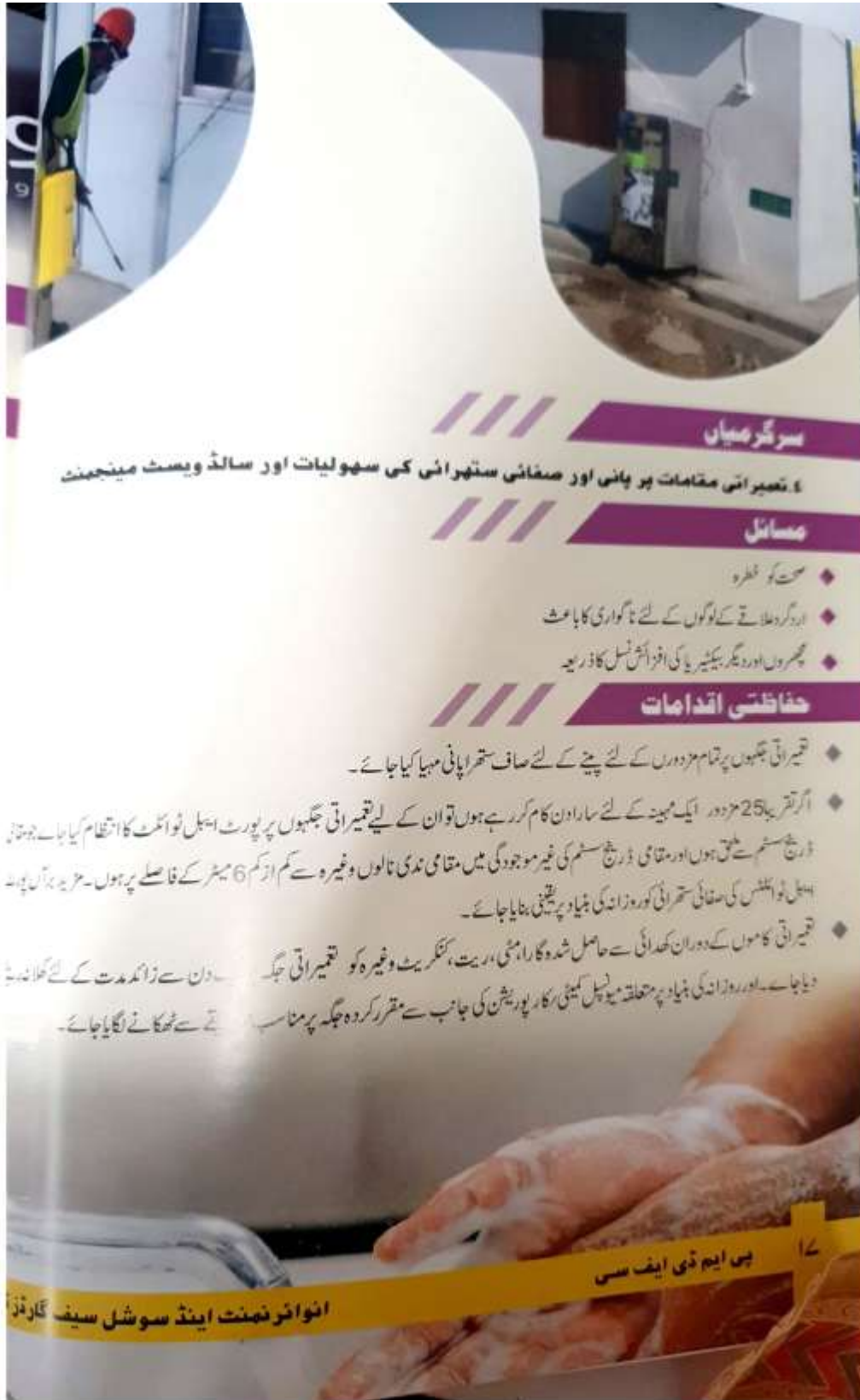
حفاظتی اقدامات

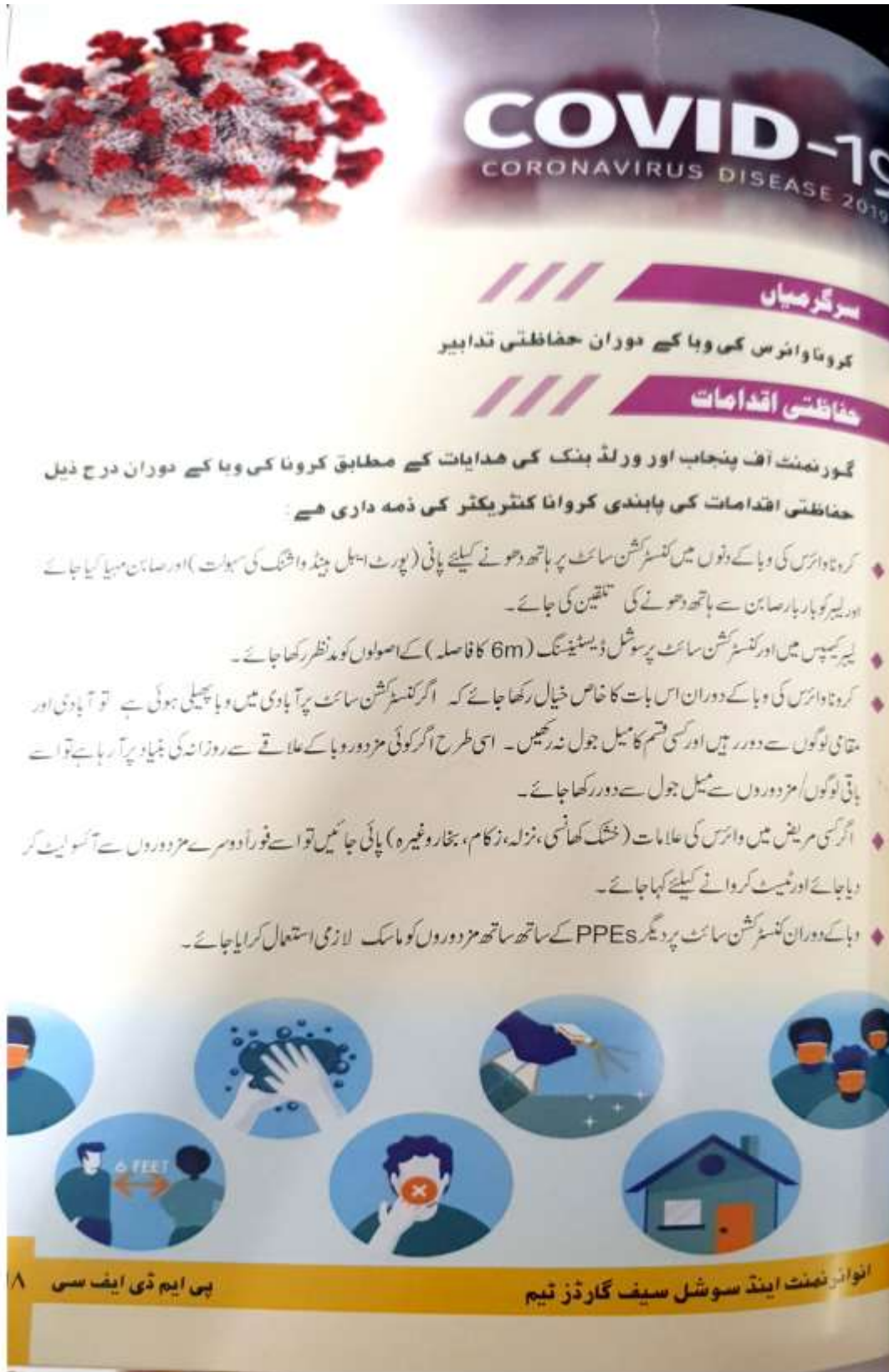
- ◆ تعمیراتی جگہ پر فرسٹ ایڈ باکس کی موجودگی کو یقینی بنایا جائے اور فرسٹ ایڈ باکس میں تمام ضروری ادویات اور طبی امداد کا ضروری سامان موجود ہو۔
- ◆ تعمیراتی کاموں کے دوران پیش آنے والے حادثات یا بیماریوں اور واقعات کا مکمل ریکارڈ رکھا جائے۔ اسی طرح حادثات کی نوعیت و وجوہات کا مکمل ریکارڈ موجود ہو۔
- ◆ مزدوروں کی صحت و سیورٹی سے متعلق ممکنہ خطرات کی بروقت نشاندہی کی جائے خاص کر وہ خطرات جو جان لیوا ثابت ہو سکتے ہیں۔ اور ضروری حفاظتی اقدامات بروقت کئے جائیں۔
- ◆ تعمیراتی کاموں سے متعلق مشینری چلانے والے ڈرائیوروں کو دوران ڈرائیونگ قواعد و ضوابط پر سختی سے عملدرآمد کرانے کے لئے آگاہی فراہم کی جائے۔
- ◆ تعمیراتی علاقوں اور سڑکوں کے ساتھ ساتھ روشنی کا معقول انتظام ہو۔




انوائٹمنٹ اینڈ سوشل سیف گارڈز ٹیم

پی ایم ڈی ایف سی ۱۶





تعمیراتی کاموں کے دوران خطرات / حادثات سے بچنے کے لیے سامان برائے ذاتی حفاظت کا غلامہ			
تعمیراتی کام	تجویز کردہ سامان برائے ذاتی حفاظت	تصویری	مقصد
اڑنے والے ذرات کا استعمال کیے جانے سے بچنے کے لیے وہات نامک کیٹیکل گیسٹین، اور بخارات، روشنی کی شعاعیں۔ ایسے تمام کام جن میں گرنے کا خطرہ ہو، پلندری پر کام کرنا، تعمیراتی کام کو سنبھالنے اور دوسری جگہ پر منتقل کرنے والے کام۔ کھدائی / شور پیدا کرنے والے کام یا بھاری مشینری استعمال کرنے کی وجہ سے شور۔ تمام تعمیراتی کام جن میں چیزوں کا گرنا یا گھمانا، نوکیلی اشیاء شامل ہوں۔ گھاتے والا یا گرم مائع، پتھرے کے حجرے سے پکڑا اٹھانا۔ جسمانی صحت کیلئے نقصان دہ سامان جیسے پتھرے کو سنبھالنا، ایسے کام جس میں کٹ یا گہرے زخم لگنے کا اندیشہ ہو، ارتعاش، بہت زیادہ درجہ حرارت۔	حفاظتی عینکیں اور پر اور اطراف سے نقصان سے بچنا کیلئے چاٹسک کے ہیلمٹ سماعت کی حفاظت کے آلات جیسے کن پش یا ایئر ٹیگ بٹلے اور گرنے والی اشیاء، مائعات اور کیمیائی مواد سے بچنا کیلئے حفاظتی جوتے یا بوت ریڈ یا مصنوعی مواد (نیوروپین)، چمڑا، سٹیل، غیر موصل مواد سے بنے گلوڑ ایک جگہ سے دوسری جگہ لے جانے والے یا ایک ہی جگہ پر سے مواد کی فراہمی تعمیراتی جگہ پر بچاؤ کا سامان چہرے کے ماسک جن میں دھول بنانے اور ہوا کو صاف رکھنے کیلئے (کیمیائی مواد، دھند، بخارات اور گیسوں سے) مناسب فلٹر لگے ہوں مناسب میٹرل سے بنے غیر موصل کپڑے، ایپرن وغیرہ ہیلمٹ، حفاظتی عینکیں کے گلوڑ اور پز کے بوت ہینڈلر، ہیڈ ڈریسی، کنکلیٹر، ماسک اور جگہ اور ایک ساتھی فرد	         	آنکھوں اور چہرے کی حفاظت / تحفظ سر کی حفاظت / تحفظ سماعت کی حفاظت / تحفظ پلوں کی حفاظت / تحفظ ہاتھوں کی حفاظت / تحفظ تحفظ تنفس جسم / ٹانگوں کی حفاظت / تحفظ اونچائی پر کام کرتے ہوئے حفاظت اونچائی پر کام کرتے ہوئے حفاظت

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Summary of Recommended Personal Protective Equipment According to Hazard			
Objective	Workplace Hazards	Suggested PPE	Pictures
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.	
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Plastic Helmets with top and side impact protection.	
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).	
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.	
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.	
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.	 
	Oxygen deficiency	Portable or supplied air (fixed	
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and	Insulating clothing, body suits, aprons etc.	
Working at *height	Rehabilitation Projects	Helmet, Safety glasses,	
	New Construction Projects	Anchor, belt, lanyard,	

*In general, use of PPEs is required for any height of 4 ft or more. Ref: OSHA standards

پی ایم ڈی ایف سی

انٹرنیٹ اینڈ سوشل سیف گارڈز ٹیم

Scanned with CamScanner





قیرانی جگہ پر ماسخ پورے نصب کروائیے جائیں، جن پر درج ذیل پیمائش احکامات لکھے ہوں:

(1) قیرانی کام کی نوعیت

(2) ایک میں رکاوٹ کی صورت میں متبادل راستے کا نشان اور عارضی رکاوٹ کا پیغام

(3) جس اہر کا گیت کیلئے راہ ہائیڈرو

(4) (PMDFC) کی جانب سے جاری کردہ سماجی و ماحولیاتی پیمائش پٹی پوسٹرز۔

قیرانی کام کی جگہ کے ارد گرد 100 میٹر تک کی حدود میں موجود ثقافتی، سماجی، مذہبی ورثہ، تاریخی عمارتوں اور مذہبی مقامات جیسے قبرستان، مسجد، مندر، گر جاگروں وغیرہ کو کسی قسم کا نقصان نہ پہنچایا جائے اور ان کی حدود میں کوڑا کرکٹ ڈالنے یا فالتو پانی چھوڑنے سے گریز کیا جائے۔ مزید برآں کھدائی کے دوران کسی نئے آثار قدیمہ ملنے کی صورت میں متعلقہ مقامی محکمے سے رجوع کیا جائے اور کھدائی کا کام بند کر کے قیرانی کام روک دیا جائے۔

سرگرمیاں

2- کھدائی کی جگہ اور اس سے متعلقہ کام اور نالوں کی صفائی اور اس سے حاصل شدہ بھل وغیرہ

مسائل



کھدائی سے حاصل شدہ مٹی رکنکر کے ڈمبر (Debris) سے رہائشیوں کی آمدورفت اور ٹریفک میں رکاوٹ

مٹی، پاشیوں کیلئے ناگواری کا باعث

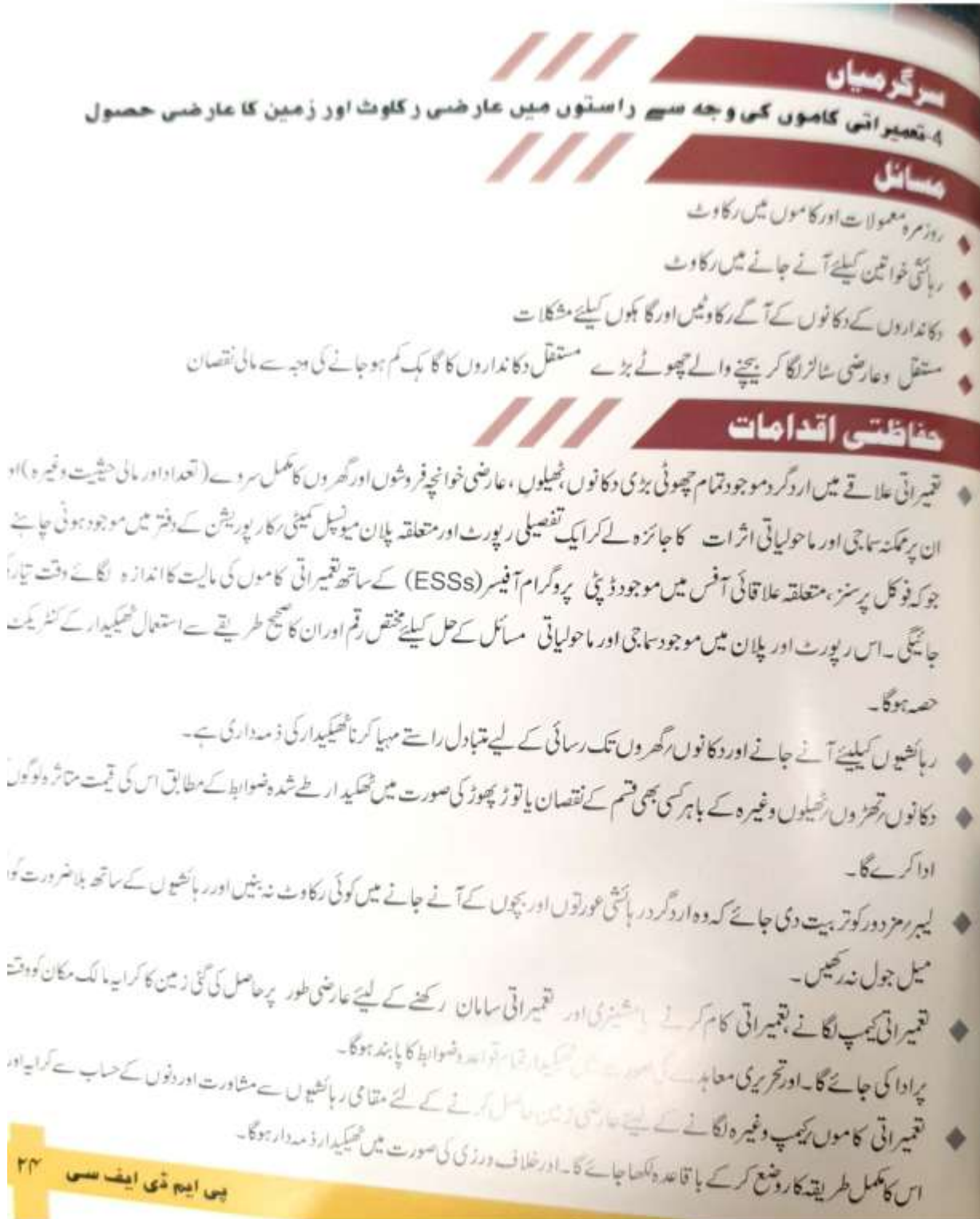
گھروں اور دیگر جاری پھیلائے والے جراثیم کی افزائش کا ذریعہ

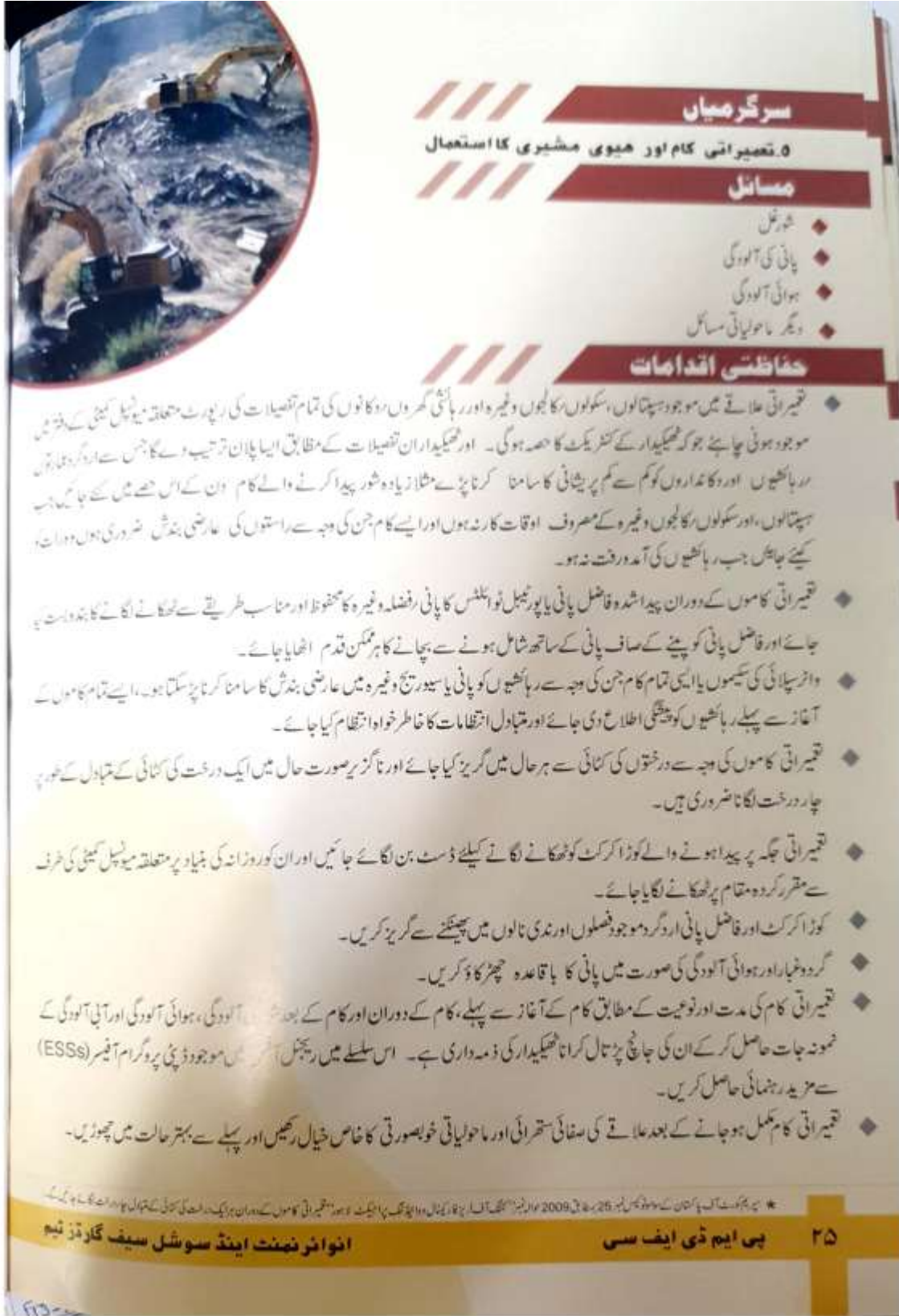
کھدائی کی جگہ پر گرنے اور حادثات کے خطرات

پی ایم ڈی ایف سی ۲۲

سول انجینئر اینڈ سوشل سیف گارڈز ٹیم







Annex J: Emergency Response Preparedness Plan

1. Introduction

Emergency management can be defined as the organization, coordination and implementation of a range of measures to prevent, mitigate, respond to, overcome and recover from the consequences of emergency events affecting the community, its assets and the environment.

2. Purpose of Plan

This plan intends to provide a framework for safety and security to infrastructure, people and vehicles. It assigns responsibility to organizations and individuals for carrying out specifications at projected times and places in an emergency situation that exceeds the capability or routine responsibility of anyone agency.

The emergency response plan provides guidance to;

- Prevent any potential sources causing hazard to the resources during all stages of the project;
- Coordinate between various organizations to take actions in case of emergencies;
- Protect people and property in emergencies and disasters;
- Develop procedure stores pond to the emergencies efficiently;
- Identify and ensure availability of personnel, equipment, facilities, supplies, and other resources for use in order to provide timely and efficient response and recovery operations; and
- Confirm that measures taken in an incident are adequate to recover the affected resources or further improvement sare needed.

3. Planning

i. Emergency Response Team

A group/team shall be dedicated to identify and control potential emergencies during the construction and operation of the project. The roles and responsibilities of the group members shall be clearly defined.

The primary responsibilities of the group are described below:

- Identify the potential hazard or risk sources that can lead to emergency situations; Ensure availability of adequate resources, procedures and communication system to deal with the identified emergency situations;
- Ensure awareness and training of the staff to facilitate implementation of the emergency response plan;
- Maintaining the records of any previous incidents; and
- Post-event analysis to bridge the gaps of the existing risk prevention procedures.
- The emergency response team shall include but not limited to the following;

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Punjab Municipal Development Fund Company (PMDFC)

1. Team Leader
2. Safety Engineer
3. Reporting officer/Inspector

Team Leader

- Approve/ modify devised measures to prevent or mitigate the risks associated with the identified risk sources
- Arrange resources for dealing with potential emergencies including, financial, equipment's and personnel required to deal with emergencies.
- Assure that the Emergency Response plan is adequate, effective and can be implemented practically.

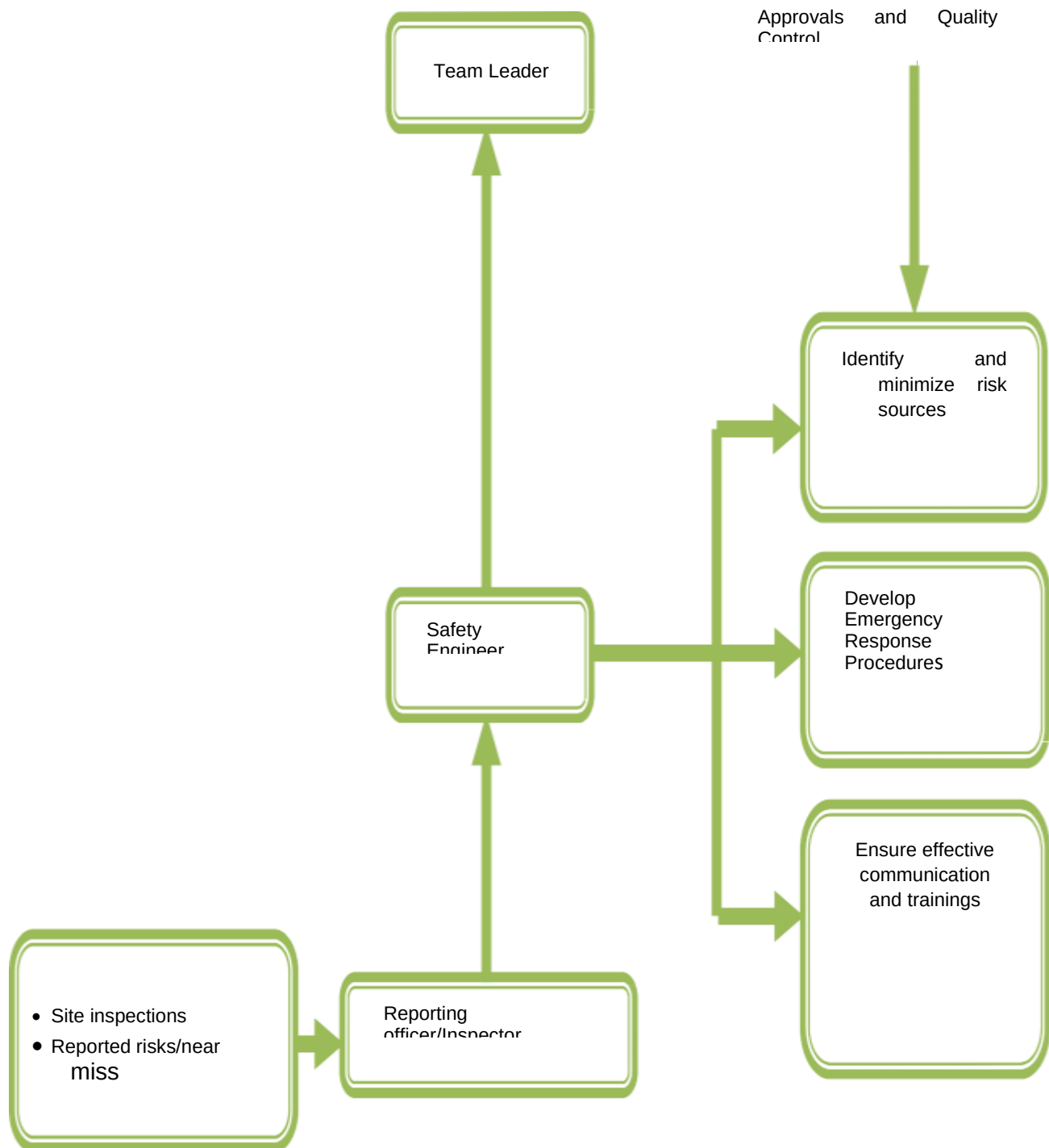
Safety Engineer

- Analyze the Identified risk sources and devise measures to prevent or mitigate the risks in close consultation with the Team Leader;
- Develop and implement the Emergency Response Procedures, in case of the possible emergencies arise;
- Ensure effective internal and external communication; and
- Provide regular trainings and arrange drills to make people aware of dealing with emergencies.

Reporting officer / Inspector

- Regular in sections of the site, to identify potential risks associated with equipment's, materials and work practices;
- Anybody from the site can notify the reporting officer about potential risk and/or near misses on the site;
- Record any identified risks and mitigation measures to control the identified risk; and
- Notify the issue and control measures taken there by to the safety engineer.

The designation, roles and responsibilities of each member shall be clearly defined and communicated to the employees. An outline of the framework of responsibilities is presented in the following organizational chart:



ii. Hazard Identification

A comprehensive identification and evaluation of the hazards /risks likely to cause an emergency shall be done by Emergency Response Team (ERT). Major potential emergencies identified in sewerage projects are as follows:

- Equipment Failure
- Power Outages
- Chemical Spills or Releases
- Flooding
- Inflow and Infiltration
- Biological Upsets
- Security Threats

In an Emergency Response Plan (ERP), hazard identification and risk assessment are crucial components for effectively managing potential hazards. These processes help identify, evaluate, and prioritize hazards based on their probability and magnitude. The vulnerability of assets at risk is also assessed, followed by an impact analysis. Here's a description of the hazard identification and risk assessment tool commonly used in ERP:

Hazard Identification: Hazard identification involves the systematic identification and recognition of potential hazards that may pose a threat to people, property, or the environment. This process typically includes a thorough examination of the facility or area under consideration, analysis of historical data, consultation with subject matter experts, and reference to relevant regulations and standards. The goal is to identify all potential hazards that may be encountered during normal operations or in emergency situations.

Risk Assessment: Risk assessment is the process of evaluating the identified hazards to determine their potential impact and the likelihood of their occurrence. This assessment usually involves two key aspects: probability and magnitude.

Probability: The probability assessment assesses the likelihood of a hazard occurring, considering factors such as historical data, expert judgment, and statistical analysis. It helps in understanding the likelihood of the hazard's initiation or occurrence, ranging from low to high probability.

Magnitude: The magnitude assessment evaluates the potential consequences or severity of a hazard if it were to occur. This assessment considers the potential impact on human health, the environment, property, and any other relevant factors. Magnitude is often categorized on a scale from minor to catastrophic, helping prioritize hazards based on their potential severity.

Vulnerability Assessment: In addition to hazard identification and risk assessment, vulnerability assessment focuses on evaluating the susceptibility or vulnerability of assets at risk. It involves analyzing the characteristics and resilience of the assets and their ability to withstand the impact of potential hazards. This assessment helps identify assets that are more vulnerable and require additional protective measures or mitigation strategies.

Impact Analysis: The impact analysis combines the results of hazard identification, risk assessment, and vulnerability assessment to determine the potential consequences of a hazard event. This analysis provides a comprehensive understanding of the potential

effects on people, infrastructure, the environment, and other critical factors. It helps prioritize response actions, allocate resources effectively, and develop appropriate mitigation strategies.

By employing a robust hazard identification and risk assessment tool, organizations can better understand and prepare for potential hazards, enabling them to develop comprehensive emergency response plans that address the identified risks and vulnerabilities

iii. Prevention and Mitigation

The ERT shall work to eliminate or reduce the impact of identified emergencies and increasing the resilience of an affected community to recover from the consequences of such events. These activities include:

- Design considerations to control flooding, earthquakes and adequate lightening for fog etc.;
- Regular in section and maintenance of construction machinery and the structural integrity;
- Review of work schedules based on weather updates; and
- Security controls based on political situations.

4. Emergency Preparedness

The ERT shall be prepared withal necessary resources and the personnel's shall be trained regularly

i. Resources

Finance and administration

The financial resources shall be reserved for dealing with any emergencies arising onsite during construction and operation. Responsibilities of the person managing there sources in case of emergencies shall be clearly defined and the required resources shall be adequate and updated regularly.

Equipment

All the necessary equipment needed in an event of emergencies shall be made available, as a minimum, the equipment needed include;

- Personal Protective Equipment
- Alarms/Warnings
- Fire extinguishers
- Crowd control, flashlights, signs, barricades
- First Aid Facility
- Detection instruments, e.g. personal alarmkits, smoke detection instruments
- Tools to fix minor vandalism

Communication

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All external and internal communication systems shall be made available. Local emergency numbers shall be clearly posted and communicated to the personnel involved in construction and during operation. The local emergency numbers are given below, which shall be regularly updated.

Emergency Numbers

	Service	Islamabad (051)
1	Ehdi Services	251191
2	Ambulance	115
3	Emergency Police	15
4	Bomb Disposal	9222362
5	Rescue	1122
6	Fire Brigade Center	16
7	Hospital Civil(casualties)	556311

Trainings

Personnel shall be made aware of the importance of safety, potential emergencies and how to respond in case of emergencies. One day training and mock exercise shall be done to prepare, the personnel to deal with emergencies.

5. Emergency Response

Response includes actions taken to reduce the impacts of an emergency event, and to limit the threat to life, property and the environment.

The emergencies can be dealt with:

- On- Site Management of the situation
- Off-site coordination to arrange necessary resources to support the on-site management
- Providing advice and reports of the situation to stake holders

i. Emergency Response Procedure:

Any person can report about an emergency, an on-site worker, an outside agency, or the public. Circumstances change during the course of an emergency in different events, thus, the procedure will vary as per the specific situation on ground. However, a basic action plan to be followed in an emergency is discussed below. This order of response is applicable to almost any emergency and should be followed in sequence.

Assess the situation:

The most important thing to do in case of emergency is to stay calm and avoid panic. Assess the situation, the cause and most immediate requirement to control, limit and/ or manage the immediate, ongoing, or further damage.

Immediate control:

The most senior person on the scene should take control and contact, or delegate someone to contact emergency services as posted and communicated by ERT and inform the reporting officer of ERT and explain the situation. The area of emergency shall be restricted by barricades, tapes and adequate signage, if and as required.

Protection from further losses:

1. Once the site is restricted, to provide protection and reduce further losses, the source causing the emergency shall be controlled including equipment's, materials, environment and accident scene from continuing damage or further hazards to the area and people. e.g.; suppress fire, prevent objects from falling, shutdown equipment or utilities, and take other necessary measures as required depending upon the type of emergency
2. Provide first aid if required or in doing so.
3. Designate people to emergency duties. e.g.: assign personnel to guide emergency services on arrival.
4. Head count People/personnel to identify any missing persons.
5. People/personnel shall be directed to safe location.
6. Arrange diversions for the traffic to reduce disturbance to the flow of traffic, if and as far as possible.
7. Preserve the accident scene until experts mark it safe; only disturb what is essential to maintain life or relieve human suffering and prevent immediate or further losses.

ii. Communication:

Emergency service providers:

The emergency service providers 'need to be kept informed of the situation. On site, personnel from the emergency services shall be guided towards the

emergency scene, brief about the event, ongoing and potential hazards and cause(s), if known.

Emergency Response Team and Management:

Members of ERT shall be immediately informed and the management shall also be kept informed.

Public:

Timely notifications to public shall be disseminated through electronic and print media depending upon the requirement and urgency of the emergency so that they can adopt alternate routes and avoid the hazards associated with the emergency encountered.

Utilities:

In case of disruption of utilities, the utility control authorities shall be immediately contacted to control the situation.

iii. Recovery:

Emergency affected individuals, communities and infrastructure shall be restored in terms of emotional, economic, and physical wellbeing including the following as a minimum:

- A detailed analysis and assessment of causes of emergency, extent of damage and gaps if any, in managing the emergency;
- Recovery/replacement of the assets and infrastructure;
- Rein statement of disrupted services;
- Road and bridge repairs;

Updating safety arrangements and Emergency response procedures to ensure better safety and security in any other arising emergencies.

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Annex K: List of Attendance



PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Project: PCP

Section: ESM

Date: 24/12/2023

PMDFC Meeting with:

Shoaib Gasim Flour Mill Kot Addu

Agenda of the Meeting:

"Public Consultation Session regarding Comprehensive Sewerage Scheme of Kot Addu City"

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
1.	M. Salman Umar	Director	Shoaib Gasim Flour Mills	0333-4053899		
2.	Ch. Akbar AQ	Director	IS	0300-6860070		
3.	WAQAS SHAFI	GIS Officer	M. Kot Addu PMDFC	0321-2002428	nmw@pmdfc.gov.pk	
4.	M. Irfan	DPO ESM	PMDFC	0321-4255525	-	
5.	Humaira Ali	DPO ESS	PMDFC	0319-7352143	-	
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Punjab Municipal Development Fund Company (PMDFC)



PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Project: PCP

Section: ESM

Date: 21/2/2023

PMDFC Meeting with:

Kot Addu Thermal Power Company (KAPCO)

Agenda of the Meeting:

"Public consultation session regarding comprehensive sewerage scheme Kot Addu city"

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
1.	Najam ul Hassan	AM-FS	KAPCO	0308-8745442	najam.hassan@kapco.com.pk	
2.	Saghir Hussain	Principal Engineer	KAPCO	0334-7621808	saghir.hussain@kapco.com.pk	
3.	Bilal Omar	AM-HSE	KAPCO	0331-7095746	Bilal.Omar@kapco.com.pk	
4.	Faham Saghir	operator	KAPCO	0333-6002985	-	
5.	Usair Aziz	operator	KAPCO	0313-740746	-	
6.	NAOBS SHAH	Gis officer	MC Kot Addu	0321-2002428	wasas@mc-kotaddu.gov.pk	
7.	Humaica Ali	DPO ESS	PMDFC	0319-7952103	-	
8.	Muhammed Isfah	DPO ESM	PMDFC	0321-4255575	-	
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Punjab Municipal Development Fund Company (PMDFC)



PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Project: PCP Section: ESM Date: 21/12/2023
 PMDFC Meeting with: Sugar Mills (Fatima + Sheikh Sugar Mill) Kot Addu
 Agenda of the Meeting: Public consultation session at DC office Kot Addu
Regarding Comprehensive Sewerage Scheme of Kot Addu City

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
1.	Sami Ullah	Agm (Administration)	Sheikh Sugar Mills	03006727598	samiullah@sheikhsugarmills.com	
2.	Bazir Gurbani	DGM Administration	Fatima Sugar Mills	03033334199	bazir.gurbani@fatimasugarmills.com	
3.	M. Irfan	DPO ESM	PMDFC	03214255575	-	
4.	Waqas Shafi	Gis Officer	MC Kot Addu PMDFC	0321-2002428	waqasgk@mc-kotaddu.com	
5.	Humaira Ali	DPO ESS	PMDFC	0319-7352103	humaira@pmdfc.com	
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Punjab Municipal Development Fund Company (PMDFC)



PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Project: PCP Section: ESM Date: 21/12/2023

PMDFC Meeting with: Lalpir Thermal Power Plant Kot Addu

Agenda of the Meeting: Public Consultation session regarding Comprehensive Sewerage Scheme of Kot Addu City

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
1.	Naveed Anjum	Deputy Manager Lalpir Power	Lalpir Power	0346-9993965	naveed.anjum@lalpir.com	
2.	M. YOUSAF	Sr. Admin Officer Lalpir	Lalpir	0346-0002999	yousaf@lalpir.com	
3.	Humaira Ali	DPO (ESS)	PMDFC	0319-735265	-	
4.	NAOBS SHAFF	GIS Officer	MC Kot Addu PMDFC	0321-2502428	naobs.sha@pmdfc.com	
5.	Muhammad Irfan	DPO ESM	PMDFC	0321-4255575	-	
6.	Rizwan Akram	DM EHS	Lalpir Power Ltd	0346-9990015	rizwan.akram@lalpir.com	
7.	Hamid Kamran	HSE	"	0304-757335	hamid.kamran@lalpir.com	
8.	Muhammad Durr	Plant Operator	"			
9.	Tahir	Plant Supervisor	"	0302-7314494	-	
10.						
11.						
12.						

EIA/ESIA of Comprehensive Sewerage Scheme of Kot Addu City

Punjab Municipal Development Fund Company (PMDFC)

PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Project: PCP Section: E&SM Date: 12-12-2023

PMDFC Meeting with: Govt Officials

Agenda of the Meeting: Stakeholder Consultation

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
1.	Munawar Abbas Birkhail	DC Kot Addu		0662550385 0662550379		Munawar
2.	Rizwana Anjum	SPO	PMDFC			
3.	Tehmina Kiani	P.O	PMDFC			Ty. S.
4.	Munawar Anshad	EA	PMDFC	03094473123	munawar.anshad@pmdfc.com	
5.	HASSAN ALI	DPO-SS	PMDFC	0305281505	hassan.ali@pmdfc.com	
6.	Munawar Ali	DPO-Env	PMDFC	0301-9255035		
7.	Tehmina Kiani	PO-ES&S	PMDFC	03094655154	tehminkaiani@pmdfc.com	Ty. S.
8.	Munawar Anshad	ADP/PS DC Kot Addu	DC Kot Addu	0300787778	munawar.anshad@kotaddu.gov.pk	
9.	Rasheed Ahmad	President	Madani Women	03336003932	rasheed.ahmad@kotaddu.gov.pk	

PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
10.	RAFIK AHMED ANJUM	MOEPS	MC Kot Addu	03136187203		
11.	Nadeem	S.E	MC Kot Addu	03007591110		
12.	Amrullah	Senior Project Manager	SPO	03007805302	amrullah@pmdfc.com	
13.	Pasoor Ali	Program Manager	SPO	030449502773	pasoor.ali@pmdfc.com	
14.	ARIF JABEEN	S.W.O.	Spill/Water and Sewerage	03006772331	arif.jabeen@pmdfc.com	
15.	Muhammad Asif	SDO	Irrigation	0332-9823333		
16.	Osama Zaidi	Rescue	Rescue 1122	0300-6161122	osama.zaidi@kotaddu.gov.pk	
17.	Mujibul IQBAL	ADP (Env)	Agriculture	0300-7816551	mujibul.iqbal@kotaddu.gov.pk	
18.	Adnan Khan	Inspector	Environmental Protection Agency	0333-600080		
19.	Yousaf Jamil	PS to Deputy Commissioner	DC Office	03007805060		
20.	Munawar Anshad	Forest	Rural Forest Officer	0300-6861787		
21.	Munawar Anshad	PMDFC	PMDFC	0321-2002428	munawar.anshad@pmdfc.com	
22.	Munawar Anshad	Forest	Forest	03017627074		

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PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

Attendance Sheet

Sr. No	Name	Designation	Organization	Contact No	Email	Signature
10.	HAFIZ M USMAN ASLAM	MO & PS	MDC Kot Addu	03136187203		
11.	Nadeem	S E	MDC Kot Addu	03007591010		
12.	Arman Singh	Senior Project Manager	SPG	0983-7815302	Arman@spg.gov.pk	
13.	Poos Ali	Program Manager	SPG	0344 9522795	Arman@spg.gov.pk	
14.	ARIF JAFEE	S.W.O.	Spd / Welfare and Govt. Serv	0300672331	arifjafee@yahoo.com	
15.	Muhammad ASIF	SDO	Irrigation Tarehna Barrage	0332-9823333		
16.	Osama Zashan	Rescue Rescue office	Rescue 1122	0300-6161122	osamazashan@gmail.com	
17.	Mujahid IQBAL	ADP Q-12 Kot Addu	Agriculture	0345-7816155	Mujahid.Iqbal@psd.gov.pk	
18.	Aftab Khan	Inspector	Environmental Protection Agency	0333-6001180		
19.	Yasir Javed	PS to Deputy Commr.	DC Office	03337005060		
20.	M Nadeem Ashad	Forest	Range Forest Officer	0300-6861787		
21.	Wajid Shafi	PMDFC Consultant	PMDFC	0321-2002428	wajidshafi@gmail.com	
22.	Shahid Ali	Project Lead		0317427774		