

## Punjab Rural Municipal Services Company

### “Engineering Design & Construction Supervision, Punjab Rural Sustainable Water Supply & Sanitation Project, Cluster South-1”



### Environmental Impact Assessment (EIA) Report for Water Supply & Sanitation Services System in Revenue Villages Tehsil Liaquatpur District Rahimyar Khan

**June, 2026**

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## LIST OF ABBREVIATION

|                          |                                                        |
|--------------------------|--------------------------------------------------------|
| $\mu\text{g}/\text{m}^3$ | Micrograms per Cubic Metre                             |
| ABR                      | Anaerobic Baffled Reactor                              |
| AoI                      | Area of Influence                                      |
| BCC                      | Behaviour Change Communication                         |
| BOD                      | Biochemical Oxygen Demand                              |
| BoQ                      | Bill of Quantities                                     |
| CBO                      | Community-Based Organization                           |
| CDWP                     | Central Development Working Party                      |
| CEO                      | Chief Executive Officer                                |
| CO                       | Carbon Monoxide                                        |
| CO <sub>2</sub>          | Carbon Dioxide                                         |
| COD                      | Chemical Oxygen Demand                                 |
| DO                       | Dissolved Oxygen                                       |
| E&S                      | Environmental and Social                               |
| EC                       | Electrical Conductivity                                |
| ECNEC                    | Executive Committee of the National Economic Council   |
| EDCS                     | Engineering Design & Construction Supervision          |
| EDSC                     | Engineering Design and Supervision Consultant          |
| EIA                      | Environmental Impact Assessment                        |
| EMP                      | Environmental Management Plan                          |
| EP&CCD                   | Environmental Protection and Climate Change Department |
| EPA                      | Environmental Protection Agency                        |
| ESC                      | Environmental and Social Cell                          |
| ESMP                     | Environmental and Social Management Plan               |
| GBV                      | Gender-Based Violence                                  |



|                  |                                                     |
|------------------|-----------------------------------------------------|
| GIS              | Geographic Information System                       |
| GRC              | Grievance Redress Committee                         |
| GRM              | Grievance Redress Mechanism                         |
| H <sub>2</sub> S | Hydrogen Sulphide                                   |
| ha               | Hectare                                             |
| HSE              | Health, Safety and Environment                      |
| HI               | High Impact                                         |
| IEE              | Initial Environmental Examination                   |
| ILO              | International Labour Organization                   |
| km               | Kilometre                                           |
| L                | Litre                                               |
| LI               | Low Impact                                          |
| LG&CDD           | Local Government & Community Development Department |
| m                | Metre                                               |
| m <sup>3</sup>   | Cubic Metre                                         |
| mg/L             | Milligrams per Litre                                |
| mm               | Millimetre                                          |
| MVS              | Multi-Village Scheme                                |
| MI               | Moderate Impact                                     |
| NEQS             | National Environmental Quality Standards            |
| NGO              | Non-Governmental Organization                       |
| NO <sub>2</sub>  | Nitrogen Dioxide                                    |
| NOC              | No Objection Certificate                            |
| OHR              | Overhead Reservoir                                  |
| OHS              | Occupational Health and Safety                      |
| OP               | Operational Policy                                  |
| PAD              | Project Appraisal Document                          |



|                   |                                                              |
|-------------------|--------------------------------------------------------------|
| PC-I              | Planning Commission Form-I                                   |
| PEPA              | Punjab Environmental Protection Agency                       |
| pH                | Potential of Hydrogen                                        |
| PIMU              | Project Implementation and Monitoring Unit                   |
| PKR               | Pakistani Rupee                                              |
| PM <sub>10</sub>  | Particulate Matter ( $\leq 10 \mu\text{m}$ )                 |
| PM <sub>2.5</sub> | Particulate Matter ( $\leq 2.5 \mu\text{m}$ )                |
| PMIU              | Program Monitoring and Implementation Unit                   |
| PPE               | Personal Protective Equipment                                |
| PRMSC             | Punjab Rural Municipal Services Company                      |
| PRSWSSP           | Punjab Rural Sustainable Water Supply and Sanitation Project |
| PI                | Positive Impact                                              |
| RO                | Reverse Osmosis                                              |
| SDU               | Service Delivery Unit                                        |
| SO <sub>2</sub>   | Sulphur Dioxide                                              |
| STP               | Sewage Treatment Plant                                       |
| TDS               | Total Dissolved Solids                                       |
| TOR               | Terms of Reference                                           |
| TSP               | Total Suspended Particulates                                 |
| TSS               | Total Suspended Solids                                       |
| VC                | Village Council                                              |
| VLD               | Voluntary Land Donation                                      |
| VO                | Village Organization                                         |
| WASH              | Water, Sanitation and Hygiene                                |
| WB                | World Bank                                                   |
| WWTP              | Wastewater Treatment Plant                                   |



## GLOSSARY

### Glossary of Terms

| Term                                            | Definition                                                                                                                   |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Area of Influence (Aoi)                         | The area likely to be affected directly or indirectly by project activities.                                                 |
| Anaerobic Baffled Reactor (ABR)                 | A wastewater treatment system that uses anaerobic processes to remove pollutants from sewage.                                |
| Baseline Environment                            | Existing environmental and social conditions before project implementation.                                                  |
| Environmental Impact Assessment (EIA)           | A systematic process for identifying, predicting, and evaluating the environmental impacts of a proposed project.            |
| Environmental and Social Management Plan (ESMP) | A plan outlining mitigation, monitoring, and management measures to address project impacts.                                 |
| Groundwater                                     | Water stored beneath the earth's surface in soil and rock formations.                                                        |
| Overhead Reservoir (OHR)                        | Elevated water storage structure used for water distribution and pressure maintenance.                                       |
| Public Standpost                                | A communal water collection point serving households without direct water connections.                                       |
| Sewerage System                                 | A network of pipes and facilities used for collection and conveyance of wastewater.                                          |
| Sewage Treatment Plant (STP)                    | A facility designed to treat wastewater before disposal or reuse.                                                            |
| Soakage Pit                                     | A subsurface structure used for infiltration and disposal of treated wastewater.                                             |
| Stakeholder                                     | Any individual, group, or organization affected by or interested in the project.                                             |
| Mitigation Measure                              | An action taken to avoid, minimize, reduce, or compensate for adverse impacts.                                               |
| Occupational Health and Safety (OHS)            | Measures and procedures to protect workers from workplace hazards.                                                           |
| Community Health and Safety                     | Protection of local communities from risks associated with project activities.                                               |
| Environmental Monitoring                        | Periodic measurement and evaluation of environmental parameters to ensure compliance with standards and mitigation measures. |
| Grievance Redress Mechanism (GRM)               | A formal process for receiving, addressing, and resolving complaints related to the project.                                 |
| Environmental Clearance (NOC)                   | Approval issued by the Environmental Protection Agency permitting project implementation subject to specified conditions.    |



## **ES. EXECUTIVE SUMMARY**

### **ES-1. Introduction**

The Local Government & Community Development Department (LG&CDD), Government of Punjab, through the Punjab Rural Municipal Services Company (PRMSC), is implementing the Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) with financial assistance from the World Bank. The project aims to improve access to safe drinking water, sanitation facilities, and hygiene services in rural areas of Punjab.

Following the successful completion of the pilot phase, the project has been expanded to additional villages across Punjab. For implementation, the project area has been divided into five geographical clusters, and Engineering Design and Supervision Consultants (EDSCs) have been engaged to prepare detailed designs and environmental and social safeguard documents.

This Environmental Impact Assessment (EIA) has been prepared for the proposed water supply and sanitation interventions in 193 villages of Tehsil Liaquatpur under the PRSWSSP. The assessment has been conducted in accordance with the applicable World Bank environmental and social requirements, the Pakistan Environmental Protection Act, 1997, and the Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations, 2022.

### **ES-2. Project Location**

The study area under Cluster South-1 comprises Tehsil Liaquatpur, located in Rahim Yar Khan District, Punjab, Pakistan. The tehsil is situated approximately 90 km northeast of Rahim Yar Khan City on the eastern side of the Indus River. Liaquatpur lies at an average elevation of approximately 96 m (315 ft) above mean sea level (AMSL) and is geographically located at approximately 28°56'07"N, 70°57'03"E.

### **ES-3. Project Proponent**

The Punjab Rural Municipal Services Company (PRMSC) through its Chief Executive Officer (CEO), is the proponent of the project.

### **ES-4. The Consultant**

M/S ALTER ULUSLARARASI MUHENDISLIK VE MUSAVIRLIK HIZMETLERI A.S.

### **ES-5. Project Description**

The villages selected for this subproject will be provided with Water Sanitation and Hygiene (WASH) facilities. The subproject involves provision of water supply, sewerage, overhead tanks & Pumping stations with sewage treatment.

The water supply system is planned based on groundwater quality and village size. In areas with adequate underground sweet water and a relatively large number of houses, a complete water supply scheme will be provided, including a tube well, OHR, and transmission network as per demand. In smaller villages where sweet water pockets are limited, water supply will





be provided through standposts. In areas where groundwater is brackish, RO plants will be installed to ensure safe drinking water.

The sewerage system is planned with multiple service options based on housing density, groundwater table depth, and local topography. In areas with a higher number of houses and where the groundwater table is not shallow, a conventional sewerage system will be provided, along with an ABR for treatment of wastewater prior to discharge. In areas with fewer houses, narrow streets, and shallow groundwater conditions, open drains will be provided to improve sanitation.

A hybrid system is introduced in which sewers are laid along main roads, while secondary drains from narrow streets discharge into these sewers. This approach is based on lessons learned from the pilot phase, where excavation in narrow streets caused damage to adjacent house walls. In low-density areas, communal septic tanks are proposed for wastewater treatment, with final discharge to nearby drains, watercourses, or ponds; where groundwater is deep, communal soakage pits will also be provided.

The estimated total cost of the project for the proposed 193 villages are **27,283.128 million PKR**. Total man power required on site for proposed Project will be approximately 08-30 workers per day per village in construction phase.

#### **ES-6. Need for EIA**

The proposed project involves the construction of water supply and sewerage infrastructure, including tube wells, overhead reservoirs (OHRs), standposts, wastewater treatment facilities, and septic tanks with soakage pits in the rural villages of Tehsil Liaquatpur. The project is expected to have only temporary and manageable environmental impacts during construction, such as dust, noise, and traffic disturbance. No involuntary resettlement is anticipated, as the proposed facilities will be constructed on government-owned land. Where private land is required, it will be obtained through Voluntary Land Donation (VLD).

According to the Punjab EPA Review of IEE and EIA Regulations, 2022, the project falls under Schedule II, Category F (Water Supply, Sewerage System and Treatment) and therefore requires an Environmental Impact Assessment (EIA). This EIA has been prepared to identify potential environmental and social impacts and recommend appropriate mitigation measures.

#### **ES-7. Legal Framework**

This section presents the environmental policies, legal requirements, and administrative framework applicable to the proposed project in Tehsil Liaquatpur. It summarizes the relevant national, provincial, and World Bank environmental requirements to be followed during project implementation.

#### **ES-8. Stakeholder Consultation**

Stakeholder engagement is an integral part of the project's Environmental and Social Assessment. Public consultations were conducted using various methods, including



community meetings, rapid participatory appraisals, and site visits, to understand stakeholders' views and concerns regarding the proposed project.

A wide range of stakeholders, including project staff, government officials, community representatives, and local residents, were consulted to identify the potential environmental and social impacts, risks, and challenges associated with the project. The key concerns raised by the local communities are presented in Table ES-1.

**Table ES-1: Concerns Raised by Locals and Their Response**

| Sr. No | Concerns Raised                                                                                                                                                    | Locations            | Response                                                                                                                                                                                                                                           |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.     | Will employment opportunities be generated for locals during the construction phase?                                                                               | All project villages | It will be made sure that 75% of the workforce will be employed from the sub-project area.                                                                                                                                                         |
| 2.     | Arrangements should be made to suppress dust, curtail high-noise activities, and control the vibrations caused due to machinery, to protect the community's health | All project villages | Regular sprinkling of water will be carried out over the loose soil to suppress the dust, the noisy activities will not be planned at night and the community will be informed before the execution of any activity that would generate vibrations |
| 3.     | Privacy of people should be upheld during construction phase of the sub-project.                                                                                   | All project villages | Contractor will provide trainings to workers regarding gender and privacy issues.                                                                                                                                                                  |
| 4.     | Construction activities should be minimized during schools' opening and closing times.                                                                             | All project villages | Contractor will be bound to minimize construction activities during schools' opening and closing times.                                                                                                                                            |
| 5.     | Will there be any closure of roads during construction phase?                                                                                                      | All project villages | In case of road closures, the nearby community will be informed beforehand and alternative routes will be provided.                                                                                                                                |
| 6.     | Solid waste production during construction time is a major concern and that should not be piled up in the project area.                                            | All project villages | The construction and other waste generated at the site shall be collected, stored and transported to the final disposal site by the contractor on daily basis.                                                                                     |
| 7.     | Will there be any tree cutting?                                                                                                                                    | All project villages | No, no trees will be cut during the execution of the project.                                                                                                                                                                                      |

#### **ES-9. Summary of Major Impacts**

The proposed project is expected to generate mostly temporary and site-specific impacts during the construction phase. Major adverse impacts include dust emissions, noise and vibration, traffic disruption, soil erosion, construction and hazardous waste generation, wastewater discharge, occupational and community health and safety risks, temporary disturbance to local residents, and increased pressure on local resources. These impacts can be effectively mitigated through the implementation of the Environmental and Social Management Plan (ESMP).

During the operation phase, the potential impacts include improper management of wastewater treatment facilities, sludge and solid waste generation, risks to groundwater and surface water quality, odour, occupational health and safety issues, and emergency



situations. These impacts are expected to remain minor with proper operation, maintenance, and environmental monitoring.

The project will also generate significant positive impacts, including improved access to safe drinking water, enhanced sanitation and hygiene, reduced incidence of waterborne diseases, improved public health, employment opportunities during construction, and an overall improvement in the quality of life and socio-economic conditions of the project villages.

#### **ES-10. Environmental and Social Management and Monitoring Plan**

Recommended mitigation measures to control potential adverse impacts are described in this Environmental and Social and Management Plan (ESMP). ESMP shall become the part of construction contract agreement and shall be strictly enforced during the implementation of the proposed project.

The proponent PRMSC will be responsible for compliance of with environmental and social safeguard requirements of the proposed project.

The proposed project activities will be monitored and managed by the PRMSC. The Environmental and Social Cell (ESC) staffed by qualified environmental and social specialists has already been established under PRSWSSP. The ESC will be the custodian of the ESMP. ESC will support ensuring the compliance of ESMP. ESC will submit progress reports for the implementation of the ESMP to WB and PEPA as per environmental approval/ NOC conditions for the PRSWSSP.

#### **ES-11. Grievance Redress Mechanism (GRM)**

The Grievance Redressal Mechanism (GRM) will be consistent with the requirements of the World Bank safeguard policies to ensure the mitigation of community concerns, risk management, and maximization of environmental and social benefits. The overall objective of the GRM is therefore to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the village level.

The PRMSC at the Local Government & Community Development Department (LG&CDD) level will serve as the Secretariat for the Grievance Redressal Committee (GRC Directorate) that will be responsible for providing oversight on the entire GRM process at a strategic level and monitoring complaints management.

The complaints may be lodged through:

- Tracking complainant(s) from subprojects sites (field and community level) to PRMSC;
- Dedicated staff to update the database routinely;
- Promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism;
- Processes for informing stakeholders about the status of a case; and
- Procedures to retrieve data for reporting purposes, including the periodic reports, from Village and Tehsil and document them into the monthly progress reports at PRMSC.



**Tier I: Village Level –Panchayat/Village Councils (VC)** made under Punjab Local Government (Amendment) Ordinance 2021 will act as the 1st Tier of GRM at the village/community level. Since VCs are not functional, the Project Appraisal Document (PAD) recommends establishment of informal Village Organizations (VOs) in lieu of VCs until formal VCs are elected. This informal VO will comprise of nine (09) members including a chairperson. All the members of the VO will be elected by the village community except a line department's representative and a BCC Officer of the PRMSC. These non-elected members are part of the VOs to give credence/ recognition to the VO. Moreover, the BCC Officer will forward the unaddressed complaints to the Tier-II of the GRC.

**Tier II: Grievance Redress Committee (GRC-Tehsil Level)** in SDU-TO will be established for each tehsil that will manage GRM aspects for all sub-project locations in each tehsil including decisions to be taken, actions and monitoring of complaints resolution at the sub-project level. GRC-II, Tier-II comprises of nine (09) members. Respective Tehsil Manager will spearhead the Tier-II. Moreover, to ensure community participation in the Tier-II, the chairperson of the concerned village – from where the complaint is lodged – will also be a member.

**Tier III: PIMU Level-GRC at PMIU (LG&CDD)** will be responsible to oversee the overall functions of the GRM at a strategic level including monthly review. GRC Tier-III will comprise of nine (09) members. The Project Director / Chief Executive Officer, PRMSC, will spearhead the Tier-III. Moreover, to ensure community participation in the Tier-III, the chairperson of the concerned village – from where the complaint is lodged – will also be a member.

#### **ES-12. Environmental Budget**

The total estimated cost for the implementation of ESMP is worked out to be about **PKR 293.470 million rupees or 1.04 million US\$<sup>1</sup>**.

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<sup>1</sup> 1 US\$ = 281.55 PKR



## SECTION -1 INTRODUCTION

The Local Government & Community Development Department (LG&CDD), Government of Punjab, through the Punjab Rural Municipal Services Company (PRMSC), is implementing the Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) with support from the World Bank. The project aims to provide safe drinking water, improve sanitation services, promote hygiene behavior, and strengthen community capacity in rural areas of Punjab.

Initially, the Executive Committee of the National Economic Council (ECNEC) approved a pilot phase covering 200 villages (10% of the total project scope) to assess the project's feasibility and sustainability. Based on the successful implementation and lessons learned from the pilot phase, the Central Development Working Party (CDWP) approved the expansion of the project to the remaining 1,800 villages on 12 December 2024.

For implementation of the remaining scope, PRMSC divided the project area into five geographical clusters and engaged Engineering Design and Supervision Consultants (EDSCs) to prepare feasibility studies, detailed engineering designs, PC-I documents, and environmental and social safeguard instruments.

This Environmental Impact Assessment (EIA) has been prepared for the proposed water supply and sanitation interventions in 193 villages of Tehsil Liaquatpur under the PRSWSSP. The assessment has been carried out in compliance with the applicable World Bank environmental and social safeguards, the Pakistan Environmental Protection Act, 1997, and the relevant environmental regulations and guidelines of the Punjab Environmental Protection Agency (EPA), Government of Punjab.

### 1.1 Project Background

Punjab is the most populous province of Pakistan with 110 million inhabitants out of which 70 million reside in rural areas<sup>2</sup>. The people living in rural areas of Punjab lack access to improved water and sanitation facilities which contribute to child stunting, malnutrition and water borne diseases. Poor condition of Water, Sanitation and Hygiene (WASH) not only affects the health of masses, but it also adversely affects the economic growth of the region.

Poverty and Shared Prosperity Report, 2020<sup>3</sup> reveals that 4 out of 5 people live below the international poverty line in rural areas. Studies conducted in different periods of time have linked improved water and sanitation facilities with the alleviation of poverty.

Despite making significant efforts by successive governments to improve the prevailing situation, 44% population of Punjab still does not have access to improved water and sanitation facilities as per globally established standards. Rural settlements of Punjab, which hold 73% of the province's population living in 23,000 revenue villages, are in dire need of investments to improve WASH. Reports show that 3 in 5 households in Punjab use E-Coli contaminated water and every 25<sup>th</sup> household in Punjab lacks access to the improved sources of drinking water. Similarly, the situation of sanitation is also immensely deplorable.

Outcomes of various studies and sector assessments have identified requirements for improving climate resilience and planned economic growth of 2,000 villages that will be part

<sup>2</sup> [https://pwd.punjab.gov.pk/population\\_profile](https://pwd.punjab.gov.pk/population_profile)

<sup>3</sup> <https://www.worldbank.org/en/publication/poverty-and-shared-prosperity-2020>





of the project. Poverty, water contamination, stunting, and sanitation condition of the areas have been taken as basic parameters for the selection of project sites/tehsils.

The Government of Punjab, with the assistance of the World Bank, will finance complete detailed engineering designs through Engineering, Design & Supervision Consultancy Services (EDCS) under the pilot phase project in the revenue villages of six (06) Geographical based Clusters of selected districts. The services will assist in; (i) design documentation, including Sub-scheme/Project Document (PC-I), Bill of Quantities, for water supply and sanitation services to achieve economies of scale and desired results, and (ii) resident supervision of infrastructure development.

The PRMSC has adopted a phase wise approach for designing of villages, to fast track the implementation of the project in each cluster. The names of the 193 villages falling within Cluster South-I are listed below in Table 1.1.

**Table 1.1: Name of the Reveue Villagese Falling within Cluster South-I**

| Sr. # | Name of Village     | Sr. # | Name of Village  | Sr. # | Name of Village |
|-------|---------------------|-------|------------------|-------|-----------------|
| 1     | Chak 140 Abbsia     | 28    | Chak 313/6R      | 55    | Chak 186 / 7 R  |
| 2     | Chak 51 Abbsia      | 29    | Chak 134 NP      | 56    | Chak 19 Abbasia |
| 3     | Chak 53 Abbasia     | 30    | Chak 135 NP      | 57    | Chak 191 / 1L   |
| 4     | Chak No 02 Abbasia  | 31    | Chak136 NP       | 58    | Chak 194 / 1L   |
| 5     | Chak No 06 Abbasia  | 32    | Chak 139 NP      | 59    | Chak 195 / 1L   |
| 6     | Chak No 07 Abbasia  | 33    | Chak 140 NP      | 60    | Chak 20 Abbasia |
| 7     | Chak No 10 Abbasia  | 34    | Chak 143 Abbasia | 61    | Chak 22 Abbasia |
| 8     | Chak No 13 Abbasia  | 35    | Chak 144 Abbasia | 62    | Chak 23 Abbasia |
| 9     | Chak No 138 Abbasia | 36    | Chak 145 Abbasia | 63    | Chak 28 Abbasia |
| 10    | Chak No 139 Abbasia | 37    | Chak 147 / 5R    | 64    | Chak 31 Abbasia |
| 11    | Chak No 14 Abbasia  | 38    | Chak 148 / 5R    | 65    | Chak 32 Abbasia |
| 12    | Chak No 142 Abbasia | 39    | Chak 150 Abbasia | 66    | Chak 33 Abbasia |
| 13    | Chak No 15 Abbasia  | 40    | Chak 152 / 7R    | 67    | Chak 36 Abbasia |
| 14    | Chak No 16 Abbasia  | 41    | Chak 153 / 7R    | 68    | Chak 37 Abbasia |
| 15    | Chak No 27 Abbasia  | 42    | Chak 154 / 7R    | 69    | Chak 38 Abbasia |
| 16    | Chak No 52 Abbasia  | 43    | Chak 155 / 7R    | 70    | Chak 39 Abbasia |
| 17    | Chak No 54 Abbasia  | 44    | Chak 156 / 7R    | 71    | Chak 3 A        |
| 18    | Chak No 55 Abbasia  | 45    | Chak 157 / 7R    | 72    | Chak 40 Abbasia |
| 19    | Ahmed Yar           | 46    | Chak 159 / 7R    | 73    | Chak 41 Abbasia |
| 20    | Arif Baloch         | 47    | Chak 174 / 7R    | 74    | Chak 42 Abbasia |
| 21    | Chak 315 / 6R       | 48    | Chak 175 / 7R    | 75    | Chak 43 Abbasia |
| 22    | Chak 316 / 6 R      | 49    | Chak 177 / 7R    | 76    | Chak 46 Abbasia |
| 23    | Chak 317/6R         | 50    | Chak 178 / 7R    | 77    | Chak 47 Abbasia |
| 24    | Chak 08 Abbasia     | 51    | Chak 179 / 7R    | 78    | Chak 48 Abbasia |
| 25    | Chak 09 Abbasia     | 52    | Chak 180 / 7R    | 79    | Chak 4 A        |
| 26    | Chak 11 Abbasia     | 53    | Chak 182 / 1L    | 80    | Chak 63 Abbasia |
| 27    | Chak 12 Abbasia     | 54    | Chak 183 / 7 R   | 81    | Chak 64 Abbasia |



| Sr. # | Name of Village    | Sr. # | Name of Village     | Sr. # | Name of Village   |
|-------|--------------------|-------|---------------------|-------|-------------------|
| 82    | Chak 65 Abbasia    | 117   | Chak No. 117 NP     | 152   | Gul Muhammad Lar  |
| 83    | Chak 68 Abbasia    | 118   | Chak No. 118 NP     | 153   | Gulani            |
| 84    | Chak 69 Abbasia    | 119   | Chak No. 119 NP     | 154   | Haroon Abad       |
| 85    | Chak 75 Abbasia    | 120   | Chak No. 119-A- NP  | 155   | Hussain Abad      |
| 86    | Chak 77 Abbasia    | 121   | Chak No. 120 NP     | 156   | Jhoung Bilawal    |
| 87    | Chak 78 Abbasia    | 122   | Chak No. 121 NP     | 157   | Juma Muhana       |
| 88    | Chak 79 Abbasia    | 123   | Chak No. 122 NP     | 158   | Kandani           |
| 89    | Chak 80 Abbasia    | 124   | Chak No. 123 NP     | 159   | Kotla Daulat      |
| 90    | Chak 81 Abbasia    | 125   | Chak No. 124 NP     | 160   | Kotla Mubarik     |
| 91    | Chak 82 Abbasia    | 126   | Chak No. 125 NP     | 161   | Kotla Nawab       |
| 92    | Chak 83 Abbasia    | 127   | Chak No. 126 NP     | 162   | Kotla Niazi       |
| 93    | Chak 84 Abbasia    | 128   | Chak No. 127 NP     | 163   | Lakhani           |
| 94    | Chak 85 Abbasia    | 129   | Chak No. 128 NP     | 164   | Lal Shah          |
| 95    | Chak 86 Abbasia    | 130   | Chak No. 129 NP     | 165   | Laoon Wala        |
| 96    | Chak 87 Abbasia    | 131   | Chak No. 130 NP     | 166   | Malhani           |
| 97    | Chak 88 Abbasia    | 132   | Chak No. 131 NP     | 167   | Malikpur          |
| 98    | Chak 89 Abbasia    | 133   | Chak No. 132 NP     | 168   | Malkani           |
| 99    | Chapri Chatan Shah | 134   | Chak No. 133 NP     | 169   | Metla             |
| 100   | Gulshan Farid      | 135   | Chak No. 137 NP     | 170   | Mir Muhammad Lar  |
| 101   | Hayat Lar          | 136   | Chak No. 138 NP     | 171   | Muhammad Daha     |
| 102   | Kanjki Wala        | 137   | Chak No. 34 Abbasia | 172   | Mujawraan         |
| 103   | Kotla Daraigh      | 138   | Chak No. 35 Abbasia | 173   | Nala Musani       |
| 104   | Kotla Khairay Khan | 139   | Chanjni             | 174   | Pakhi War         |
| 105   | Muradpur Sail      | 140   | Chohan              | 175   | Pararan Sharif    |
| 106   | Taranda Gurgujj    | 141   | Choudari            | 176   | Qadu Wali         |
| 107   | Turkary            | 142   | Chur Wala           | 177   | Rais Pathan       |
| 108   | Firoza             | 143   | Duda Naich          | 178   | Rashid Abad       |
| 109   | Ahmed Ali Lar      | 144   | Gabrani             | 179   | Rindan            |
| 110   | Allah Dita Bhela   | 145   | Gharib Shah         | 180   | Sadiqpur          |
| 111   | Allah Jiwaya Lar   | 146   | Ghemi               | 181   | Saidpur           |
| 112   | Ashraf Shah        | 147   | Ghuka               | 182   | Shahbazpur Gharbi |
| 113   | Bahan Wala         | 148   | Goth Amin           | 183   | Shamsabad         |
| 114   | Bahar Khaki        | 149   | Goth Hayat          | 184   | Shidani Sharif    |
| 115   | Chak No. 116 NP    | 150   | Goth Mahi           | 185   | Talbani           |
| 116   | Chak No. 116-A- NP | 151   | Gous Abad           | 186   | Tanwari           |

| Sr. # | Name of Village | Sr. # | Name of Village | Sr. # | Name of Village |
|-------|-----------------|-------|-----------------|-------|-----------------|
| 187   | Trinda Mir Khan | 190   | Wahid Bux Sial  | 193   | Unran           |
| 188   | Ther Posti      | 191   | Yakhtar Maha    |       |                 |
| 189   | Tibbi Sayyadan  | 192   | Zaffar Abad     |       |                 |

## 1.2 Project Location

The study area under Cluster South-1 comprises Tehsil Liaquatpur, located in Rahim Yar Khan District, Punjab, Pakistan. The tehsil is situated approximately 90 km northeast of Rahim Yar Khan City on the eastern side of the Indus River. Liaquatpur lies at an average elevation of approximately 96 m (315 ft) above mean sea level (AMSL) and is geographically located at approximately 28°56'07"N, 70°57'03"E. The location map of the project area is presented in Figure 1.1.



**Figure 1.1: Location Map of the Project Area**

## 1.3 Project Categorization

Environmental clearance from the Environmental Protection and Climate Change Department (EP&CCD), Punjab is mandatory according to the Punjab Environmental Protection Act, 2012. Section 12 (1) of the Act states that:

*"No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof."*

As per Punjab Environmental Protection Agency (PEPA) Review of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Regulations 2022, Schedule-II, EIA is required for 'Water Supply, Sewerage System and Treatment (Category F).

## 1.4 Objective of the EIA

The objective of this EIA is the identification of possible environmental and social impacts of the proposed project on both short and long-term bases. Based on the level and nature of these observations, the EIA delineates proper mitigation measures. As a planning tool, the EIA aims to ensure that environmental, socio-economic, and cultural issues throughout the





entire project lifecycle are anticipated and considered by the project proponent. It also serves as a framework for establishing project controls to reduce or prevent adverse environmental or socio-economic impacts.

The specific objectives of this EIA are:

- To assess the existing environmental and socioeconomic conditions of the project area;
- To identify potential impacts of the proposed interventions on the environmental, ecological, and social aspects of the project area, to predict and evaluate these impacts and determine their significance;
- To propose appropriate mitigation measures that should be incorporated in the design of the project to avoid or minimize (if cannot eliminate) the potentially adverse impacts;
- To assess the compliance status of the proposed activities with respect to the national and provincial environmental legislation and WB's OPs;
- To provide institutional, monitoring, reporting, and documentation measures for environmental safeguards compliance; and estimated costs for implementing these measures; and
- To help decision-makers in taking informed decisions.

### 1.5 Scope of EIA

The EIA identifies the potentially significant impacts of the proposed project and suggests the applicable mitigation measures to avoid, minimize or reduce the magnitude of the impacts. It will also indicate the institutional and training requirements to implement mitigation measures during the construction and operation of the proposed project.

The current EIA presents a preliminary roadmap for the environment and social management for the construction and operation of the water supply scheme, sewerage network and sewage treatment plant (STP) in all 193 Revenue villages in the tehsil Liaquatpur.

### 1.6 Contractual Requirements / Obligations of EIA

The impacts and their mitigation measures, summarized in EIA, will be part of the Bidding Documents to ensure that Contractors implement EIA recommendations at all project stages. The EIA requirements will be part of the Contract and the details prescribed in the EIA will be mandatory. The EIA will be equally applicable to Subcontractors, including nominated Subcontractors (if any).

At the stage of the bidding process, the Contractor will be instructed to carefully consider the requirements for environmental and social management contained in this EIA when preparing the bid and pricing the items of Work. The Contractor will need to accept that the prescriptions and clauses detailed in the EIA are an integral part of the Contract for relevant items of Work; unless separate items are included in the Bill of Quantities (BoQs). The Contractor will need to accept that separate payment will not be made in respect to compliance with the EIA. The Contractor should, therefore, be aware that in case the Contractor or Subcontractors fail to implement the EIA recommendations, the Environment and Social team shall take necessary action(s) to ensure that the EIA is properly implemented and/or to rectify the damages caused by such negligence.



## 1.7 The Project Proponent

The Punjab Rural Municipal Services Company (PRMSC) through its Chief Executive Officer (CEO), is the proponent of the project and intends to obtain Environmental Impact Assessment (EIA) approval in compliance with Section 12, of the Pakistan Environmental Protection Act (PEPA) 1997 (Amended 2012).

Address: 5<sup>th</sup> Floor, KD Plaza, 100 MM Alam Road, Lahore

Contact No. 042-99333609 , Email: cid.prmsc@punjab.gov.pk

## 1.8 The Consultant

**M/S ALTER ULUSLARARASI MUHENDISLIK VE MUSAVIRLIK HIZMETLERI A.S. (The Consultant)** is responsible for the detailed engineering design, environmental and social assessments, preparation of bidding documents, procurement support, construction supervision, quality assurance, contract administration, and project monitoring for the Water Supply and Sewerage Project in Liaquatpur. The Consultant shall ensure the successful implementation and delivery of safe drinking water supply and improved sanitation services in accordance with applicable technical, environmental, social, and contractual requirements.

The contact details for the company are given as under:

**M/S ALTER**, House No. 401 A, Block A1, Gulberg III, Lahore.

Tel: +92 42 34556738- Mobile No. +92 321 5202121

Email: [egul@alter.com.tr](mailto:egul@alter.com.tr)

## 1.9 Identification of the Project

The project consists of the development of a piped water supply network, including tube wells, standposts, overhead reservoirs (OHRs), wastewater treatment plants, and septic tanks with soakage pits in the revenue villages of Tehsil Liaquatpur. The proposed interventions are planned in accordance with the criteria established by PRMSC and the World Bank, which are based on the number of households in each village.

### 1.9.1 Criteria for Project Interventions

In line with PRMSC guidelines, the water supply system will be designed based on the population size of each revenue village as follows:

- For revenue villages with up to 50 households, water will be supplied through stand posts.
- For revenue villages with household sizes between 50 to 300, water distribution will be carried out through inclusion in an MVS or installation of Public Standpost.
- For revenue villages with more than 300 households, piped solutions with tubewell and storage facilities such as Overhead Reservoirs (OHRs) will be provided to ensure adequate storage and distribution.

Water will be abstracted from groundwater sources through tube wells equipped with pumping systems and conveyed through the designed distribution system according to village size and demand.

For sanitation, covered drains (Type-I and Type-II) will be provided along with communal septic tanks. Sewerage will be disposed of either into irrigation channels or existing oxidation



ponds, depending on site-specific conditions and availability. Maximum efforts will be made to avoid soakage pits, however, where unavoidable it will be provided away from the villages.

In addition, street pavement will be provided in each revenue village having more than 50 households to improve accessibility, drainage conditions, and overall living environment.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub clauses [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million & Wastewater Channels / Sewerage System Schemes].

## **1.10 Approach & Methodology to Work**

### **1.10.1 Approach**

The study has been conducted in accordance with the applicable World Bank Safeguard Policies and the relevant requirements of the Punjab Environmental Protection Agency (PEPA). It is based on both primary and secondary data.

Primary data were collected through field surveys and investigations, including baseline environmental conditions, air, water and noise quality monitoring, ecological surveys, identification of environmentally sensitive receptors, and socio-economic surveys covering demographics, livelihoods, occupations, quality of life, and access to social services.

Secondary data were obtained from relevant literature, published information, and previous studies. Consultations were also carried out with key stakeholders, including government departments, community representatives, and local residents, to understand their concerns, perceptions, and expectations regarding the project and its potential environmental and social impacts.

The findings of this assessment are based on the preliminary project design and may be updated following the finalization of technical specifications and the alignment of the proposed water supply and sewerage networks, as well as the locations of overhead reservoirs, pumping stations, and sewage treatment plants (STPs).

### **1.10.2 Methodology**

An Environmental and Social Checklist was developed for EIA data collection to ensure that information gathered by the Consultant was consistent, comprehensive, and covered all relevant environmental and social aspects. The checklist facilitated systematic data collection and analysis, enabling a better understanding of local conditions and helping to identify potential environmental and social impacts and appropriate mitigation measures.

The following methodology was adopted for the preparation of the EIA of the proposed project.

#### **A. Orientation**

Meetings and discussions were held among the members of the EIA Consulting Team. This activity is aimed at achieving a common ground of understanding various issues of the Study.

#### **B. Data Collection Planning**

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 EIA Consulting Team. The plan included; identification of specific data requirements and their sources; determination



of time schedules and responsibilities for their collection and the indication of the logistics and other supporting needs for the execution of the data acquisition plan. Field surveys were then conducted based on the data collection plan.

### **C. Detailed Field Survey**

Detailed site visits and technical visits for environmental monitoring and social assessment for the collection of data were conducted in November, 2025 to April, 2026. The data collected from the field include:

- Identification of environmentally sensitive receptors including air-sensitive receivers, noise-sensitive receivers, and water bodies expected to receive pollutant load;
- Sampling and analysis for air, noise wastewater, and groundwater;
- Ecological survey;
- Socioeconomic survey including public consultation;
- Stakeholders' consultations;

### **D. Sampling & Analysis of Physical Environmental Parameters**

EPA Certified Laboratory (ASIAN Laboratory) was hired for environmental monitoring. The Laboratory was mobilized from August 2025 to October 2025 for collection of water and wastewater samples as well as air and noise monitoring.

### **E. Review of Secondary Data**

Previous environmental and social soundness assessment for 16 tehsils was collected in order to gain a complete understanding of existing environmental conditions of the area including:

- **Physical environment:** topography, geology, soils, surface and groundwater resources, and climate;
- **Biological environment:** flora and fauna (particularly rare or endangered species), critical habitats/zones, and vegetation communities within the project area;
- **Socio-economic environment:** settlements, socio-economic conditions, infrastructure, and land use.
- **Heritage aspects:** sites of cultural, archaeological, or historical significance.

### **F. Area of Influence (Aoi)**

Considering the project interventions simultaneously in primary settlement as well as number of secondary settlements of revenue villages, the whole revenue village is considered as area of influence of the sub project.

### **G. Environmental and Social Baseline Survey of the Project**

Environmental and social surveys were carried out within the Aoi to establish the baseline of the project area from November, 2025 to April, 2026. Prior to the start of field activities, comprehensive checklists, proformas, and maps were developed to gather the following information:

#### **(i) Physical Environment**

The following information was acquired for the establishment of the physical environment baseline:



- Topography;
- Water resources (including available surface and groundwater resources and natural streams, hydrology, water supply, water contamination etc.);
- Climate data (including temperature, precipitation, humidity, wind speed, direction etc.);
- Water, surface water, ambient air quality and noise level monitoring data;
- Existing water supply and sewerage systems;
- Seismology;
- Geology
- Environmental Sensitive Receptors.

#### **(ii) Ecological Environment**

- Flora (trees, herbs, shrubs, grasses, and overall vegetation including valuable or rare trees and their loss due to implementation of the Project, etc.);
- Fauna/ Wildlife (Mammals, reptiles, amphibians, and avifauna.);
- Reserved forests, Guzara forests, Community forests/ Private forests, and wildlife sensitive or notified areas in Aol;
- Migratory birds' corridors; and
- Endangered species (both flora and fauna).

#### **(iii) Socio-Economic Environment**

Analysis is carried out on the basis of secondary data within the Aol in order to develop the socio-economic baseline information of the general settled population. Data and analyses of pertinent socio-economic parameters were revalidated in the socio-economic baseline survey of the sample population settled within the Aol. These aspects include the following:

- Demographic characteristics;
- Nature of business/occupation;
- Livelihood/income;
- Living standard of the population;
- Community Institution available;
- Gender issues;
- Housing construction patterns;
- Mode of transport;
- Basic amenities of the project area;
- Health facilities/ Educational facilities.

#### **H. Stakeholder Consultations**

There are two categories of stakeholders in the project:

- Community stakeholder





- Institutional stakeholder

For the current study, community stakeholder consultations were carried out through following techniques:

- Formal/ informal meetings (through village numberdars, politically influentials community resource persons)
- Individual interviews
- Group Discussions

The institutional stakeholder consultation session was carried out by holding meetings at the offices of relevant government functionaries. The study teams met with the institutional stakeholders, affected persons and local communities in and around the project area. The objective of the consultation was to disseminate information on the project and its expected impact, long-term as well as short-term, among primary and secondary stakeholders and to gather information on relevant issues so that the feedback received could be used to address these issues at an early stage. Stakeholder consultation is discussed in detail in Section 7.

## I. Impact Assessment and Mitigation Measures

A logical and systematic approach was adopted for impact identification and assessment. The process began during the screening and continued through scoping which identified the key issues and classified them into different categories. The tools were used for impact assessment, through environmental and social screening checklists for impact assessment of construction and operational phase.

Identification of potential environmental and social impacts in terms of their nature, magnitude, extent, location, timing, and duration was carried out. The impacts were correlated to the Project location, design stage, construction as well as operation stage. Based on the impacts prediction methods and as a result of public/stakeholder consultations, EIA team screened the adverse environmental and social impacts for inclusion in the mitigation measures and environmental and social management plan.

EIA team proposed practicable, economically feasible and socially acceptable mitigation measures for the significant adverse environmental and social impacts. Details of mitigation measures are provided in Section 8.

### 1.11 Structure of EIA

The structure of this EIA is listed below:

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

**Section 2: Legal and Administrative Framework** Lists national as well as provincial laws, regulations and procedures and applicable World Bank Operational Policies (OPs).

**Section 3: Screening and Scoping of Project** will discuss the spatial and temporal boundaries of the project. Important issued raised by the community during the consultative sessions and significant impact that are determined during the initial visits.

**Section 4: Project Description** provides an overall description of the project including proposed networks, design considerations and concepts, manpower requirement, waste generation, machinery and material requirements.



**Section 5: Analysis of Alternatives** has been discussed in this section.

**Section 6: Baseline Environmental & Social Conditions** gives a description of baseline physical, biological and socio-economic conditions of the project area.

**Section 7: Stakeholder Consultation** identify the main stakeholders and their concerns raised during scoping sessions and deal with the measures to mitigate the social impacts.

**Section 8: Anticipated Environmental and Social Impacts and their Mitigations Measures** identify, predict, and evaluate the impacts of the project activities during the construction and operation stages and deal with the measures proposed to mitigate potential environmental impacts of the proposed project.

**Section 9: Environmental and Social Management & Monitoring Plan** This section outlines the organizational framework, mitigation, and monitoring plans, and training requirements, defines roles and responsibilities and estimates budget requirements for satisfactory implementation.

**Section 10: Grievance Redressal Mechanism:** The Grievance Redress Mechanism (GRM), outlines the policy and procedure for documenting, addressing, responding, and employing methods to resolve project grievances and complaints that may emerge during and after PRSWSSP sub-projects implementation.

**Section 11: The Environmental Budget** required for the effective implementation of the Environmental and Social Management Plan (ESMP) has been calculated and detailed in this section.

**Section 12:** Based on the findings of the study, **appropriate conclusion and recommendations** have been proposed.

#### 1.12 Composition of Study Team

Team composition is as under:

- 1) Mr. Hussain Kamran (Sr. Specialist - E & S – PRMSC)
- 2) Mr. Bashir Hussain Laghari (Environment Expert – ALTER)
- 3) Mr. Ihasan-ul –Haq Farooqi (Social Expert – ALTER)
- 4) Miss Shazia Farooqi (Gender Specialist – ALTER)
- 5) Mr. Ismail Gohar (Sociologist – ALTER)
- 6) Mr. Najam Ahmed (GIS Specialist – ALTER)
- 7) Miss Samina (Sociologist – ALTER)
- 8) Miss Rehana (Sociologist – ALTER)
- 9) Mr. Nasir Ahmed (Sociologist – ALTER).





**Study Team**

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## SECTION -2 LEGAL AND ADMINISTRATION FRAMEWORK

### 2.1 General

This section deals with the current environmental policy as well as legal and administrative framework required to develop Environmental Impact Assessment (EIA) for the proposed interventions in villages of tehsil Liaquatpur. All relevant provisions of environmental policies laid down by the Government of Pakistan, Government of Punjab along with applicable World Bank Policies have been duly discussed and the project proponent will be required to adhere to these regulations throughout the course of the project.

### 2.2 Summary of Key National Strategies, Policies, Acts and Legislation

The summary of key national strategies, policies, acts and legislation from environmental perspective are briefly described in Table 2.1 below:

**Table 2.1: Key National Strategies / Policies, Legislation / Acts, Laws and Regulations and Their Relevance to the Project**

| Sr. No. | Policy/Strategy                                         | Brief Coverage                                                                                                                                                                                                                                                                                                                                                                                                                           | Relevance to Project                                                                                                                                                                                                                                              |
|---------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Fatal Accidents Act 1855                                | An act to provide compensation to family's loss occasioned by the death of a person caused by actionable wrong. It is enacted as follows: <ul style="list-style-type: none"><li>• Suit for compensation to the family of a person for loss occasioned to it by his death by actionable wrong</li><li>• Not more than one suit to be brought</li><li>• Plaintiff shall deliver particulars etc.</li><li>• Interpretation clause</li></ul> | The provisions of this act would be applicable if any fatal accident occurs during the execution of construction works for the proposed Project.                                                                                                                  |
| 2       | Pakistan Penal Code 1860                                | It authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.                                                                                                                                                                                                                                                                              | The provisions of the Penal Code 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.                                                 |
| 3       | Land Acquisition Act, 1894 (Including Later Amendments) | The primary law for acquisition of land for public purposes in Pakistan is 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". The exercise of the power of acquisition has been limited to public purposes.                                 | No land acquisition will be carried out through the provisions of this Act under the project. State owned land will be preferred and used for the construction of overhead tanks, pumping stations & STP. Private land will be obtained through VLD, if required. |
| 4       | Protection of Trees and Brushwood Act, 1949             | This Act prohibits cutting or lopping of trees and brushwood without permission of the Forest Department.                                                                                                                                                                                                                                                                                                                                | This act will be applicable to the proposed project in term of Tree Cutting which lies in jurisdiction of Forest Department.                                                                                                                                      |
| 5       | Pakistan Antiquities Act 1975                           | The protection of cultural resources in Pakistan is ensured by the Antiquities Act of 1975, which provides a comprehensive definition of Antiquities. The law prohibits new construction                                                                                                                                                                                                                                                 | The provisions of this act would be applicable if any accidental archaeological discoveries occur during the excavation works for the                                                                                                                             |



| Sr. No. | Policy/Strategy                                                      | Brief Coverage                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Relevance to Project                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                      | in the proximity of a protected antiquity and empowers the Government to prohibit excavation in any area which may contain articles of archaeological significance.                                                                                                                                                                                                                                                                                                                         | construction of proposed Project.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6       | National Conservation Strategy 1992                                  | Pakistan National Conservation Strategy (NCS) is the principal policy document on environmental issues in the Country. The NCS outlines the Country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. | The core areas that are relevant in the context of the proposed project are pollution prevention during construction, conserving, biodiversity and supporting forestry and plantation.                                                                                                                                                                                                                                                                |
| 7       | Guidelines for Public Consultation, 1997                             | The Pakistan Environmental Protection Ordinance 1997 requires public participation during the review of an EIA (Section 12(3)). The "Policy and procedures for the filing, review and approval of environmental assessments" requires proponents to consult with the affected community and relevant NGO's during the preparation of an environmental report.                                                                                                                               | These guidelines are applicable for the preparation of the EIA / ESMP. During the preparation of the EIA, public consultations were carried out for: <ul style="list-style-type: none"> <li>informing the stakeholders about what is proposed;</li> <li>providing an opportunity for those otherwise unrepresented to present their views and values, therefore allowing more sensitive consideration of mitigation measures and tradeoffs</li> </ul> |
| 8       | Guidelines for Review and Preparation of Environmental Reports, 1997 | These guidelines describe the format and content of IEE/EIA reports to be submitted to Provincial EPA/EPD for obtaining NOC. The guidelines present: <ul style="list-style-type: none"> <li>The environmental assessment report format;</li> <li>Assessing impacts;</li> <li>Mitigation and impact management and preparing an environmental management plan;</li> <li>Reporting;</li> <li>Review and decision making;</li> <li>Monitoring and auditing; and Project Management.</li> </ul> | These guidelines are applicable for the preparation of the EIA.                                                                                                                                                                                                                                                                                                                                                                                       |
| 9       | National Sanitation Policy, 2006                                     | The National Sanitation Policy of Pakistan, 2006, stresses on the safe disposal of excreta away from the dwellings, creation of an open defecation-free environment and, promotion of health and hygienic practices in the country.                                                                                                                                                                                                                                                         | This policy is applicable to the project for the efficient management of solid waste or wastewater during construction or operation phase of the project. This project primarily focused on provision of improve sanitation services in target areas.                                                                                                                                                                                                 |



| Sr. No. | Policy/Strategy                                                   | Brief Coverage                                                                                                                                                                                                                                                                                              | Relevance to Project                                                                                                                                                                 |
|---------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10      | Protection Against Harassment of Women at the Workplace Act, 2010 | The Protection Against Harassment of Women at the Workplace Act refers to sexual harassment at the workplace.                                                                                                                                                                                               | This Act will be applicable to the project if women are employed for the construction of the proposed Project or women living in near vicinity of the project area.                  |
| 11      | Canal and Drainage Act 1873 and Amendment Act, 2016               | This Act prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.                                                                                                                                             | This act is applicable to the project for the efficient management of wastewater disposal during the construction or operation phase of the project.                                 |
| 12      | Punjab Local Government (Amendment) Ordinance 2021                | The Ordinance establishes a new tier of local government at the village level called Village Councils, which incorporated the main functions of village panchayats prescribed in the Panchayats and Neighborhoods Councils Act, 2019 (PVPNCA 2019) with regards to water, sanitation, and waste management. | This act is applicable to the proposed project, village councils is informed about the project and will remain in contact during the construction or operation phase of the project. |

### 2.3 Key Provincial Strategies / Policies, Legislation / Acts, Laws and Regulations

The provincial policies, strategies, acts and laws relevant for the environmental safeguard of the project activities are given below in Table 2.2.

After the 18<sup>th</sup> amendment to the constitution of Pakistan, many subjects, including environmental protection and pollution prevention, have been devolved to the provincial jurisdiction. Therefore, the apex environmental statute governing the proposed project will be the Punjab Environmental Protection Act 1997. However, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. The following description presents a brief overview of the relevance of various existing provincial policies, legislation and guidelines.

**Table 2.2: Key Provincial Strategies / Policies, Legislation / Acts, Laws and Regulations and Their Relevance to the Project**

| Sr. No. | Strategies / Policies / Legislations / Acts / Laws & Regulations | Brief Coverage                                                                                                                                                                                                                                                                                                                               | Relevance to Project                                                                                                                      |
|---------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Punjab Land Revenue Act, 1967                                    | WHEREAS it is expedient to consolidate and amend the law relating to the making and maintenance of records-of-rights, the assessment and collection of land-revenue, the appointment and functions of Revenue Officers and other matters connected with the Land Revenue Administration in the Province of the Punjab, or incidental thereto | All the land required for the project, be it public or private, will be transferred in the name of PRMSC under the provisions of this Act |
| 2       | Punjab Plantation and Maintenance of Trees Act, 1974             | The Punjab Plantation and Maintenance of Trees Act, (1974) regulates tree plantations and enforces measures for their protection. The requirements of this act are applicable in terms of planting new trees and their maintenance by the owner of the proposed Project land who would have the physical possession.                         | This act would be implemented if any tree cutting activity involved during construction.                                                  |





| Sr. No. | Strategies / Policies / Legislations / Acts / Laws & Regulations                           | Brief Coverage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Relevance to Project                                                                                                                                                                                                                                               |
|---------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3       | The Punjab Wildlife (Protection, reservation, Conservation & Management) Act, 1974         | This act provides for the protection, preservation, conservation and management of wildlife in the Province of Punjab. This act defines the wildlife sanctuary, game reserves, protected areas, and national parks. It also defines the rules and responsibilities of the relevant authorities and the relevant personnel to protect ecological resources. It also describes the penalties and punishments on offenses against the sections given in the act.                                                                                                                                                                                                                                                                                                                                                                                                                      | This policy is to avoid any disturbance to ecological system near project area due to construction activities.                                                                                                                                                     |
| 4       | Punjab Land Acquisition Rules, 1983                                                        | This Law provides for the acquisition of land needed for public purposes and for Companies, and determines the amount of compensation to be made on account of such acquisition. It also establishes the due process for land acquisition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | State land will be preferred and used for the construction of overhead tanks, pumping stations & STP. However, Private land if required will be acquired through VLD in this project.                                                                              |
| 5       | The Motor Vehicles Rules, 2000                                                             | Subject to the provisions of this Act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the National Environmental Quality Standards, or where applicable the standards customary under clause (g) of sub-section (I) of section 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | During Construction all these rules will be followed to avoid emission of air pollutant from vehicles.                                                                                                                                                             |
| 6       | Guidelines and Checklists adopted by Government of Punjab after 18 <sup>th</sup> Amendment | Post the adoption of the 18 <sup>th</sup> Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation. The Punjab Environmental Protection Act, 1997 (as Amended upto 2022) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The "environment" has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses "a" to "f". | All projects to be implemented in Punjab must comply with PEQS during all the phases i.e., construction and operation.<br>No Objection Certificate (NOC) shall be required from Punjab Environmental Protection Agency (PEPA) before commencement of construction. |
| 7       | Punjab Drinking Water Policy 2011                                                          | The overall objective of Punjab's Water Policy is to provide clear policy directions to the Government of Punjab on the sustainable management and development of water from all sources of water (surface water, groundwater and rainwater), for all sub-sectors of water use (domestic, stock water, agriculture, industry).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | This policy is applicable and drinking water supply will be designed according to this policy guidelines.                                                                                                                                                          |
| 8       | Punjab Environmental Tribunal Rules, 2012                                                  | According to Section-31 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Tribunal shall make every effort to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | This is applicable to dispose of a complaint or an appeal or other proceedings regarding                                                                                                                                                                           |



| Sr. No. | Strategies / Policies / Legislations / Acts / Laws & Regulations                   | Brief Coverage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Relevance to Project                                                                                                                                                                                                                                                                                                                                                   |
|---------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                    | dispose of a complaint or an appeal or other proceedings regarding environmental problems associated with the construction and development of any project within sixty days from the date of filing of the complaint, appeal or other proceedings but any decision of the Tribunal shall not be rendered invalid by reason of any delay in the disposal of complaint, appeal or other proceedings.                                                                                                                                                                                                                                                                    | environmental problems associated with the construction and development of any project within sixty days from the date of filing of the complaint, appeal or other proceedings.                                                                                                                                                                                        |
| 11      | 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 law will be applicable to the proposed project mainly due to its provision that „any construction activity within 61 meter or 200 ft. of protected antiquities, are prohibited“. The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed Project. |
| 12      | Punjab Local Government Musalihat Anjuman (Constitution and Functions) Rules, 2016 | The dispute may be brought to the Musalihat Anjuman. The Musaliheen shall make every reasonable effort in encouraging and assisting the parties in arriving at an amicable settlement but for this purpose shall not impose, coerce or try to dictate terms for any specific resolution of the dispute.                                                                                                                                                                                                                                                                                                                                                               | The provisions of this rule would be applicable, if any dispute occur during the execution of proposed Project. The GRM under the project will also be aligned accordingly.                                                                                                                                                                                            |
| 13      | Punjab Environmental Quality Standards (PEQS), 2016                                | In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the Punjab Environmental Quality Standards (PEQS), 2016. They endow information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to regulate environmental pollution. Results of environmental monitoring (ambient air, water and noise) conceded out at different locations in study area are compared with PEQS values and are conversed in later section of the report. | These standards are applicable in compliance with all the Punjab Environmental Quality standards of different Environmental Parameters during Construction and operational phase.                                                                                                                                                                                      |
| 14      | The Punjab Flood Plain Regulation Act, 2016                                        | This act regulates construction in the flood plains in the Punjab. According to this act, no construction can be carried out in flood plains without prior approval in writing from canal officer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Construction work will be carried out in underground for installing of water supply lines and sewerage lines.                                                                                                                                                                                                                                                          |
| 15      | Punjab Restriction on Employment of Children Act, 2016                             | According to the sub-section 11(a) of this act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven                                                                                                                                                                                                                                                                                                                                                                           | This act will trigger if any contractor hires skilled and unskilled labor under the age of 15. This would be prohibited in the project                                                                                                                                                                                                                                 |





| Sr. No. | Strategies / Policies / Legislations / Acts / Laws & Regulations                                            | Brief Coverage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Relevance to Project                                                                                                                                                                                                                                                   |
|---------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                             | days, and a mandatory fine between 10,000 and 50,000 rupees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                        |
| 16      | The Punjab Bonded Labour System (Abolition) Act 1992 & The Punjab Bonded Labour System (Amendment) Act 2018 | The Act abolishes bonded and forced labour system with a view to preventing the economic and physical exploitation of the labour class.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | This act will trigger on the payment of advance/ <i>peshgi</i> , whether in cash or kind. It will prevent bonded/ forced labour of any kind.                                                                                                                           |
| 17      | The Punjab Minimum Wages Act 2019                                                                           | The Act regulates minimum rates of wages for unskilled and different categories of skilled workers employed in an industry, industrial and commercial establishments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | This Act will be applicable to ensure payment of minimum wages to the employees, labour, and all the skilled, semi-skilled, and skilled staff of the contractors and consultants during their engagement with this project.                                            |
| 18      | The Workmen's Compensation Act 1923                                                                         | This Act ensures the payment by certain classes of employers to their workmen of compensation for injury by accident.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | This act will be applicable to ensure that the employees/ labour receive due compensation for injury by accident during the course of performance of project activities.                                                                                               |
| 19      | Punjab Protection of Women against Violence Act, 2016                                                       | This act counters gender-based discrimination, violence against women, and economic and social empowerment of women. This act will entail if gender-based violence observed in the project area during construction phase.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | This Act will be applicable to the project if women are employed for the construction of the proposed Project or women living in near vicinity of the project area.                                                                                                    |
| 20      | Punjab Tehsil / Town municipal Administration (Works) rules, 2003 (amendments, 2016)                        | According to Chapter VIII-A Occupational Safety & Hazard Clause 50 A Workplace Safety and clause 50 B pertains to responsibilities of the Local Government Engineer related to health and safety.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | All the mentioned clauses will be applicable on construction labor/workers/ and sewer men/sanitary workers during execution of subprojects.                                                                                                                            |
| 21      | Punjab Environmental Protection Act 1997 (Amended 2022)                                                     | Post the adoption of the 18 <sup>th</sup> Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation. The Punjab Environmental Protection Act, 1997 (as Amended up to 2022) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The „environment“ has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses „a“ to „f“. | All projects to be implemented in Punjab must comply with PEQS during all the phases i.e., construction and operation.<br><br>No Objection Certificate (NOC) shall be required from Punjab Environmental Protection Agency (PEPA) before commencement of construction. |
| 22      | Punjab Policy on Controlling Smog, 2025                                                                     | The Punjab Environmental Protection Department issued this policy on controlling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | During construction and operational phases all PEQS will                                                                                                                                                                                                               |



| Sr. No. | Strategies / Policies / Legislations / Acts / Laws & Regulations | Brief Coverage                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Relevance to Project                                                                                                                                                                                      |
|---------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | Smog Prevention and Control Rules 2023                           | smog in 2025 It imposed a complete ban on open burning of rice stubble, solid waste and other hazardous materials. It focuses the reasons behind the formation of dense smog in the Punjab, especially in Lahore and its environs, on the onset of winters each year and provide a short and medium to long term plan, including measure for protection of school going children; minimizing road accidents and creating mass awareness on precautionary measures for citizens at large. | be followed in accordance with to compliance and to minimize pollution load to control smog.                                                                                                              |
| 23      | Punjab Labor Policy, 2018                                        | The Punjab Labor Policy, 2018 intends to guide and support the Government and the stakeholders in developing strategies, plans and programs for the protection and promotion of the rights and benefits of working community without jeopardizing the genuine concerns of the employers.                                                                                                                                                                                                 | The labor policy will be relevant as it will deal with the protection of labor. Mitigation and enhancement measures have been proposed in this EIA to ensure proper working conditions for project labor. |
| 24      | Punjab Growth Strategy 2018                                      | The document endorses Punjab's health sector vision and strategy, which emphasizes improvement of water, sanitation and hygiene services to prevent communicable diseases.                                                                                                                                                                                                                                                                                                               | This strategy will be adopted in design of proposed project.                                                                                                                                              |
| 25      | Punjab Occupational Safety and Health Act, 2019                  | This law was enacted to ensure occupational safety and health of the persons at workplace. It aims at protection of workers against risks arising out of the occupational hazards and to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace.                                                                                                                                                               | This act will be applicable to the proposed project in term of the health and safety during the construction and operational phases of the project.                                                       |
| 26      | Punjab Water Act 2019                                            | An Act to comprehensively manage and regulate water resources in the Punjab in the interest of conservation and sustainability. It is expedient to provide for comprehensive management of all water resources in the Punjab and to regulate their use in the interest of conservation and sustainability and matters connected with and ancillary thereto.                                                                                                                              | This act will be applicable to the proposed project. The drinking water supply will be designed in light of PWA, 2019.                                                                                    |

## 2.4 Applicable World Bank Policies

### 2.4.1 World Bank Operational Policies

The World Bank operational policies applicable to the project and its compliance mechanism, are summarized in the description below;

| Safeguard Policies                 | Triggered | Explanation                                                                                                                                                                                                                                                                                             |
|------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental Assessment (OP 4.01) | Yes       | Under this OP, the World Bank requires environmental assessment (EA) of projects proposed for Bank's financing to help ensure that they are environmentally sound and sustainable and thus to improve decision making through appropriate analysis of actions and of their likely environmental impacts |



| Safeguard Policies                            | Triggered                              | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Natural Habitats (OP/BP 4.04)                 | No                                     | This OP is not triggered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Physical Cultural Resource OP/4.11            | No                                     | The sub-project does not lie near any cultural and heritage resource therefore OP 4.11 will not be triggered.<br>The possible discovery of archaeological sites or random findings during the excavation and earthworks may occur. In such case, this OP will be triggered. Furthermore, Chance Find Procedures will also be implemented.                                                                                                                                                                                                                                                                                   |
| Involuntary Resettlement OP/4.12              | Yes<br>(Not relevant for the villages) | OP 4.12 is not triggered as the sub-project does not require any land acquisition, therefore there will be no involuntary resettlement, livelihood impacts, or restrictions to access. Consequently, there is no need of a Resettlement Action Plan.                                                                                                                                                                                                                                                                                                                                                                        |
| Forests (OP/BP 4.36)                          | No                                     | The sub-project area does not fall under forest area and will not affect any forest. So, this OP is not triggered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Access to information (BP 17.50)              | Yes                                    | The World Bank's Policy on Disclosure of Information is to be open about its activities and to welcome and seek out opportunities to explain its work to the widest possible audience. This policy is triggered for sub-projects categorized as A and B. The developer consults project affected groups and local NGOs: a) during scoping and before TORs are prepared; b) when the draft EA is available; and c) throughout project implementation as necessary. The developer provides relevant information in a timely manner prior to consultation and in a form and language accessible to the groups being consulted. |
| Projects on International Waterways (OP 7.50) | Yes                                    | This policy will be triggered. The Project has got the PAD cleared from Legal department. An exemption for notification has been approved by the SAR VP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## 2.5 Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx

World Bank Management has developed a Guidance Note titled "MANAGING THE RISKS OF ADVERSE IMPACTS ON COMMUNITIES FROM TEMPORARY PROJECT INDUCED LABOR INFLUX" to assist Bank staff in establishing an approach to identifying risks to and impacts on local communities associated with the temporary influx of labor that typically results from construction works, and to advising Borrowers accordingly on how to best manage such risks. This guidance note provides guidance on identifying, assessing and managing the risks of adverse social and environmental impacts that are associated with the temporary influx of labor resulting from Bank supported projects. The guidance note contains guiding principles and recommendations to be considered as part of the design and implementation of projects with civil works that require labor from outside the project's area of influence. This Note does not introduce new requirements, but rather seeks to provide concrete guidance on how to approach temporary labor influx within the environmental and social assessment process.

## 2.6 Environmental, Health & Safety Guidelines

In addition to operational policies (OP), the WBG has also established its EHS guidelines for all the interventions that are financed by the group. These EHS Guidelines are technical reference documents with general and sector-specific examples of Good International Industry



Practice (GIIP). Following EHS guidelines are relevant to the proposed project during the construction and operation phase:

**EHS Guidelines for Water & Sanitation (2007):** Issues associated water and sanitation are presented in the EHS Guidelines for Water and Sanitation (2007).

**EHS General Guidelines:** Generic issues related to Environment, Health and Safety and good practices are discussed in EHS General Guideline

**EHS Guidelines for Construction Materials Extraction:** Issues associated with sourcing of construction materials are presented in the EHS Guidelines for Construction Materials Extraction.

## 2.7 International Labour Organization (ILO) Fundamental Conventions – Ratified by Pakistan

The following fundamental conventions of ILO shall be applicable to the project:

- Forced Labour Convention, 1930 (Convention No. 29)
- Freedom of Association and Protection of the Right to Organize Convention, 1948 (Convention No. 87)
- Right to Organize and Collective Bargaining Convention, 1949 (Convention No. 98)
- Equal Remuneration Convention, 1951 (Convention No. 100)
- Abolition of Forced Labour Convention, 1957 (Convention No. 105)
- Discrimination (Employment and Occupation) Convention, 1958 (Convention No. 111)
- Minimum Age Convention, 1973 (Convention No. 138) Minimum age specified: 14 years
- Worst Forms of Child Labour Convention, 1999 (Convention No. 182)

## 2.8 International Protocol/Conventions

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

**Table 2.3: International Agreements/Conventions Relevant to the Project**

| Sr. No. | Agreement/ Convention                                                                                                                                            | Ratification                                       | Description/Relevance                                                                                                                                                                                                                                                                                                                          |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972<br>Web Link:<br><a href="http://whc.unesco.org">http://whc.unesco.org</a> | Pakistan ratified this convention on 23 July 1976. | This Convention requires parties to adopt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection. |



| Sr. No. | Agreement/ Convention                                                                                                                               | Ratification                                                                | Description/Relevance                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | <a href="#">/en/%20convention%20text/</a>                                                                                                           |                                                                             | The proposed project design and ESS team paid due attention to archaeological sites and local norms. Both of these factors will also be considered during project implementation.                                                                                                                                                                                                                                                 |
| 2.      | Convention on Conservation of Migratory Species of Wild Animals, 1979<br><a href="https://www.cms.int/">https://www.cms.int/</a>                    | Pakistan signed this convention in 1981 and ratified it in December 1987.   | Convention on the Conservation of Migratory Species deals with the conservation and protection of the migratory species. Species covered in the Convention should be given special attention during EA and monitoring and any impacts identified should be mitigated to acceptable levels.                                                                                                                                        |
| 3.      | The Rio Declaration, 1992<br>Web Link:<br><a href="http://www.unesco.org/education/pdf/RIO_E.PDF">http://www.unesco.org/education/pdf/RIO_E.PDF</a> | Pakistan signed the treaty on 13Jun 1992 and ratified on 1 June 1994        | The Rio Declaration comprises 27 principles which address important issues such as; sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption. |
| 4.      | Convention on Biological Diversity, 1994<br>Web Link:<br><a href="https://www.cbd.int/">https://www.cbd.int/</a>                                    | Pakistan signed this treaty in 1992 and it was ratified by cabinet in 1994. | The Convention on the Biological Diversity (CBD) has three main goals: Conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.                                                                                                                                                                                      |

## 2.9 Institution Responsible for Planning, Policies and Regulations

### 2.9.1 Environmental Protection Agency, Punjab

Implementation of Punjab Environmental Protection Act 1997 (Amended 2012, 2017 & 2022) is the mandate of the Punjab-EPA. Punjab-EPA is headed by a Director General, and sections are headed by Directors, i.e., Director EIA, Technical, Director Administration and Finance, and Director Laboratory. Punjab-EPA has established District Environment Offices at district level.

As the proposed Project falls in tehsil Liaquatpur, district Rahimyar Khan of the Punjab, therefore, Punjab-EPA will be responsible for reviewing the reports, issuing environmental approval and overall monitoring of the proposed project activities.





## SECTION -3 SCREENING AND SCOPING OF PROJECT

### 3.1 Screening of the Project

Under the Environmental and Social Management Framework (ESMF), sub-projects are categorized into environmental classes (E1, E2, and E3) and social classes (S1, S2, and S3) based on the nature and significance of their potential impacts.

The proposed project has been classified as **E-2** for environmental impacts and **S-3** for social impacts. As required under the ESMF, an Environmental and Social Management Plan (ESMP) has been prepared for the project. In addition, the project has been screened in accordance with the Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations, 2022.

The project aims to improve water supply and sanitation services in the revenue villages of Tehsil Liaquatpur. The proposed works include the construction of tube wells, public standposts, overhead reservoirs (OHRs), water distribution networks, wastewater treatment facilities, septic tanks with soakage pits, covered drains, and street pavements. The type of intervention in each village has been determined by PRMSC and the World Bank based on the number of households.

According to PRMSC criteria:

- Villages with up to 50 households will be provided water through public standposts.
- Villages with 51 to 300 households will be served through a Multi-Village Scheme (MVS) or public standposts, as appropriate.
- Villages with more than 300 households will be provided with a piped water supply system, including tube wells, pumping equipment, and overhead reservoirs for water storage and distribution.

Water will be sourced from groundwater through tube wells and supplied to consumers through the proposed distribution network.

For sanitation, covered drainage systems (Type-I and Type-II) and communal septic tanks will be constructed. Wastewater will be disposed of through suitable facilities such as oxidation ponds, irrigation channels, or other approved treatment and disposal systems, depending on local conditions. The use of soakage pits will be minimized and, where required, they will be located away from residential areas.

Street pavement will also be provided in villages with more than 50 households to improve access, drainage, and overall community hygiene.

Based on the Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations, 2022, the project falls under **Schedule II, Category F (Water Supply, Sewerage Systems, and Treatment Facilities)**, as it includes water supply schemes, wastewater channels, and sewerage systems with a project cost exceeding PKR 50 million. Therefore, preparation and approval of an Environmental Impact Assessment (EIA) are mandatory before the commencement of construction activities.

### 3.2 Spatial and Temporal Boundaries of Environmental Assessment

The spatial boundary of the Environmental Assessment covers all areas likely to be affected by the proposed Water Supply and Sewerage Project in Tehsil Liaquatpur. These include the





locations of proposed tube wells, overhead reservoirs (OHRs), water distribution networks, sewerage networks, wastewater treatment facilities, communal septic tanks, disposal areas, access routes, construction camps, material storage areas, and adjacent communities that may experience direct or indirect environmental and social impacts.

The temporal boundary of the assessment encompasses the entire project life cycle, including the pre-construction, construction, operation, and maintenance phases. Potential environmental and social impacts associated with each phase have been identified and assessed, and appropriate mitigation measures have been proposed to minimize adverse effects and enhance project benefits.

### 3.3 Important Issues and Concerns Raised During Consultation

During the stakeholder consultations, respondents were asked about their views on the proposed project and its potential impacts. Overall, the community strongly supported the project and anticipated significant improvements in water supply, sanitation, public health, and living conditions.

However, some respondents expressed concerns regarding temporary impacts during the construction phase, particularly dust generation, increased noise levels, traffic disruptions, and occupational health and safety risks. Community members emphasized the importance of timely completion of construction activities and the implementation of appropriate mitigation measures to minimize inconvenience to local residents.

The main concerns expressed by respondents during the stakeholder consultations included the following:

- Dust and noise pollution from construction activities.
- Health and safety risks to workers and local communities.
- Temporary disruption of access roads and community movement.
- Possible disturbance to daily routine and local businesses.
- Delays in project completion and prolonged construction activities.

### 3.4 Significant Environmental and Social Impacts and Factors Considered

The Environmental Impact Assessment (EIA) identified and evaluated the following key environmental and social aspects associated with the construction and operation of the proposed project:

- **Soil Erosion and Soil Contamination** resulting from excavation activities, fuel and lubricant spills, and improper waste disposal.
- **Groundwater Quality and Quantity Impacts** due to groundwater abstraction through tube wells, potential contamination from wastewater disposal, and leakage from sanitation facilities.
- **Surface Water Quality Impacts** caused by construction runoff, wastewater discharges, and improper disposal of construction wastes.
- **Air Quality Deterioration** resulting from dust emissions, vehicle movements, excavation works, and operation of construction machinery.
- **Noise and Vibration Impacts** generated by construction equipment, vehicles, pumping facilities, and other project-related activities.



- **Solid and Liquid Waste Generation** including construction debris, domestic waste, wastewater, and sludge generated during construction and operation phases.
- **Occupational Health and Safety (OHS) Risks** to workers arising from excavation works, machinery operation, electrical installations, confined spaces, and handling of hazardous materials.
- **Community Health and Safety Impacts** including traffic hazards, restricted access, dust, noise, and risks associated with open excavations and construction activities.
- **Impacts on Flora and Fauna** due to site clearance, habitat disturbance, noise, and increased human activities within the project area.
- **Traffic and Access Disruptions** resulting from excavation and installation of water supply and sewerage networks.
- **Socio-Economic Impacts** including temporary employment opportunities, improved access to safe drinking water and sanitation services, enhanced public health, and overall improvement in living conditions.
- **Impacts on Physical and Cultural Resources**, if any, encountered during excavation and construction activities.

These impacts have been assessed for both the construction and operational phases of the project, and appropriate mitigation and management measures have been proposed in the Environmental and Social Management Plan (ESMP).



## SECTION -4 PROJECT DESCRIPTION

The Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) is being implemented across 2,000 villages in 16 tehsils of Punjab with support from the World Bank. ECNEC authorized PRMSE to initially execute the Project in 200 villages as a pilot phase to assess its feasibility and long-term sustainability. With the pilot phase successfully completed, the Project is now progressing toward the remaining 1,800 villages. This EIA specifically covers 193 villages located in tehsil Liaquatpur.

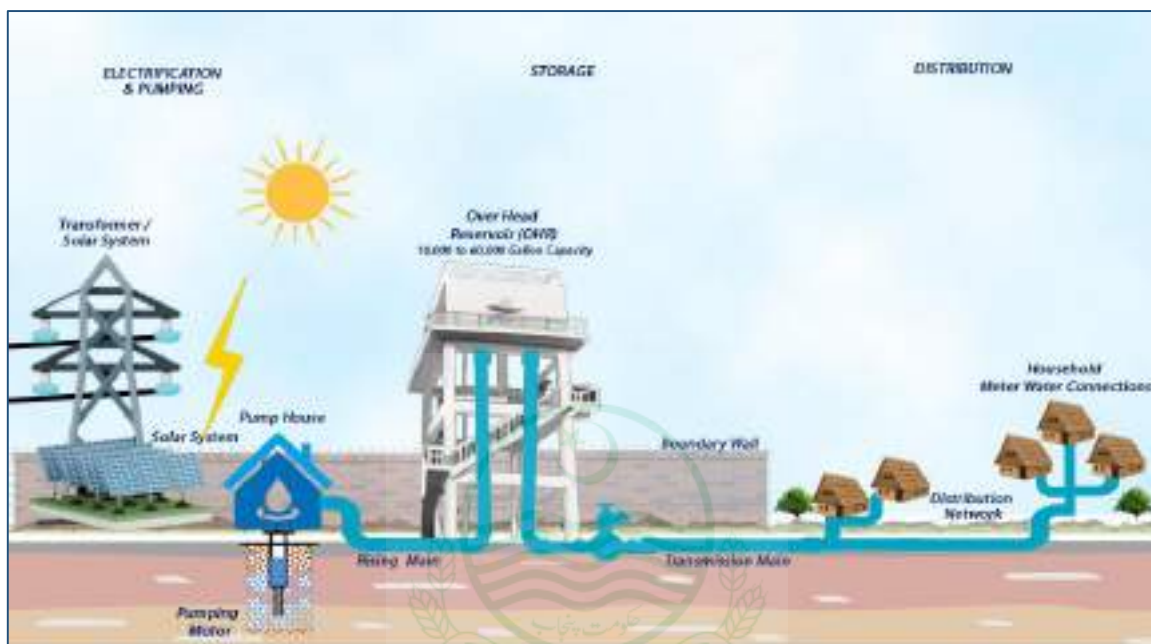


Figure 4.1: Illustrating Project Intervention in Component 1 Sub Component 1.2

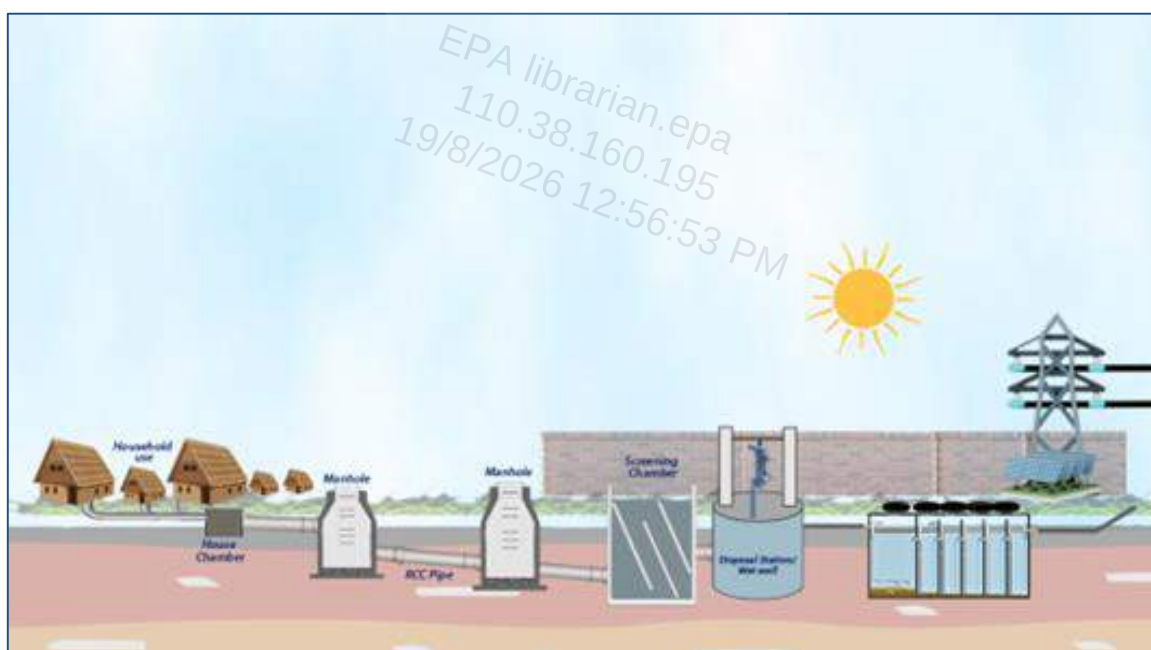


Figure 4.2: Illustrating Project Interventions in Component 1 Sub Component 1.1



Project components are briefly described below:

### **COMPONENT 1: Water Supply and Sanitation Infrastructure Development**

Component 1 will fill the infrastructure gap in the existing traditional rural Water Supply and Sanitation (WSS) systems that underlies the low access to safely managed water and sanitation in rural Punjab.

#### ➤ **Subcomponent 1.1: Sanitation Infrastructure Development.**

This subcomponent will focus on fecal sludge collection, transference, treatment and disposal.

#### ➤ **Sub-component 1.2: Water Supply Infrastructure Development**

The study on technology options and their feasibility informed the choice of technology for water abstraction, treatment, and conveyance.

### **COMPONENT 2: Behavior Change and Capacity Development**

This component will finance activities that facilitate and induce health protective behavior change and build community capacity to support WSS service delivery.

#### ➤ **Subcomponent 2.1 Awareness raising and behavior change related to safe WASH practices**

The project will support basic hygiene, small-scale infrastructure to directly promote good hygiene practice and

#### ➤ **Subcomponent 2.2: Training and Capacity Building of Village-level Institutions**

Trainings will target village-level institutions that have a defined role in water and sanitation service provision. These will be complemented by household behavior change but are distinct, in that they will build the capacity of informal village level organizations to perform tasks that both complement and the O&M responsibilities assigned to Service Delivery Units (SDU).

### **COMPONENT 3: Service delivery Improvement**

#### ➤ **Subcomponent 3.1: Establishing institutions and building capacity for service delivery**

The service delivery model of the project consists of three tiers: (i) a provincial SDU head office that has functions of both, the Project Implementation and Management Unit (PIMU) as the implementing body of the project and a public-owned section 42 company. (ii) Tehsil level units that are on frontlines of service delivery; and (iii) Community Caretakers and Operators (CCO) that may be part of Village Councils, Village Organizations, or just village residents.

#### ➤ **Subcomponent 3.2: Solid Waste and Animal Waste Management**

Promoting the safe handling of solid waste is an integral aspect of the design of this project

#### ➤ **Subcomponent 3.3: Water Quality Monitoring**

The project will support a transition in Punjab towards regular and frequent water quality monitoring in rural areas for both drinking water supply and wastewater.



## **COMPONENT 4: Project Management and Monitoring**

### ➤ **Subcomponent 4.1: Project Monitoring through a customized Management Information System**

The project will develop and use a comprehensive IT based Management Information System (MIS) to track project implementation progress, WSS service delivery performance, the flow of public and donor funds earmarked for WASH and related financial management information, and outcome indicators.

### ➤ **Subcomponent 4.2: Strengthening of Project Implementation and Management Unit (PIMU)**

The key implementation tier will be the Project implementation and management unit (PIMU), which will be associated with the Department of Local Government and Community Development (LG&CD) – the implementing agency - and led by a full-time Project Director.

PRMSC has divided the 16 tehsils into 5 zones based on geographical location and accordingly hired the services of 5 Engineering Design and Supervisory Consultants (EDCS) for the proposed project. Interventions are planned across 16 tehsils, within which 238 villages have been identified for implementation. In order to fast track, the project implementation and execution of the civil works, PRMSC with the help of consultants has divided 1800 pilot villages from sixteen different tehsils into 5 packages for designing and provision of Water Sanitation and Hygiene (WASH) facilities. This document pertains to the 193 villages selected in tehsil Liaquatpur. The subproject involves the provision of water supply system, sewerage system, overhead tanks and pumping stations with sewage treatment plants in all 193 villages.

#### **4.1 Need and Purpose of Project**

The underlying issues related to water supply and sewerage in the target villages are summarized below:

##### **Water Supply Issues:**

- No water supply Network in the villages;
- Most of the household use shallow groundwater;
- Shallow ground water is not fit for drinking;
- Polluted drinking water is causing water borne diseases.

##### **Sewerage Issues:**

- Properly designed sewerage system does not exist in most of the villages;
- Existing open drains are damaged and do not cover the entire settlements;
- No proper disposal Point in all the villages;
- Sewage collected in soakage pits and open plots seeps into ground and contaminates groundwater;
- Raw sewage ponds are a breeding ground for disease vectors.

##### **Solid Waste Issues:**

- There is no proper solid waste management system and designated dumping sites in the project area, locals usually throw their waste into open plots or streets.





- There are heaps of waste which attract rodents, flies and disease vectors.
- Organic waste is usually burnt by the villagers, which causes health issues.
- Open drains are used as a garbage/solid waste disposal point thus resulting in decrease of water carrying capacity of these drains.
- During rain, storm water and sewage overflow from the drains and spread solid waste through the area thus causing nuisance, environmental issues and spread of diseases.

## 4.2 Objectives of Project

The overall objective of the proposed Water Supply and Sanitation Project is to provide safe, reliable, and sustainable drinking water supply and sanitation services to the population of the project area, thereby improving public health, protecting environmental resources, enhancing climate resilience, and supporting sustainable socio-economic development through environmentally and socially responsible infrastructure development.

## 4.3 Project Description

### 4.3.1 Existing System

The existing water and sewerage situation of the village is given below.

#### A. Existing Water Supply System

There is no existing functional water supply system in the villages hence no water supply network exists here. At present, domestic boreholes are the main water source for the village which is available at a depth of around 50-75 ft. Deeper tube wells at depth of around 150 ft are also bored which are used for irrigation purposes. People bring drinking water from deep boreholes (outside of the village or even from nearby villages) if their village have brackish groundwater. Where the sweet water is available people collect water from deep borehole within their villages. Many villagers perceive that this water is unhygienic which results in major waterborne diseases like hepatitis, cholera and diarrhea.

#### B. Existing Sewerage System

There is no existing sewerage pipe network or disposal station in the villages. The sewerage system is totally based on open drains of varying sizes and capacities. The sewage is first collected in house collection chamber (soakage pits), which is then carried through existing open channels, drains and ultimately dispose of into nearest sewage pond and fields. Some of this sewage is also used to irrigate nearby crops/farmlands through water courses.

A sewage pond exists in each village which is used as a main sewage recipient. Most of the drain's direct sewerage into this pond and rest of the drains after collecting sewage from the adjacent areas disposed of into nearest fields haphazardly.

#### C. Existing Solid Waste

Solid waste management system and designated dumping sites are not available in the project area. The waste is usually dumped in the streets, agricultural fields or open plots. The heaps of waste cause nuisance and the situation gets worse during rainy season. The organic waste is burnt to meet the fuel demands in the kitchens. Glimpses of existing conditions are shown in **Annex-2**.





### 4.3.2 Proposed System

Summary of Proposed Water Supply and Sewerage Components are presented in the Table 4.1.

**Table 4.1: Summary of Proposed Water Supply and Sewerage Components**

| Description                                | Unit | Total       |
|--------------------------------------------|------|-------------|
| <b>Tehsil Liaquatpur</b>                   |      |             |
| Proposed No. of Tubewells (0.10 Cusecs)    | No.  | 8           |
| Proposed No. of Tubewells (0.15 Cusecs)    | No.  | 6           |
| Proposed No. of Tubewells (0.25 Cusecs)    | No.  | 8           |
| Proposed No. of Tubewells (0.30 Cusecs)    | No.  | 2           |
| Proposed No. of Tubewells (0.50 Cusecs)    | No.  | 26          |
| Proposed No. of Ejector Pumps(0,01 Cusecs) | No.  | 99          |
| Proposed No. of Ejector Pumps(0,02 Cusecs) | No.  | 82          |
| Proposed No. of Ejector Pumps(0,03 Cusecs) | No.  | 36          |
| Proposed No. of Ejector Pumps(0,04 Cusecs) | No.  | 15          |
| Proposed No. of Ejector Pumps(0,05 Cusecs) | No.  | 9           |
| Proposed No. of Ejector Pumps(0,06 Cusecs) | No.  | 9           |
| Proposed No. of Ejector Pumps(0,07 Cusecs) | No.  | 6           |
| Proposed No. of Ejector Pumps(0,08 Cusecs) | No.  | 3           |
| Proposed No. of Ejector Pumps(0,09 Cusecs) | No.  | 1           |
| Proposed No. of Ejector Pumps(0,1 Cusecs)  | No.  | 3           |
| Proposed No. of Ejector Pumps(0,11 Cusecs) | No.  | 1           |
| Length of Distribution Network (Ø 8")      | ft   | 132         |
| Length of Distribution Network (Ø 6")      | ft   | 46,914      |
| Length of Distribution Network (Ø 5")      | ft   | 16,546      |
| Length of Distribution Network (Ø 4")      | ft   | 163,272     |
| Length of Distribution Network (Ø 4.5")    | ft   | 1,324 ft    |
| Length of Distribution Network (Ø 3.5")    | ft   | 545,645     |
| Proposed No. of OHWT (10,000 gallons)      | No.  | 5           |
| Proposed Drainage Network (6" x 6")        | ft   | 1,129,594.3 |
| Proposed Drainage Network (8" x 8")        | ft   | 47,245.5    |
| Standpost ( 1000 Gallons )                 | No.  | 266         |
| Standpost ( 2000 Gallons)                  | No.  | 14          |
| Drain Type-1                               | ft   | 951,000     |
| Drain Type-2                               | ft   | 44,380      |
| Length of Drains                           | Km   | 303.4       |
| Septic Tank                                | No   | 901         |



## **Water Supply System**

The project aims to improve the existing drinking water problems through provision of properly treated water as per World Health Organization (WHO) guidelines through metered pipe supply network. The project will help to reduce the water consumption as company plans to charge tariff on the basis of volumetric consumption. This project will also help to discourage the installation of wells in individual households. A comprehensive behaviour change communication is one of the components of the project in which residents of the villages will be sensitized on the importance of water conservation. Moreover, it is expected the provision of safe drinking water at door step will help to improve the socio-economic conditions of the society by curbing the medical expenses and saving of time required to fetch water. Moreover, the man-hours lost due to illness caused by the water borne diseases can be reduced. PRMSC has hired services of Independent third party (Pakistan Council of Research for Water Resources) to ensure the water quality through frequent testing of the treated water at end of treatment train as well as point of use.

Water supply system can be characterized by following main components:

- Water Source
- Distribution System

### **Water Source**

Number of tube wells for water supply system are proposed after assessment of total water demand of the project areas and where sustainable ground resources are available. The design criteria for tube wells are discussed in the following sections;

### **Design Criteria for Tube Wells**

An appropriate well design is a blend of hydraulic and economic efficiencies of the tube well over its life span. It includes the selection of the depth, diameter, construction materials (well casings, screens, filter pack etc.), pump and prime mover in consonance with the local hydro-geological conditions and the design capacity. All these major factors depend upon the "design capacity" which in turn is governed by the aquifer's geometry and parameters.

Capacity of the tube well is based upon the maximum day water requirements, for the served area, with design operational duration (working hours) of 12 hours per day.

In order to design the well, the following major factors are considered:

- Design, construction details, water quality of the existing tube wells;
- Depth to water table under existing and future conditions;
- Groundwater quality;
- Aquifer parameters.

### **Pumping Facilities**

Pumps are devices used to transfer water (or other liquids) from point A to point B with pressure to overcome the resistance along its path. It is important to understand the different types of pumps, their applications, design differences and the procedures used to operate and maintain them.



## **Water Transmission System**

The transmission system's function is to transport water from source to the reservoir, if any, and to the distribution point. Water conduits for the transmission system may be canals, aqueducts or tunnels, free-flow pipelines, or pressure pipelines. The transmission of water is either under gravity or pumping. Pressure pipeline is generally the type of water conduit used for water supply transmission systems.

## **Water Reservoirs**

In distribution systems, whether water is obtained by gravity or by pumping, distribution reservoirs are usually necessary for the following reasons:

- To balance the supply and demand in the system. In small distribution systems, variations in demand may be three or more times the average hourly consumption.
- To maintain adequate and fairly uniform pressure throughout the distribution system.
- To avoid the total interruption of water service when repairing pipes between the source of supply and the reservoir.
- To allow pumps to be operated uniformly throughout the day. Such pumps may be much smaller than would otherwise be required.

## **Overhead Water Reservoir (OHR)**

Overhead Reservoirs (OHRs) are also key component of water distribution system. In water supply system OHRs serve the following functions:

- Store water for use during electric load-shedding and during maintenance works of tube-wells/ pumps.
- Provide balancing of flow and pressure during peak hours.

As per "Technical and Service Delivery Standards for Water Supply and Sanitation Sectors" Storage Capacity of Overhead reservoirs should be based on around 1/6<sup>th</sup> of average day demand.

## **Water Distribution System**

The purpose of a distribution network is to distribute the potable water from the storage reservoir over the area to be provided, and deliver it to the individual consumer in such a way that at any tap point and at any time sufficient water of good quality can be withdrawn.

## **Looped System**

A distribution network is looped when there are only few or no pipe dead-ends, such that water can move through the system freely. The advantages of a looped system are;

- The lower water velocities in the main reduce head losses, resulting in greater capacity.
- Main breaks can be isolated, minimizing service interruptions to consumers.
- Usually, better chlorine residual content is achieved.



## Stand Post

The function of the standpost system is to deliver potable water from the distribution network to the public through fixed tapping points. Standposts serve as communal outlets where consumers can conveniently collect water for domestic use. They are typically located at accessible points within residential clusters to minimize walking distance. Each standpost is designed to provide an adequate and controlled flow rate to meet community demand. The system ensures equitable water distribution, promotes hygiene, and supports communities without individual household connections.

### A. Sewerage System

The sewerage system of these villages has been designed so that the final disposal of collected sewage should be in the proposed pumping station. This pumping station will pump sewage into Anaerobic Baffled Reactor (ABR). After treatment, treated effluent complying with PEQS, would be discharged into existing nearby sewerage pond or community owned water courses. The sewerage systems have been designed for design year of 2050. Design criteria and consideration are briefly discussed below:

#### Design Criteria

The design criteria are based on Standards set forth under the Water and Sanitation Agency (WASA), Lahore criteria and past design experiences of similar projects.

The main objectives of the design criteria are as follows:

- To develop a sewerage system, that can be operated with minimum operation and maintenance cost;
- To collect sewage efficiently and safely to prevent diseases and nuisance; and
- To proposed efficient treatment system which will deliver an effluent that will meet the Punjab Environmental Quality Standards (PEQS).

#### 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. For the project area, **80%** of the water demand has been taken as sewage generation.

#### Peak Factor & Flow

The capacities of the sanitary sewer are sufficient to carry peak flows, rather than the average flow because the rates 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 has been 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. Peak Factor shown in the table below will be taken for the computation of peak flows;



| Population        | Peak Factor |
|-------------------|-------------|
| Up to 5,000       | 4.50        |
| 5,000 to 10,000   | 4.00        |
| 10,000 to 25,000  | 3.50        |
| 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 flow has been taken as 80% of average non-Domestic 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 has been followed for infiltration rate for the selected localities of the project area.

### Storm Water Allowance

Keeping in view the project area, 33% of peak sewage flow has been taken as storm water allowance.

### Total Sewage Flow

Total sewage flow is the sum of all the above flow and sewers / conduits has been designed on this total sewage flow.

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

### Manholes

Manholes will be located according to conventional sewer network design i.e., starting point, junctions between sewers and change in direction and grades etc.

Following manhole spacing are adopted for the design of sewerage system;

**Table 4.2: Manhole Spacing**

| Pipe Size | Interval |
|-----------|----------|
| 9 inches  | 50 Feet  |
| 12 inches | 100 Feet |
| 15 inches | 150 Feet |
| 18 inches | 200 Feet |
| 24 inches | 250 Feet |



| Pipe Size       | Interval |
|-----------------|----------|
| 30-42 inches    | 250 Feet |
| 48-60 inches    | 250 Feet |
| Above 60 Inches | 250 Feet |

Following manholes dimensions are adopted for sewerage systems of project area;

**Table 4.3: Manhole Diameter**

| Sewer Size   | Manhole Internal Diameter |
|--------------|---------------------------|
| 9-18 inches  | 04 Feet                   |
| 24-30 inches | 05 Feet                   |
| 36-42 inches | 6.5 Feet                  |
| 48-54 inches | 7.5 Feet                  |
| 60-66 inches | 8 Feet                    |
| 72 inches    | 9 Feet                    |

#### **Change in Sewer Diameter in Manhole**

To minimize the risk of blockage in sewers, the diameter of the outgoing sewer is not less than the diameter of the largest incoming sewer. The top of smaller sewers entering a manhole will normally be at the same level as that of the outgoing sewer.

#### **Slope of Channel Within Manhole**

All manhole invert levels used in the sewer calculations has been the centre of the manhole and all distances and slopes has been calculated between canters of manholes.

#### **Drop Manholes**

The drop connections to manholes have been provided if the difference in pipe invert level is greater than 3.0 ft otherwise no drop manholes will be provided.

#### **Manhole Steps**

Ductile Iron and Malleable Cast iron steps etc. are usually used in the manholes. Keeping in view the project area and current practices malleable cast iron steps shall be used in the manhole.

#### **Sewage Disposal Stations**

Sewage lift / pump station is 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.

The pumping station consists of following structures:

- i) One screen chamber (Two partitions)
- ii) One Wet well (Two partitions)
- iii) One Dry well
- iv) One valve chamber



Pumps (working + standby) are proposed in dry well having capacity varying from 0.1 to 0.5 cusec depending on the volume of sewerage produce in the village. The sewage will be treated in ABR from where this treated effluent will be disposed into existing water course.

### Anaerobic Baffled Reactor (ABR)

Proposed Sewage Treatment plant consists of Screening Chamber, Wet Well, Dry Well with Pumping Machinery and Sewage Force main up to Proposed STP. Anaerobic Baffled Reactor (ABR), which has chambers divided by baffles, provides a mechanism for both primary and secondary sedimentation. The majority of solids are removed by the ABR's first chamber, which also has low sludge formation and high SRT. The bulk of shock loads may be handled by the technology with ease. The system's ease of construction makes it perfect for wastewater treatment. The anaerobic process reduces the formation of sludge biomass, the particles in the effluent are reduced due to significant sedimentation in the baffled chambers, and most importantly, the ABR has lower capital and operating costs than aerobic processes. Another significant benefit is that this technique works best in semi-arid and tropical environments.

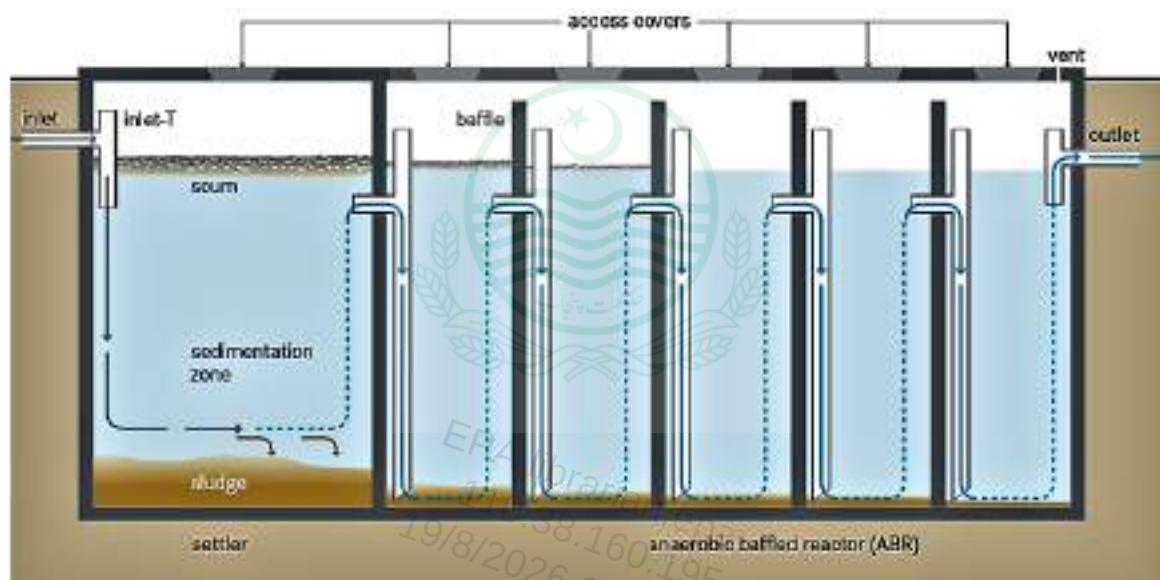


Figure 4.3: Process Flow Diagram of STP / WWTP / ABR

### Project Cost

The estimated total cost of the project for the proposed 193 villages is PKR 27,283.128 million or 96.90 million US\$<sup>4</sup>

### 4.4 Land Acquisition

The laying of piping network for water supply and sewerage system will not require land acquisition, as the pipeline will be buried underground. The network will be designed in a manner that the pipeline is laid along the public roads / streets. However, if pipeline route is required to pass through any private lands, special permission for laying and periodic maintenance shall be sought from the landowners.

<sup>4</sup> 01 USD = 281.55 PKR



The land required for the construction of overhead tank, pumping station and STP will consist of state land, acquired through process of No Objection Certificate (NOC). In cases where private land is needed, it shall be obtained through Voluntarily Land Donation (VLD). State land is mostly available in villages called “Chak”. During British Raj, new canals were built to bring the barani areas under cultivation by introducing the irrigated areas around the core of new villages called *Chak*. As sufficient state land is available in these villages (Chaks), therefore NOC process was adopted. Whereas in other villages government land is not available hence private land, donated by community members through VLD procedure, shall be used.

However, land through VLD is only obtained after satisfying the set criteria: first, that the state land is not available in the proposed village; second, when state land in the village is not technically viable based on requirements of engineering design for the construction of infrastructure; third, only after meeting the VLD Screening.

**Table 4.4: Land Requirement Details**

| Sr. No. | Tehsil     | Revenue Villages | Private Land required through VLD (in Marla) | State Land required through NOC (in Marla) |
|---------|------------|------------------|----------------------------------------------|--------------------------------------------|
| 1       | Liaquatpur | Ahmed Yar        | 3.7                                          | 6                                          |
| 2       |            | Arif Baloch      | 20.19                                        | 6                                          |
| 3       |            | Chak 315 / 6R    | 6.83                                         | 3                                          |
| 4       |            | Chak 316 / 6 R   | 6.97                                         | 3                                          |
| 5       |            | Chak 317/6R      | 9.20                                         | 3                                          |
| 6       |            | Chak 08 Abbasia  | 19.58                                        | 3                                          |
| 7       |            | Chak 09 Abbasia  | 7.87                                         | 6                                          |
| 8       |            | Chak 11 Abbasia  | 24.12                                        | 3                                          |
| 9       |            | Chak 12 Abbasia  | 9.05                                         | 3                                          |
| 10      |            | Chak 313/6R      | 6.83                                         | 3                                          |
| 11      |            | Chak 134 NP      | 13.87                                        | 3                                          |
| 12      |            | Chak 135 NP      | 3.70                                         | 3                                          |
| 13      |            | Chak136 NP       | 5.65                                         | 3                                          |
| 14      |            | Chak 139 NP      | 9.32                                         | 6                                          |
| 15      |            | Chak 140 NP      | 5.66                                         | 3                                          |
| 16      |            | Chak 143 Abbasia | 17.36                                        | 3                                          |
| 17      |            | Chak 144 Abbasia | 7.26                                         | 3                                          |
| 18      |            | Chak 145 Abbasia | 5.30                                         | 3                                          |
| 19      |            | Chak 147 / 5R    | 10.48                                        | 3                                          |
| 20      |            | Chak 148 / 5R    | 6.83                                         | 3                                          |
| 21      |            | Chak 150 Abbasia | 6.75                                         | 3                                          |
| 22      |            | Chak 152 / 7R    | 9.22                                         | 3                                          |



| Sr. No. | Tehsil | Revenue Villages | Private Land required through VLD (in Marla) | State Land required through NOC (in Marla) |
|---------|--------|------------------|----------------------------------------------|--------------------------------------------|
| 23      |        | Chak 153 / 7R    | 9.05                                         | 3                                          |
| 24      |        | Chak 154 / 7R    | 9.22                                         | 3                                          |
| 25      |        | Chak 155 / 7R    | 9.49                                         | 3                                          |
| 26      |        | Chak 156 / 7R    | 9.49                                         | 3                                          |
| 27      |        | Chak 157 / 7R    | 14.38                                        | 3                                          |
| 28      |        | Chak 159 / 7R    | 6.08                                         | 3                                          |
| 29      |        | Chak 174 / 7R    | 7.66                                         | 3                                          |
| 30      |        | Chak 175 / 7R    | 13.18                                        | 3                                          |
| 31      |        | Chak 177 / 7R    | 5.49                                         | 3                                          |
| 32      |        | Chak 178 / 7R    | 6.14                                         | 3                                          |
| 33      |        | Chak 179 / 7R    | 5.73                                         | 3                                          |
| 34      |        | Chak 180 / 7R    | 9.19                                         | 3                                          |
| 35      |        | Chak 182 / 1L    | 3.56                                         | 3                                          |
| 36      |        | Chak 183 / 7 R   | 7.39                                         | 3                                          |
| 37      |        | Chak 186 / 7 R   | 4.76                                         | 3                                          |
| 38      |        | Chak 19 Abbasia  | 25.53                                        | 3                                          |
| 39      |        | Chak 191 / 1L    | 3.83                                         | 3                                          |
| 40      |        | Chak 194 / 1L    | 11.48                                        | 3                                          |
| 41      |        | Chak 195 / 1L    | 5.49                                         | 3                                          |
| 42      |        | Chak 20 Abbasia  | 11.90                                        | 3                                          |
| 43      |        | Chak 22 Abbasia  | 7.12                                         | 3                                          |
| 44      |        | Chak 23 Abbasia  | 14.03                                        | 6                                          |
| 45      |        | Chak 28 Abbasia  | 3.56                                         | 3                                          |
| 46      |        | Chak 31 Abbasia  | 5.66                                         | 12                                         |
| 47      |        | Chak 32 Abbasia  | 31.66                                        | 3                                          |
| 48      |        | Chak 33 Abbasia  | 8.94                                         | 3                                          |
| 49      |        | Chak 36 Abbasia  | 6.21                                         | 3                                          |
| 50      |        | Chak 37 Abbasia  | 19.72                                        | 3                                          |
| 51      |        | Chak 38 Abbasia  | 10.30                                        | 3                                          |
| 52      |        | Chak 39 Abbasia  | 11.52                                        | 3                                          |
| 53      |        | Chak 3 A         | 9.32                                         | 3                                          |
| 54      |        | Chak 40 Abbasia  | 9.09                                         | 3                                          |
| 55      |        | Chak 41 Abbasia  | 11.0                                         | 3                                          |
| 56      |        | Chak 42 Abbasia  | 16.32                                        | 3                                          |
| 57      |        | Chak 43 Abbasia  | 29.67                                        | 3                                          |



| Sr. No. | Tehsil | Revenue Villages   | Private Land required through VLD (in Marla) | State Land required through NOC (in Marla) |
|---------|--------|--------------------|----------------------------------------------|--------------------------------------------|
| 58      |        | Chak 46 Abbasia    | 11.46                                        | 3                                          |
| 59      |        | Chak 47 Abbasia    | 14.54                                        | 3                                          |
| 60      |        | Chak 48 Abbasia    | 10.98                                        | 3                                          |
| 61      |        | Chak 4 A           | 3.83                                         | 6                                          |
| 62      |        | Chak 63 Abbasia    | 19.37                                        | 3                                          |
| 63      |        | Chak 64 Abbasia    | 7.12                                         | 3                                          |
| 64      |        | Chak 65 Abbasia    | 15.38                                        | 6                                          |
| 65      |        | Chak 68 Abbasia    | 15.67                                        | 6                                          |
| 66      |        | Chak 69 Abbasia    | 4.97                                         | 3                                          |
| 67      |        | Chak 75 Abbasia    | 17.39                                        | 3                                          |
| 68      |        | Chak 77 Abbasia    | 17.94                                        | 3                                          |
| 69      |        | Chak 78 Abbasia    | 14.8                                         | 3                                          |
| 70      |        | Chak 79 Abbasia    | 14.91                                        | 12                                         |
| 71      |        | Chak 80 Abbasia    | 12.16                                        | 3                                          |
| 72      |        | Chak 81 Abbasia    | 18.13                                        | 3                                          |
| 73      |        | Chak 82 Abbasia    | 7.14                                         | 3                                          |
| 74      |        | Chak 83 Abbasia    | 9.26                                         | 12                                         |
| 75      |        | Chak 84 Abbasia    | 15.27                                        | 9                                          |
| 76      |        | Chak 85 Abbasia    | 19.24                                        | 3                                          |
| 77      |        | Chak 86 Abbasia    | 8.46                                         | 9                                          |
| 78      |        | Chak 87 Abbasia    | 41.68                                        | 12                                         |
| 79      |        | Chak 88 Abbasia    | 22.51                                        | 3                                          |
| 80      |        | Chak 89 Abbasia    | 5.32                                         | 3                                          |
| 81      |        | Chapri Chatan Shah | 5.66                                         | 3                                          |
| 82      |        | Gulshan Farid      | 17.27                                        | 6                                          |
| 83      |        | Hayat Lar          | 20.41                                        | 3                                          |
| 84      |        | Kanjki Wala        | 22.79                                        | 6                                          |
| 85      |        | Kotla Daraigh      | 22.35                                        | 9                                          |
| 86      |        | Kotla Khairay Khan | 7.27                                         | 3                                          |
| 87      |        | Muradpur Sail      | 29.63                                        | 6                                          |
| 88      |        | Taranda Gurgujj    | 43.43                                        | 6                                          |
| 89      |        | Turkary            | 65.05                                        | 12                                         |
| 90      |        | Firoza             | 17.2                                         | 6                                          |
| 91      |        | Chak 140 Abbasia   | 12.21                                        | 3                                          |
| 92      |        | Chak 51 Abbsia     | 14.92                                        | 6                                          |



| Sr. No. | Tehsil | Revenue Villages    | Private Land required through VLD (in Marla) | State Land required through NOC (in Marla) |
|---------|--------|---------------------|----------------------------------------------|--------------------------------------------|
| 93      |        | Chak 53 Abbasia     | 8.52                                         | 6                                          |
| 94      |        | Chak No 02 Abbasia  | 6.88                                         | 6                                          |
| 95      |        | Chak No 06 Abbasia  | 9.66                                         | 6                                          |
| 96      |        | Chak No 07 Abbasia  | 7                                            | 6                                          |
| 97      |        | Chak No 10 Abbasia  | 15.04                                        | 6                                          |
| 98      |        | Chak No 13 Abbasia  | 20.3                                         | 12                                         |
| 99      |        | Chak No 138 Abbasia | 8.17                                         | 3                                          |
| 100     |        | Chak No 139 Abbasia | 13.3                                         | 3                                          |
| 101     |        | Chak No 14 Abbasia  | 15.66                                        | 12                                         |
| 102     |        | Chak No 142 Abbasia | 10.61                                        | 6                                          |
| 103     |        | Chak No 15 Abbasia  | 18.45                                        | 6                                          |
| 104     |        | Chak No 16 Abbasia  | 15.51                                        | 6                                          |
| 105     |        | Chak No 27 Abbasia  | 10.68                                        | 6                                          |
| 106     |        | Chak No 52 Abbasia  | 20.45                                        | 20                                         |
| 107     |        | Chak No 54 Abbasia  | 11                                           | 3                                          |
| 108     |        | Chak No 55 Abbasia  | 9.58                                         | 3                                          |
| 109     |        | Ahmed Ali Lar       | 3.3                                          | 6                                          |
| 110     |        | Allah Dita Bhela    | 2.3                                          | 6                                          |
| 111     |        | Allah Jiwaya Lar    | 2.9                                          | 6                                          |
| 112     |        | Ashraf Shah         | 2.17                                         | 6                                          |
| 113     |        | Bahan Wala          | 6.4                                          | 9                                          |
| 114     |        | Bahar Khaki         | 24.7                                         | 9                                          |
| 115     |        | Chak No. 116-A-NP   | 2.4                                          | 3                                          |
| 116     |        | Chak No. 116 NP     | 3.4                                          | 6                                          |
| 117     |        | Chak No. 117 NP     | 1.52                                         | 6                                          |
| 118     |        | Chak No. 118 NP     | 0.47                                         | 3                                          |
| 119     |        | Chak No. 119-A- NP  | 1.2                                          | 3                                          |
| 120     |        | Chak No. 119 NP     | 2.4                                          | 3                                          |
| 121     |        | Chak No. 120 NP     | 0.12                                         | 3                                          |
| 122     |        | Chak No. 121 NP     | 2.96                                         | 6                                          |
| 123     |        | Chak No. 122 NP     | 3.9                                          | 6                                          |
| 124     |        | Chak No. 123 NP     | 2.2                                          | 3                                          |
| 125     |        | Chak No. 124 NP     | 2.7                                          | 6                                          |
| 126     |        | Chak No. 125 NP     | 2.7                                          | 6                                          |
| 127     |        | Chak No. 126 NP     | 9                                            | 3                                          |



| Sr. No. | Tehsil | Revenue Villages    | Private Land required through VLD (in Marla) | State Land required through NOC (in Marla) |
|---------|--------|---------------------|----------------------------------------------|--------------------------------------------|
| 128     |        | Chak No. 127 NP     | 4.3                                          | 6                                          |
| 129     |        | Chak No. 128 NP     | 2                                            | 3                                          |
| 130     |        | Chak No. 129 NP     | 2.8                                          | 6                                          |
| 131     |        | Chak No. 130 NP     | 0.75                                         | 3                                          |
| 132     |        | Chak No. 131 NP     | 0.75                                         | 3                                          |
| 133     |        | Chak No. 132 NP     | 1.88                                         | 3                                          |
| 134     |        | Chak No. 133 NP     | 1.2                                          | 3                                          |
| 135     |        | Chak No. 137 NP     | 0.45                                         | 3                                          |
| 136     |        | Chak No. 138 NP     | 1.45                                         | 3                                          |
| 137     |        | Chak No. 34 Abbasia | 1.88                                         | 6                                          |
| 138     |        | Chak No. 35 Abbasia | 3.7                                          | 9                                          |
| 139     |        | Chanjni             | 3.7                                          | 6                                          |
| 140     |        | Chohan              | 2.75                                         | 3                                          |
| 141     |        | Choudari            | 13.6                                         | 12                                         |
| 142     |        | Chur Wala           | 1.75                                         | 3                                          |
| 143     |        | Duda Naich          | 1.88                                         | 6                                          |
| 144     |        | Gabrani             | 17.8                                         | 6                                          |
| 145     |        | Gharib Shah         | 4.9                                          | 6                                          |
| 146     |        | Ghemi               | 5.87                                         | 6                                          |
| 147     |        | Ghuka               | 2.88                                         | 6                                          |
| 148     |        | Goth Amin           | 5.51                                         | 6                                          |
| 149     |        | Goth Hayat          | 6.3                                          | 9                                          |
| 150     |        | Goth Mahi           | 12.8                                         | 12                                         |
| 151     |        | Gous Abad           | 6.3                                          | 9                                          |
| 152     |        | Gul Muhammad Lar    | 12.7                                         | 6                                          |
| 153     |        | Gulani              | 17.7                                         | 12                                         |
| 154     |        | Haroon Abad         | 7.8                                          | 3                                          |
| 155     |        | Hussain Abad        | 0.47                                         | 3                                          |
| 156     |        | Jhoung Bilawal      | 5.51                                         | 6                                          |
| 157     |        | Juma Muhana         | 6.8                                          | 9                                          |
| 158     |        | Kandani             | 19.4                                         | 6                                          |
| 159     |        | Kotla Daulat        | 14.81                                        | 12                                         |
| 160     |        | Kotla Mubarik       | 6.2                                          | 9                                          |
| 161     |        | Kotla Nawab         | 6.9                                          | 9                                          |
| 162     |        | Kotla Niazi         | 7.8                                          | 9                                          |





| Sr. No.      | Tehsil | Revenue Villages  | Private Land required through VLD (in Marla) | State Land required through NOC (in Marla) |
|--------------|--------|-------------------|----------------------------------------------|--------------------------------------------|
| 163          |        | Lakhani           | 6.8                                          | 9                                          |
| 164          |        | Lal Shah          | 7.8                                          | 9                                          |
| 165          |        | Laoon Wala        | 6.8                                          | 9                                          |
| 166          |        | Malhani           | 7.5                                          | 9                                          |
| 167          |        | Malikpur          | 1.94                                         | 9                                          |
| 168          |        | Malkani           | 6.8                                          | 9                                          |
| 169          |        | Metla             | 5.9                                          | 6                                          |
| 170          |        | Mir Muhammad Lar  | 1.88                                         | 6                                          |
| 171          |        | Muhammad Daha     | 6.8                                          | 6                                          |
| 172          |        | Mujawraan         | 5.3                                          | 6                                          |
| 173          |        | Nala Musani       | 2.76                                         | 6                                          |
| 174          |        | Pakhi War         | 5.9                                          | 6                                          |
| 175          |        | Pararan Sharif    | 9.7                                          | 9                                          |
| 176          |        | Qadu Wali         | 13.2                                         | 12                                         |
| 177          |        | Rais Pathan       | 5.52                                         | 6                                          |
| 178          |        | Rashid Abad       | 2.76                                         | 6                                          |
| 179          |        | Rindan            | 8.1                                          | 3                                          |
| 180          |        | Sadiqpur          | 1.9                                          | 3                                          |
| 181          |        | Saidpur           | 11.8                                         | 9                                          |
| 182          |        | Shahbazpur Gharbi | 289                                          | 6                                          |
| 183          |        | Shamsabad         | 2.2                                          | 6                                          |
| 184          |        | Shidani Sharif    | 13.2                                         | 6                                          |
| 185          |        | Talbani           | 38.2                                         | 18                                         |
| 186          |        | Tanwari           | 6.4                                          | 9                                          |
| 187          |        | Trinda Mir Khan   | 11.6                                         | 9                                          |
| 188          |        | Ther Posti        | 2.3                                          | 6                                          |
| 189          |        | Tibbi Sayyadan    | 6.4                                          | 6                                          |
| 190          |        | Wahid Bux Sial    | 6.2                                          | 6                                          |
| 191          |        | Yakhtar Maha      | 1.4                                          | 6                                          |
| 192          |        | Zaffar Abad       | 17                                           | 9                                          |
| 193          |        | Unran             | 4.9                                          | 6                                          |
| <b>Total</b> |        |                   | <b>2190.24</b>                               | <b>1043.0</b>                              |

The total 2190.24 Marla land is required through VLD, whereas 1043.0 Marla land is required through NOC.



#### 4.5 Project Administrative Jurisdiction

The proposed project falls under the jurisdiction of Deputy Commissioners of relevant tehsil of province.

#### 4.6 Project Implementation Schedule

The project will take 10 months in each village from start to finish. The commencement is scheduled simultaneously in May/June 2026.

#### 4.7 Construction Activities and Required Machinery

Construction activities involve following:

- Earth Work
- Structure/ Concrete works
- Pipe Laying

Table 4.5 presents the list of expected machinery required for construction. The number of these machines will be finalized with the detailed design of the proposed road:

**Table 4.5: List of expected Machinery/Equipment**

|    |                                      |    |                            |
|----|--------------------------------------|----|----------------------------|
| 1  | Mobile Crane                         | 15 | Jack Hammer                |
| 2  | Dumpers                              | 16 | Plate Compactor            |
| 3  | Road/Power Roller                    | 17 | Wood Shuttering            |
| 4  | Light Weight Compactor               | 18 | Formwork                   |
| 5  | Ramming Machine                      | 19 | Steel Cage Shuttering Unit |
| 6  | Water Sprinkler and Water Tanker     | 20 | Motor graders              |
| 7  | Excavator                            | 21 | Generators                 |
| 8  | Tractor with Front Blade and Trolley | 22 | Welding Plant              |
| 9  | Loader                               | 23 | Transit Mixer              |
| 10 | Road Cutter                          | 24 | Vibrators                  |
| 11 | Pneumatic Tyred Roller (PTR)         | 25 | Scaffolding                |
| 12 | Tandem Roller                        | 26 | Light Transport            |
| 13 | Concrete Mixer Machine               | 27 | Mini/ Hand Roller          |
| 14 | Tower Crane                          | 28 | Barricades                 |

#### 4.8 Construction Camps

Camp sites will be selected based on following considerations:

- Number of workforces deployed;
- Type and quantity of machinery mobilized;
- Availability of adequate area for establishing camp sites including parking areas for machinery, stores and workshops;
- Access to communication and local markets;
- Appropriate distance from sensitive areas including settlements and religious and/or cultural facilities.



Final locations will be selected by the contractor with the assistance of Supervision Consultant. A centralized construction camp will be preferred in tehsils where villages are geographically in close proximity; this will result in resource efficiency and better monitoring of construction activities. Care will be taken to safeguard the existing environment of the area and location shall be selected away from settlements. If the campsite is to be established on privately owned land, the contractors will acquire it on rental basis from private landowners. The contractors will return the land on as received basis. All debris, construction materials, left over chemicals and machinery shall be removed before handing back the premises to landowners.

#### **4.9 Construction Materials**

The materials used in construction of water supply, sewerage, overhead tanks pumping station & sewage treatment plant (STP) in all villages, would include coarse aggregates (crush), bricks, fine aggregates (sand), soil, water, pipes (RCC & HDPE), cement, reinforcement, asphalt etc. Procurement, safe handling and transportation of these material as per the EHS guidelines and other requisite standards will be responsibility of the Contractors. Local suppliers of construction materials should be preferred if they meet the financial and quality standards criteria.

#### **4.10 Workforce Requirement**

##### **Workforce during Construction Phase**

Total man power required on site for proposed Project will be approximately 08-30 workers per village per day, depending on the type of construction. Hiring of the local labor will be preferred.

##### **Workforce during Operation Phase**

Total man power required during operation phase for proposed Project will be approximately 5 workers per village comprising skilled and unskilled staff.

#### **4.11 Solid Waste Generation**

Due to construction activities waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and waste construction materials. Solid waste generated during construction and camp sites will be safely disposed of in demarcated waste disposal sites.

##### **Construction and Operation Phase**

The solid waste generation is estimated to be 0.28kg/capita/day during construction phase of the proposed Project.

#### **4.12 Water Requirement**

##### **Construction Phase**

The water consumption is estimated to be 30 liter/day/worker<sup>5</sup> during construction phase of the proposed Project.

<sup>5</sup> The most basic water requirement is stipulated by the World Health Organization (WHO) and varies between 20 and 50 litres per capita per day (LPCD).



## Operation Phase

The water consumption is estimated to be 30 liter/capita/day (during operation phase of the proposed project).

### 4.13 Wastewater Generation during Construction Phase

The wastewater generation is estimated to be 24 liter/capita/day<sup>6</sup> for during construction phase of the proposed Project. Temporary toilets with cesspit will be adequately installed and treated periodically, and after the completion of work, the ground will be restored.



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<sup>6</sup> Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain (Domestic sewage generation = 80% of water consumed/day)



## SECTION -5 ANALYSIS OF ALTERNATIVES

The analysis of alternatives is an essential component of the Environmental Impact Assessment (EIA) process. The purpose of this Section is to evaluate different project alternatives in order to identify the most environmentally, socially, technically, and economically feasible option for the proposed Water Supply and Sewerage Project being implemented. The alternatives considered for the project include:

### 5.1 No Project Alternative

- Alternative Project Locations
- Alternative Water Supply Sources
- Alternative Sewerage and Wastewater Disposal Options
- Alternative Construction Materials and Technologies
- Alternative Implementation Approaches

Under the “No Project Alternative,” the proposed water supply and sewerage infrastructure would not be implemented.

### Potential Implications

#### Water Supply

- Continued dependence on unsafe and unreliable water sources.
- Increased risk of waterborne diseases due to contaminated groundwater and poor sanitation conditions.
- Insufficient access to potable water for the growing population.

#### Sewerage and Sanitation

- Continued discharge of untreated wastewater into open drains and agricultural lands.
- Environmental degradation and unhygienic conditions.
- Increased groundwater contamination.

#### Socioeconomic Conditions

- Reduced public health standards.
- Increased medical expenses and productivity losses.
- Limited improvement in living standards and community development.

### Conclusion

The “No Project Alternative” was rejected because it would not address the existing deficiencies in water supply and sanitation services and would allow environmental and public health problems to persist.

### 5.2 Alternative Project Locations

Different alignments and locations for the proposed infrastructure components such as:

- Water supply pipelines,



- Sewerage networks,
- Tube wells,
- Pumping stations, and
- Sewage Treatment Plant (STP)

were considered during the planning stage.

### **Selection Criteria**

The following criteria were used for selecting the preferred locations:

- Minimum land acquisition requirements,
- Avoidance of sensitive environmental receptors,
- Accessibility for operation and maintenance,
- Technical feasibility,
- Reduced resettlement impacts,
- Cost effectiveness.
- Preferred Option
- The selected project locations primarily utilize existing public rights-of-way, roads, and government land in order to minimize environmental and social impacts.

### **5.3 Alternative Water Supply Sources**

Different water supply options were evaluated for the project area.

#### **(i) Groundwater Source**

Groundwater extraction through tube wells was considered due to:

- Availability of groundwater in the project area,
- Lower initial infrastructure requirements,
- Operational feasibility,
- Reliable supply for rural settlements.

#### **Limitations**

- Risk of declining groundwater table,
- Possibility of salinity and contamination in some areas.

#### **(ii) Surface Water Source**

Surface water from nearby canals or rivers was also evaluated.

#### **Limitations**

- High treatment requirements,
- Increased operational and maintenance costs,
- Additional transmission infrastructure requirements,
- Seasonal variations in water quality.





### **Preferred Alternative**

Groundwater abstraction through properly designed and monitored tube wells was selected as the preferred option due to its technical and economic feasibility for the pilot project.

#### **5.4 Alternative Sewerage and Wastewater Disposal Options**

The following wastewater management alternatives were assessed:

##### ***(i) Septic Tanks and Soak Pits***

Traditionally used in rural areas.

##### ***Limitations***

- Ineffective in densely populated settlements,
- Risk of groundwater contamination,
- Poor sludge management practices.

##### ***(ii) Open Drains***

Existing open drainage systems were reviewed.

##### ***Limitations***

- Public health hazards,
- Odor and vector issues,
- Environmental pollution,
- Unsafe conditions for residents.

##### ***(iii) Underground Sewerage System with Treatment Facility***

A properly designed sewerage network connected to a sewage treatment system was considered.

##### ***Advantages***

- Improved sanitation and hygiene,
- Reduced environmental pollution,
- Better wastewater management,
- Protection of groundwater resources,
- Long-term sustainable solution.

### **Preferred Alternative**

The underground sewerage network coupled with wastewater treatment facilities was selected as the preferred option due to its environmental and public health benefits.

#### **5.5 Alternative Construction Materials and Technologies**

Different construction methods and materials were considered for pipelines and associated infrastructure.



### ***Pipeline Materials Considered***

- PVC Pipes,
- HDPE Pipes,
- Reinforced Concrete Pipes (RCC),
- Ductile Iron Pipes.

### ***Preferred Materials***

The selection of materials was based on:

- Durability,
- Hydraulic efficiency,
- Resistance to corrosion,
- Availability,
- Cost effectiveness,
- Ease of maintenance.

HDPE and PVC pipes were preferred for water supply systems, while RCC and HDPE pipes were considered suitable for sewerage infrastructure depending upon hydraulic requirements.

### **5.6 Alternative Implementation Approaches**

Different implementation approaches were considered including:

- Simultaneous construction across all villages,
- Phased implementation,
- Priority-based implementation.

### ***Preferred Alternative***

A phased implementation approach was selected because it:

- Reduces environmental and social disturbances,
- Improves construction management,
- Allows effective monitoring,
- Facilitates budget allocation and resource management,
- Enables incorporation of lessons learned during implementation.

### **5.7 Environmentally Preferred Alternative**

Based on the comparative assessment of technical, environmental, social, and economic considerations, the environmentally preferred alternative for the PRMSC Pilot Project includes:

- Groundwater-based water supply system through monitored tube wells,
- Underground sewerage network,
- Sewage treatment and controlled disposal,



- Utilization of existing public land and ROWs,
- Phased project implementation,
- Adoption of environmentally sound construction practices.

## 5.8 Conclusion

The analysis demonstrates that the selected project alternative provides the most feasible and sustainable solution for improving water supply and sanitation services in the project area. The proposed project is expected to significantly improve public health conditions, environmental quality, and socioeconomic development while minimizing adverse environmental and social impacts through implementation of appropriate mitigation measures and Environmental and Social Management Plans (ESMPs).



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## **SECTION -6      DESCRIPTION OF ENVIRONMENTAL & SOCIAL BASELINE**

### **6.1      General**

This section presents the current environment around the proposed development which has been considered with respect to physical, ecological and socio-economic resources. The EIA of the proposed project covers a comprehensive description of the project area, including the resources which are expected to be affected by the project, as well as, those which are not expected to be directly affected by the construction and operation of the project.

EIA teams conducted the reconnaissance and detailed field visits of the project area from November, 2025 to April, 2026. The prime objective of the field visits was to collect the baseline data on physical, eco-biological and environmental & social aspects along with identification, assessment and categorization of the significant environmental and social impacts of the proposed Project. Further analysis and arriving at the meaningful results, the secondary data was collected from published sources/reports and relevant departments, which were also verified through visual observations during reconnaissance and detailed surveys.

### **6.2      Delineation of Study Area / Area of Influence (AoI)**

As per the environmental screening study conducted earlier, the project falls in “Category E2”. The impacts of the project activities are limited and within the boundary of each targeted revenue village. The relevant revenue village is considered as project area and boundary of revenue village has been considered Area of Influence (AoI).

To further explain the Area of Influence (AoI) based on the proposed project activities, maps illustrating the geographical extent and layout of the water supply and sewerage networks, water and wastewater treatment facilities, and the disposal of treated effluent into ponds located within the principal settlements of the villages are provided. It is to be noted that the outfall of the treated effluent is into the existing wastewater collection pond located within the boundary of the village (within the confines of AoI). As the level of project intervention (water supply and treatment, wastewater collection and treatment system) and on ground conditions (such as sewerage ponds) are similar in all 238 villages therefore, maps of a typical village is shared to develop understanding of the area of influence.

As per the national and provincial regulations along with the requirements of World Bank’s OP’s, impacts and risks have been analyzed within the project AoI. Environmental and social impacts and risks will also be analyzed for all relevant stages of the project cycle, including pre-construction, construction and operation phases of the project.

### **6.3      Physical Environment**

The physical environment includes topography, geology, soil, climate, hydrology, drainage, seismology, surface water, groundwater and ambient air.

#### **6.3.1      Topography**

Liaquatpur is situated on the flat alluvial plains of the Indus Basin at an average elevation of approximately 96 m above mean sea level. The topography is generally level with a gentle regional slope, and the area is characterized by fertile alluvial soils deposited by the Indus River system. The absence of steep terrain and the presence of extensive agricultural land



make the area suitable for the development of water supply and sanitation infrastructure. Due to the relatively low relief, appropriate drainage and pumping arrangements are required to ensure efficient operation of the proposed sewerage system and to minimize the risk of waterlogging.

### 6.3.2 Geology

Punjab's area mostly consists of an alluvial plain formed by the southward-flowing Indus River and its four major tributaries. The general slope of the land is from northeast to southwest, but it rises in the areas between rivers. Approximately 70 percent land area of the province comprises flood plains of Indus basin. Geologically, lands in the flood plains are lightly mantled with alluvial deposits transported from the Himalaya foothills. The underlying bedrock is composed of Precambrian metamorphic and tertiary consolidated rocks. The overlying alluvium consists of Pleistocene to recent unconsolidated deposits of sand, clay and silt. The formation age of the alluvium also dates from Pleistocene to recent, the latter being predominant earth river banks and the former around the central part of the plains, no major fault zone traverses the project area.

Liaquatpur reflects a classic foreland –basin geology: vast plains built up by river – borne alluvium resting a top older sedimentary layers eroded from adjacent mountain belts – chiefly, the Sulaiman Range. these sediments make older rock units that are geologically significant but deeper subsurface features. the presence of chalk and coal nearby suggests deeper geological complexity and varying depositional environments over time.

### 6.3.3 Climate and Meteorology

#### A. Average Temperatures

The project area has hot summer and cold winters. The summer starts from May and lasts till September. June is the hottest month. The mean maximum temperature is 39 °C and minimum temperature varies between 28°C for month of June. The winter seasons lasts from November to February. January is the coldest month. The mean maximum range is 21°C and mean minimum temperature range is 08°C in January as shown in the following table:

**Table 6.1: Temperature Variation in Summer and Winter Season**

| Sr. No. | Cluster | Tehsils    | Average Annual Rainfall (mm) | Summer Season |             | Winter Season |             |
|---------|---------|------------|------------------------------|---------------|-------------|---------------|-------------|
|         |         |            |                              | Mean Max °C   | Mean Min °C | Mean Max °C   | Mean Min °C |
| 2       | South-1 | Liaquatpur | 101                          | 39            | 28          | 21            | 8           |

In project areas, most of the times of the year sunny days dominate. A few days per month are partly cloudy and with seldom overcast days. The maximum precipitation is observed during June to August. In project areas are classified as arid region having average annual rainfall less than 101 mm in a year. Highest intensity of rain is recorded in month of July and August owing to monsoon season.

#### B. Wind

In targeted tehsil windier part of the year is April to August. In north, central and south- zones of Punjab, April and July are notably the windiest months. Conversely, in the South-I zone of

Punjab, June experiences higher wind activity. Moreover, from April to July, dust storms are prevalent in the targeted tehsil.

**Table 6.2: Average Wind Speed and Windiest Month in Tehsils**

| Cluster | Tehsils    | Windiest Month | Avg. Wind Speed |
|---------|------------|----------------|-----------------|
| South-1 | Liaquatpur | June           | 13 km/h         |

#### 6.3.4 Water Resources

Description of surface water and groundwater of targeted villages in different tehsils is as under. Hydrology map of Punjab Province is shown in Figure 1.1.

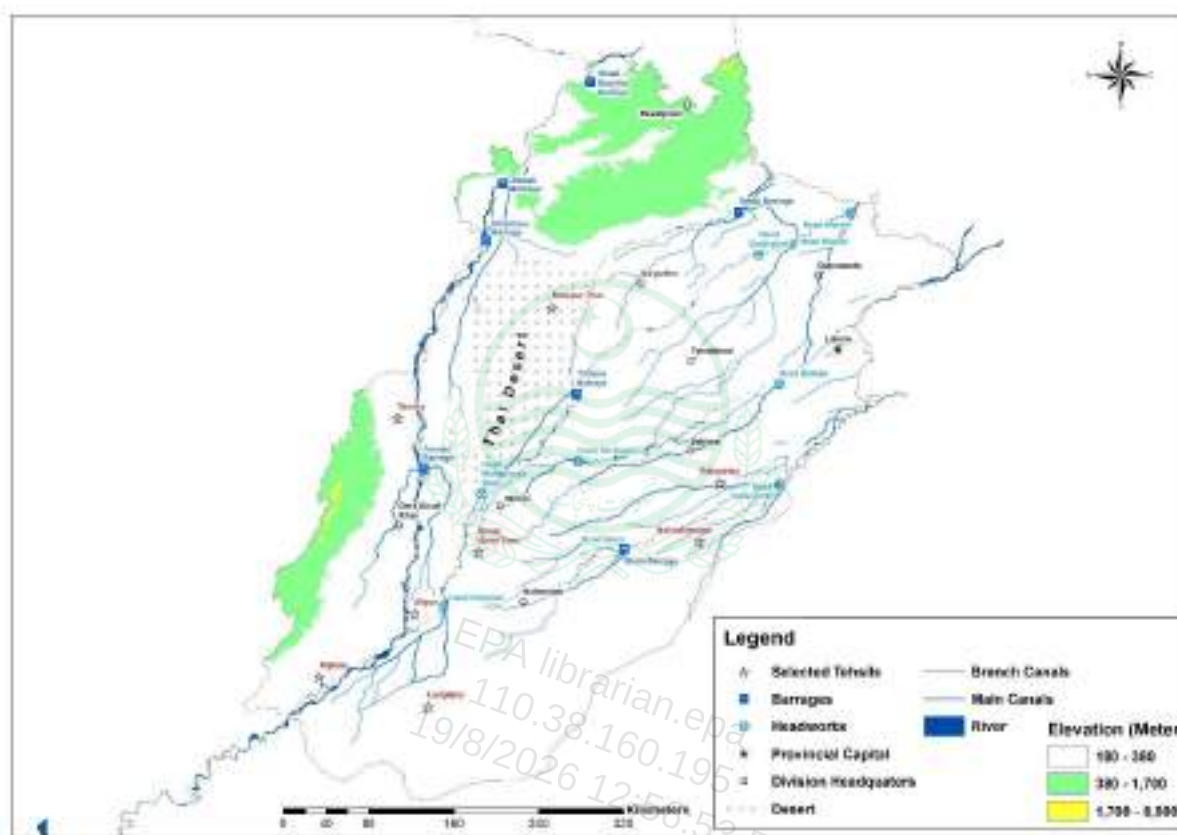


**Figure 6.1: Hydrology Map of Punjab Province**

#### Surface Water

Punjab is land of Indus River and its four major tributaries in Pakistan, the Jhelum, Chenab, Ravi, and Sutlej rivers. Punjab Irrigation system is one of the world's largest irrigation systems with a command area of over 21 million acres. The system consists of 24 main canals and 12 barrages and vast network of canals, distributaries and minors spanning over 40,000 kilometers. Targeted villages in south of the Punjab are in command area of this irrigation system. The detail of canal and distributaries passing within or nearby the targeted villages is shared in Table 6.3. In Liaquatpur, canals associated with the Abbasia Canal system provide water primarily for agricultural activities, Surface water is not a major source of potable water but is widely used for irrigation, livestock, and groundwater recharge.





**Table 6.3: Surface Water Bodies in Targeted Villages of Relevant Tehsil**

| Tehsil     | Surface Water Bodies of Targeted Villages in Tehsil |                                   |              |                                                                                           |                                                                                   |
|------------|-----------------------------------------------------|-----------------------------------|--------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|            | River                                               | Main Canal                        | Branch Canal | Distributary                                                                              | Minor Canal                                                                       |
| Liaquatpur | -                                                   | Punjad Main Lines and Minch Canal | -            | Unran, Shedani, Sharif, Lower Rindan, Khan Bella, Upper Nawain Kot, Kamdani, Arif, Chuhar | Gabar, Shamas, Pacca Laran, Ashraf, Gulzar, Allahabad, Choudari, 1-R/3-R, Duphali |

#### **A. Groundwater/Drinking Water Quality**

In Liaquatpur groundwater is the primary source of domestic water supply. The quality of groundwater is generally brackish to moderately saline, with elevated Total Dissolved Solids (TDS) reported in several locations. In some areas, the presence of dissolved salts and occasional microbial contamination limits its direct suitability for drinking without basic treatment; however, it remains commonly used for household purposes and limited irrigation.

Groundwater depth in the tehsil range from 20 to 50 ft and serves as the primary source of water. The groundwater quality is non-objectionable in terms of taste and color, indicating generally acceptable groundwater conditions.

The groundwater analysis of the targeted villages in tehsil revealed the following facts in Table 6.4.

**Table 6.4: Groundwater Analysis**

| Tehsil     | Groundwater Detail of targeted villages in Tehsil |                   |         |             |                            |
|------------|---------------------------------------------------|-------------------|---------|-------------|----------------------------|
|            | Depth                                             | Taste             | Color   | Source      | Remarks                    |
| Liaquatpur | 15-30 feet                                        | Non-Objectionable | 0 (TCU) | Groundwater | Compliance with PEQS Limit |

Based on the data, where the groundwater is brackish, seepage from the canal water will serve as the primary source of water for the water supply system. Whereas, in areas where the groundwater is deemed acceptable in terms of taste, it will be utilized as a source of water following appropriate treatment measures as indicated below:

- Chlorination for Microbial contamination
- Sand and carbon filters for turbidity
- Adsorption media filter for Arsenic / fluoride.

#### **6.3.5 Environmental Monitoring, Sampling and Testing**

In order to determine the ambient air, noise levels, groundwater/ drinking water quality, environmental monitoring was carried out through EPA approved environmental labs in the project area. The sampling locations for the environmental monitoring of ambient air, noise and groundwater/ drinking water and wastewater for the relevant tehsils lies within the boundary of the selected villages. To analyze the quality of groundwater and surface water, monitoring was performed for the villages.

#### **A. Ambient Air Quality**

The ambient air quality monitoring period was 24 hours. The results of ambient air quality monitoring are given in Table 6.5.



**Table 6.5: Ambient Air Quality Results**

| Parameters  |                 | Carbon monoxide                 | Sulphur dioxide   | Ozone                         | Nitric oxide      | Nitrogen Dioxide  | PM (2.5)          | PM (10)           | Suspended particulate Matter |
|-------------|-----------------|---------------------------------|-------------------|-------------------------------|-------------------|-------------------|-------------------|-------------------|------------------------------|
| Unit        |                 | (24 hours)<br>mg/m <sup>3</sup> | µg/m <sup>3</sup> | (1 hour)<br>µg/m <sup>3</sup> | µg/m <sup>3</sup> | µg/m <sup>3</sup> | µg/m <sup>3</sup> | µg/m <sup>3</sup> | µg/m <sup>3</sup>            |
| <b>PEQS</b> |                 | <b>5</b>                        | <b>120</b>        | <b>130</b>                    | <b>40</b>         | <b>80</b>         | <b>35</b>         | <b>150</b>        | <b>500</b>                   |
| Liaquatpur  | Chak 46 Abbasia | 1.46                            | 32.65             | 0.04                          | 3.96              | 2.04              | 19                | 78                | 119                          |
|             | Chak 09 Abbasia | 1.59                            | 75.68             | 0.04                          | 3.13              | 3.20              | 24                | 78                | 112                          |
|             | Chak 88 Abbasia | 1.40                            | 79.23             | 0.03                          | 3.80              | 2.16              | 20                | 81                | 111                          |
|             | Chak 51 Abbasia | 1.83                            | 80.55             | 0.05                          | 3.19              | 2.84              | 24                | 71                | 115                          |

The ambient air quality monitoring is carried out via mobile air quality laboratories that are stationed at the sides of roads. As a result, areas with heavy traffic may exhibit higher concentrations of particulate matter and gases emanating from vehicular exhausts. The central and northern regions of Punjab are comparatively more industrialized than the southern region, which leads to a greater prevalence of anthropogenic sources of air pollution. The above Table 6.5 indicates that at most testing location, air quality (majority of the parameters) is within PEQS limit with minor fluctuations. However, some of the parameters surpass the PEQS which are highlighted red in the above table.

### Noise Level

Noise levels were monitored with the help of a portable digital sound meter at the project area for 24 (twenty-four) hours. The results of noise monitoring are given in Table 6.6.

**Table 6.6: Noise Monitoring Results**

| Tehsil     | Villages        | Equivalent Noise Level (Leq) dB(A) |            | PEQS Limit dB(A) |            |
|------------|-----------------|------------------------------------|------------|------------------|------------|
|            |                 | Day Time                           | Night Time | Day Time         | Night Time |
| Liaquatpur | Chak 46 Abbasia | 47                                 | 42         | <b>55</b>        | <b>45</b>  |
|            | Chak 09 Abbasia | 47                                 | 42         |                  |            |
|            | Chak 88 Abbasia | 46                                 | 42         |                  |            |
|            | Chak 51 Abbasia | 47                                 | 41         |                  |            |

The results of the noise monitoring conducted indicate that none of the readings obtained from any of the villages exceeded the prescribed noise limits as set forth by the Punjab Environmental Quality Standards

### B. Wastewater Quality

Wastewater samples were collected and was analyzed. The analysis results of wastewater samples are compared with PEQS. The detailed monitored results for wastewater quality are given in Table 6.7. Detailed results of wastewater monitoring are provided at Annex-3.

**Table 6.7: Results of Wastewater**

| Parameters |                 | pH   | COD  | BOD  | TSS  | Oil & Grease |
|------------|-----------------|------|------|------|------|--------------|
| Unit       |                 | -    | mg/L | mg/L | mg/L | mg/L         |
| PEQS       |                 | 6-9  | 150  | 80   | 200  | 10           |
| Liaqatpur  | Chak 46 Abbasia | 7.4  | 321  | 170  | 36   | 3.5          |
|            | Chak 09 Abbasia | 7.81 | 519  | 278  | 623  | 08           |
|            | Chak 88 Abbasia | 6.57 | 2010 | 1075 | 934  | 9.5          |
|            | Chak 51 Abbasia | 7.81 | 519  | 278  | 623  | 08           |

The collected samples of wastewater are not representative, as they are spot samples taken from open drains and channels. However, the analysis of the wastewater samples indicates that the levels of biological oxygen demand (BOD), chemical oxygen demand (COD), and total suspended solids (TSS) in most of the samples are higher than the limits established in the Punjab Environmental Quality Standards (PEQS). To meet the PEQS requirements, a potential solution is to utilize an Anaerobic Baffled Reactor (ABR) for wastewater treatment, which can readily ensure compliance with these standards.

### 6.3.6 Seismology

Project area fall within zone 2A according to the zoning developed by Government of Pakistan. Figure 6.2 shows the seismic zoning map of Pakistan.

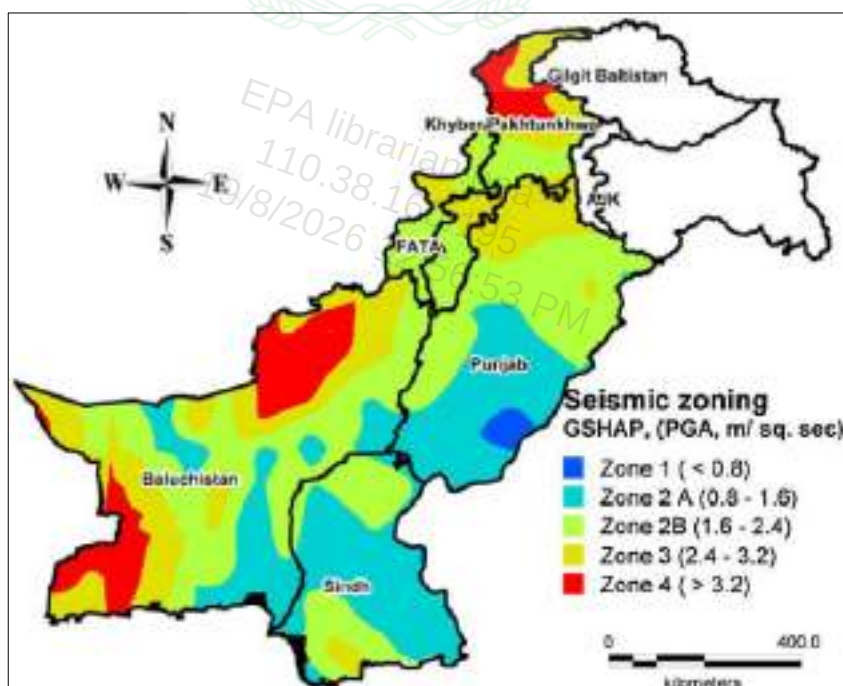


**Figure 6.2: Seismic Zone Map of Project Area**



## 6.4 Sensitive Receptors

Village wise sensitive receptors are identified in the Table 6.8 below:

**Table 6.8: Sensitive Receptors**

| Cluster | Tehsil & District          | Village Name     | Schools | Mosques | Hospital / Clinic / BHU | Graveyard | Minority Graveyard | Minority Religious Places | Other |
|---------|----------------------------|------------------|---------|---------|-------------------------|-----------|--------------------|---------------------------|-------|
| South-1 | Liaquatpur & Rahimyar Khan | Chak 51 Abbasia  | -       | 2       | -                       | 2         | -                  | -                         | -     |
|         |                            | Chak 53 Abbasia  | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 02 Abbasia  | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 06 Abbasia  | 1       | 3       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 07 Abbasia  | 1       | 2       |                         |           |                    |                           |       |
|         |                            | Chak 10 Abbasia  | 2       | -       | -                       | -         | -                  |                           |       |
|         |                            | Chak 13 Abbasia  | 2       | 3       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 138 Abbasia | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 139 Abbasia | -       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 14 Abbasia  | 2       | 2       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 142 Abbasia | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 15 Abbasia  | 1       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 16 Abbasia  | 4       | 6       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 27 Abbasia  | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 140 Abbasia | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 52 Abbasia  | 2       | 5       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 54 Abbasia  | -       | 2       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 55 Abbasia  | 1       | 1       | -                       | 1         | -                  | -                         | -     |
|         |                            | Ahmed Yar        | 2       | 5       | -                       | 1         | -                  | -                         | -     |
|         |                            | Arif Baloch      | 1       | 1       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 315 / 6R    | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 316 / 6 R   | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 317/6R      | 1       | 2       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 08 Abbasia  | 1       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 09 Abbasia  | -       | 3       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 11 Abbasia  | 2       | 2       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 12 Abbasia  | 2       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                            | Chak 313/6R      | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 134 NP      | 1       | 2       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak 135 NP      | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                            | Chak136 NP       | -       | 1       | -                       | -         | -                  | -                         | -     |



| Cluster | Tehsil & District | Village Name     | Schools | Mosques | Hospital / Clinic / BHU | Graveyard | Minority Graveyard | Minority Religious Places | Other |
|---------|-------------------|------------------|---------|---------|-------------------------|-----------|--------------------|---------------------------|-------|
|         |                   | Chak 139 NP      | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 140 NP      | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 143 Abbasia | 1       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 144 Abbasia | 2       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 145 Abbasia | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 147 / 5R    | 1       | 2       | 1                       | -         | -                  | -                         | -     |
|         |                   | Chak 148 / 5R    | 2       | 4       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 150 Abbasia | 1       | 1       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 152 / 7R    | 1       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 153 / 7R    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 154 / 7R    | -       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 155 / 7R    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 156 / 7R    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 157 / 7R    | 2       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 159 / 7R    | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 174 / 7R    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 175 / 7R    | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 177 / 7R    | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 178 / 7R    | 1       | 1       | 1                       | -         | -                  | -                         | -     |
|         |                   | Chak 179 / 7R    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 180 / 7R    | 2       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 182 / 1L    | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 183 / 7 R   | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 186 / 7 R   | 1       | 1       | 1                       | 1         | -                  | -                         | -     |
|         |                   | Chak 19 Abbasia  | 1       | 2       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 191 / 1L    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 194 / 1L    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 195 / 1L    | 1       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 20 Abbasia  | 7       | 9       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 22 Abbasia  | 3       | 3       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 23 Abbasia  | 5       | 5       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 28 Abbasia  | -       | 1       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 31 Abbasia  | 1       | 4       | -                       | -         | -                  | -                         | -     |
|         |                   | Chak 32 Abbasia  | 1       | 2       | -                       | 1         | -                  | -                         | -     |
|         |                   | Chak 33 Abbasia  | 2       | 1       | -                       | -         | -                  | -                         | -     |



| Cluster | Tehsil & District | Village Name       | Schools | Mosques | Hospital / Clinic / BHU | Graveyard | Minority Graveyard | Minority Religious Places | Other       |
|---------|-------------------|--------------------|---------|---------|-------------------------|-----------|--------------------|---------------------------|-------------|
|         |                   | Chak 36 Abbasia    | 1       | 2       | -                       | 1         | -                  | -                         | -           |
|         |                   | Chak 37 Abbasia    | 2       | 3       | 1                       | 1         | -                  | -                         | -           |
|         |                   | Chak 38 Abbasia    | 1       | 3       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 39 Abbasia    | 1       | 2       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 3 A           | 2       | 3       | -                       | 1         | -                  | -                         | -           |
|         |                   | Chak 40 Abbasia    | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 41 Abbasia    | 2       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 42 Abbasia    | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 43 Abbasia    | 3       | 3       | -                       | 1         | -                  | -                         | Janazgah -1 |
|         |                   | Chak 46 Abbasia    | 2       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 47 Abbasia    | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 48 Abbasia    | 2       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 4 A           | 1       | 2       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 63 Abbasia    | 2       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 64 Abbasia    | 1       | 1       | -                       | 2         | -                  | -                         | -           |
|         |                   | Chak 65 Abbasia    | 2       | 2       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 68 Abbasia    | -       | 5       | 1                       | 2         | -                  | -                         | -           |
|         |                   | Chak 69 Abbasia    | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 75 Abbasia    | 3       | 4       | 1                       | 1         | -                  | -                         | Janazgah-1  |
|         |                   | Chak 77 Abbasia    | 2       | 3       | 1                       | 1         | -                  | -                         | -           |
|         |                   | Chak 78 Abbasia    | 1       | 3       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 79 Abbasia    | 2       | 2       | -                       | 1         | -                  | -                         | -           |
|         |                   | Chak 80 Abbasia    | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 81 Abbasia    | 2       | 3       | -                       | 1         | -                  | -                         | -           |
|         |                   | Chak 82 Abbasia    | 2       | 2       | -                       | -         | -                  | -                         | Janazgah-1  |
|         |                   | Chak 83 Abbasia    | 3       | 2       | -                       | 1         | -                  | -                         | -           |
|         |                   | Chak 84 Abbasia    | 1       | 2       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 85 Abbasia    | -       | 3       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 86 Abbasia    | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 87 Abbasia    | 4       | 4       | 1                       | -         | -                  | -                         | -           |
|         |                   | Chak 88 Abbasia    | 4       | 3       | -                       | -         | -                  | -                         | -           |
|         |                   | Chak 89 Abbasia    | 2       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Chapri Chatan Shah | 1       | 1       | -                       | -         | -                  | -                         | -           |
|         |                   | Gulshan Farid      | 1       | 3       | -                       | 1         | -                  | -                         | -           |
|         |                   | Hayat Lar          | 5       | 8       | 2                       | 1         | -                  | -                         | -           |





| Cluster | Tehsil & District | Village Name       | Schools | Mosques | Hospital / Clinic / BHU | Graveyard | Minority Graveyard | Minority Religious Places | Other        |
|---------|-------------------|--------------------|---------|---------|-------------------------|-----------|--------------------|---------------------------|--------------|
|         |                   | Kanjki Wala        | 3       | 4       | -                       | -         | -                  | -                         | -            |
|         |                   | Kotla Daraigh      | 3       | 7       | -                       | 1         | -                  | -                         | -            |
|         |                   | Kotla Khairay Khan | 1       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Muradpur Sail      | 2       | 6       | -                       | -         | -                  | -                         | -            |
|         |                   | Taranda Gurgujj    | 5       | 7       | -                       | 1         | -                  | -                         | -            |
|         |                   | Turkary            | 7       | 13      | 1                       | 1         |                    |                           | Imambargah-1 |
|         |                   | Firoza             | 2       | 4       | 1                       | 1         | -                  | -                         | -            |
|         |                   | Ahmed Ali Lar      | 1       | 5       | -                       | -         | -                  | -                         | -            |
|         |                   | Allah Dita Bhela   | 2       | 5       | -                       | 1         | -                  | -                         | -            |
|         |                   | Allah Jiwaya Lar   | 1       | 7       | -                       | -         | -                  | -                         | -            |
|         |                   | Ashraf Shah        | -       | 5       |                         | 1         |                    |                           | -            |
|         |                   | Bahan Wala         | 3       | 8       | -                       | 1         | -                  | -                         | -            |
|         |                   | Bahar Khaki        | 2       | 9       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 116-A- NP | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 116 NP    | 2       | -       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 117 NP    | -       | 3       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 118 NP    | -       | 2       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 119-A- NP | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 119 NP    | 1       | 11      | -                       | 2         | -                  | -                         | Shrine       |
|         |                   | Chak No. 120 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 121 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 122 NP    | 2       | 1       | -                       | 1         | -                  | -                         | -            |
|         |                   | Chak No. 123 NP    | 1       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 124 NP    | 1       | -       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 125 NP    | 3       | 2       | -                       | 2         | -                  | -                         | -            |
|         |                   | Chak No. 126 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 127 NP    | 1       | 3       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 128 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 129 NP    | 1       | 3       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 130 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 131 NP    | 2       | 4       | -                       | 1         | -                  | -                         | -            |
|         |                   | Chak No. 132 NP    | 1       | -       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 133 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 137 NP    | -       | 1       | -                       | -         | -                  | -                         | -            |
|         |                   | Chak No. 138 NP    | 1       | 1       | -                       | -         | -                  | -                         | -            |



| Cluster | Tehsil & District | Village Name        | Schools | Mosques | Hospital / Clinic / BHU | Graveyard | Minority Graveyard | Minority Religious Places | Other          |
|---------|-------------------|---------------------|---------|---------|-------------------------|-----------|--------------------|---------------------------|----------------|
|         |                   | Chak No. 34 Abbasia | 2       | 3       | -                       | -         | -                  | -                         | -              |
|         |                   | Chak No. 35 Abbasia | 4       | 9       | -                       | 2         | -                  | -                         | -              |
|         |                   | Chanjni             | 2       | 8       | -                       | 1         | -                  | -                         | Eidgah         |
|         |                   | Chohan              | 2       | 6       | -                       | 1         | -                  | -                         | -              |
|         |                   | Choudari            | 7       | 21      | -                       | -         | -                  | -                         | -              |
|         |                   | Chur Wala           | 2       | 1       | -                       | -         | -                  | -                         | -              |
|         |                   | Duda Naich          | 1       | 3       | -                       | -         | -                  | -                         | -              |
|         |                   | Gabrani             | 3       | 6       | 1                       | -         | -                  | -                         | -              |
|         |                   | Gharib Shah         | 1       | 11      | -                       | -         | -                  | -                         | -              |
|         |                   | Ghemi               | 0       | 10      | -                       | 2         | -                  | -                         | Shrine         |
|         |                   | Ghuka               | -       | 4       | -                       | 1         | -                  | -                         | -              |
|         |                   | Goth Amin           | 3       | 10      | -                       | 1         | -                  | -                         | -              |
|         |                   | Goth Hayat          | 7       | 11      | -                       | 2         | -                  | -                         | -              |
|         |                   | Goth Mahi           | -       | 2       | -                       | 1         | -                  | -                         | -              |
|         |                   | Gous Abad           | 2       | 6       | -                       | -         | -                  | -                         | -              |
|         |                   | Gul Muhammad Lar    | 3       | 15      | -                       | -         | -                  | -                         | -              |
|         |                   | Gulani              | 4       | 14      | -                       | 1         | -                  | -                         | -              |
|         |                   | Haroon Abad         | 2       | 8       | -                       | 1         | -                  | -                         | Eidgah         |
|         |                   | Hussain Abad        | -       | 1       | -                       | -         | -                  | -                         | -              |
|         |                   | Jhoung Bilawal      | 4       | 5       | -                       | 1         | -                  | -                         | -              |
|         |                   | Juma Muhana         | 1       | 5       | -                       | 3         | -                  | -                         | -              |
|         |                   | Kandani             | 2       | 11      | -                       | -         | -                  | -                         | -              |
|         |                   | Kotla Daulat        | 6       | 25      | 1                       | 1         | -                  | -                         | Eidgah & Marsa |
|         |                   | Kotla Mubarik       | 1       | 9       | -                       | 1         | -                  | -                         | -              |
|         |                   | Kotla Nawab         | 6       | 13      | -                       | 5         | -                  | -                         | -              |
|         |                   | Kotla Niazi         | 2       | 12      | -                       | 2         | -                  | -                         | -              |
|         |                   | Lakhani             | 3       | 10      | -                       | 1         | -                  | -                         | -              |
|         |                   | Lal Shah            | 1       | 5       | -                       | -         | -                  | -                         | -              |
|         |                   | Laoon Wala          | 3       | 7       | -                       | -         | -                  | -                         | Madrsa         |
|         |                   | Malhani             | 3       | 9       | -                       | 2         | -                  | -                         | Madrsa         |
|         |                   | Malikpur            | -       | 1       | -                       | -         | -                  | -                         | -              |
|         |                   | Malkani             | 1       | 16      | -                       | 4         | -                  | -                         | -              |
|         |                   | Metla               | 2       | 4       | 2                       | 1         | -                  | -                         | Eidgah         |
|         |                   | Mir Muhammad Lar    | 2       | 4       | -                       | -         | -                  | -                         | -              |



| Cluster | Tehsil & District | Village Name      | Schools | Mosques | Hospital / Clinic / BHU | Graveyard | Minority Graveyard | Minority Religious Places | Other  |
|---------|-------------------|-------------------|---------|---------|-------------------------|-----------|--------------------|---------------------------|--------|
|         |                   | Muhammad Daha     | 1       | 11      | -                       | -         | -                  | -                         | -      |
|         |                   | Mujawraan         | 4       | 13      | -                       | -         | -                  | -                         | -      |
|         |                   | Nala Musani       | 4       | 5       | -                       | 2         | -                  | -                         | -      |
|         |                   | Pakhi War         | 4       | 7       | -                       | 5         | -                  | -                         | Madrsa |
|         |                   | Pararan Sharif    | 4       | 12      | -                       | 2         | -                  | -                         | Madrsa |
|         |                   | Qadu Wali         | 4       | 16      | -                       | 3         | -                  | -                         | -      |
|         |                   | Rais Pathan       | 2       | 12      | -                       | 5         | -                  | -                         | Madrsa |
|         |                   | Rashid Abad       | 1       | 2       | -                       | -         | -                  | -                         | -      |
|         |                   | Rindan            | 8       | 7       | -                       | 2         | -                  | -                         | -      |
|         |                   | Sadiqpur          | -       | 1       | -                       | -         | -                  | -                         | -      |
|         |                   | Saidpur           | 2       | 4       | -                       | -         | -                  | -                         | Madrsa |
|         |                   | Shahbazpur Gharbi | 1       | 2       | -                       | 1         | -                  | -                         | -      |
|         |                   | Shamsabad         | 2       | 5       | -                       | 1         | -                  | -                         | Shrine |
|         |                   | Shidani Sharif    | 3       | 24      | -                       | 6         | -                  | -                         | -      |
|         |                   | Talbani           | 7       | 25      | -                       | 5         | -                  | -                         | -      |
|         |                   | Tanwari           | 5       | 11      | -                       | -         | -                  | -                         | Eidgah |
|         |                   | Trinda Mir Khan   | 5       | 23      | 1                       | 2         | -                  | -                         | -      |
|         |                   | Ther Posti        | 1       | 5       | -                       | 1         | -                  | -                         | -      |
|         |                   | Tibbi Sayyadan    | 2       | 15      | -                       | 2         | -                  | -                         | -      |
|         |                   | Wahid Bux Sial    | 5       | 8       | -                       | -         | -                  | -                         | -      |
|         |                   | Yakhtar Maha      | -       | 3       | -                       | -         | -                  | -                         | -      |
|         |                   | Zaffar Abad       | 2       | 9       | -                       | -         | -                  | -                         | -      |
|         |                   | Unran             | 1       | 6       | -                       | -         | -                  | -                         | -      |

**Note:** The socially sensitive receptors listed in the table above are within a radius of 100 meters of the execution of work.

## 6.5 Biological Environment

Project area is rich in biodiversity because of its diverse landscape and geographical location. The variety of ecosystem is evident and is home to various species. The following section describes the biological environment of the project area.

### 6.5.1 Flora

The major floral species found in the project area include the following:

| Tehsil     | Floral Species                                                                                                                                                                                                                                         |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Liaquatpur | Kikar (Acacia nilotica), Neem (Azadirachta indica), Sheesham (Dalbergia), Khagi/ Ajwa Date Palm (Phoenix dactylifera L.), Sufaida (Eucalyptus spp.), Bari (Ziziphus mauritiana), Poplar (Populus spp.), Jaman (Syzygium cumini), Simal (Bombax cieba), |



### 6.5.2 Fauna

The faunal species observed in the project areas were verified with the secondary data resources of the Punjab Forest, Wildlife and Fisheries Department and World Wildlife Fund (WWF). The species in vicinity include the following:

#### A. Mammals

Common animals found in the project area include wild cat, dogs, cats, jackals, Weasel, house rats, wild boar, bats, porcupine, bandicoot, soft furred rat and Indian gerbil. Domestic livestock observed during field visits include buffaloes, cattle, goats, sheep, and donkeys that are used by the local residents for their livelihood.

#### B. Amphibians

Bullfrog (*Hoplobatrachus tigernius*), Pahari tidda maindak (*Fejervarya limnocharis*), frog (rana tigrine) and Toad (*Bufo bufo*) are also present in the nearby ponds and canals during rainy season.

#### C. Birds

House sparrow (*Passer domesticus*), House crow (*Corvus splendens*) and Mynah (*Acridotheres tristis*) are the most common sight in the area. In addition, following birds are also seen in the project area.

| Common Name         | Scientific Name             |
|---------------------|-----------------------------|
| Nightingale         | <i>Pycnonotus cafer</i>     |
| Parrot              | <i>Psittacula krameri</i>   |
| Pigeon              | <i>Columba livia</i>        |
| Hoopoe              | <i>Upupa epops</i>          |
| Duck                | <i>Anatidae</i>             |
| Koel                | <i>Eudynamys scolopacea</i> |
| Quail               | <i>Coturnix coturnix</i>    |
| Plover              | <i>Charadriinae</i>         |
| Black kite          | <i>Mivus migrans</i>        |
| Dove                | <i>Columbidae</i>           |
| Hérons              | <i>Ardeidae</i>             |
| Mallard             | <i>Anas platyrhynchos</i>   |
| Gray Partridge      | <i>Perdix perdix</i>        |
| Black Partridge     | <i>Melanoperdix niger</i>   |
| Sandgrouse          | <i>Pteroclididae</i>        |
| Red wattled lapwing | <i>Vanellus indicus</i>     |
| red-vented bulbul   | <i>Pycnonotus cafer</i>     |
| pewit               | <i>Vanellus vanellus</i>    |
| cuckoo              | <i>Cuculidae</i>            |
| jungle babbler      | <i>Turdoides striata</i>    |



## D. Reptiles

Common tree lizard (*Calotes versicolor*), Monitor lizard (*Varnus bengalensis*), fat tailed lizard (*Uromastix hardwickii*), fringed toed lizard (*Acanthodactylus cantoris*), Tortoise (Testudinidae), snakes (Serpentes), cobra (*Naja*) and Scorpions (Scorpiones) are observed in and around the proposed site. Saw-scale viper (*Echis carinatus*), Indian soft-shell turtle (*Aspideretes gangeticus*), striped keelback (*Amphiesma stolatum*) and Indian falpshell (*Lisseysms punctate andersoni*) are also reported by the local residents.

### 6.5.3 Endangered Species

There are no endangered species of flora and fauna observed in the Study Area.

### 6.5.4 Legally Protected Areas

The Government of Punjab through Punjab Legally Protected Areas act 2020 may declare an area to be called a protected area, with a specific name such as wetlands, national park, wildlife or game reserves. In order to provide for the protection, preservation, conservation and management of ecologically important areas.

A table indicating legally protected areas and other important ecological hotspots in the Project area district Rahimyar khan

| Sr. No. | Name of Legally Protected Area | Status         | District      | Distance from Nearest Project Village |
|---------|--------------------------------|----------------|---------------|---------------------------------------|
| 1       | Abbasia Plantation             | Game Reserve   | Rahimyar Khan | 10 km                                 |
| 2       | Qasimwala                      | Protected Area | Rahimyar khan | 30 km                                 |

As indicated from the above table, there are no legally protected areas in the area or in the influence of the project area. The nearest legally protected area is about 10 km away from the nearest project village.

## 6.6 Socioeconomic Profile

### 6.6.1 Population Size

The project is expected to benefit about 60,059 households in the 193 Revenue Villages. The average population size is 2,221 persons per Revnue Village.

**Table 6.9: Primary Data Results of Project Area**

| Sr. No | Tehsil & Zone      | Revenue Village  | Settlement Name           | House Hold | Male | Female | Total Population |
|--------|--------------------|------------------|---------------------------|------------|------|--------|------------------|
| 1      | Liaqatpur/ South-1 | Ahmad Ali Lar    | Mudlal                    | 43         | 165  | 153    | 318              |
|        |                    |                  | Basti Nazir Shah          | 77         | 296  | 274    | 570              |
|        |                    |                  | Basti Ghulam Akbar Mohana | 31         | 119  | 110    | 229              |
|        |                    |                  | Basti Akram Khan Daher    | 37         | 142  | 131    | 274              |
| 2      |                    | Allah Dita Bhela | Allah Dita Bhela          | 108        | 410  | 378    | 788              |
|        |                    |                  | Mohammad Baksh Bhela      | 59         | 224  | 207    | 431              |
|        |                    |                  | Jam Abdul Rasheed Lar     | 47         | 178  | 165    | 343              |
| 3      |                    | Allah Jiwaya Lar | Sardar Jam Iqbal Lar      | 51         | 183  | 169    | 352              |
|        |                    |                  | Allah Jiwaya Lar 1        | 171        | 614  | 566    | 1180             |



| Sr. No | Tehsil & Zone | Revenue Village  | Settlement Name                               | House Hold | Male | Female | Total Population |
|--------|---------------|------------------|-----------------------------------------------|------------|------|--------|------------------|
|        |               |                  | Basti Malik Shahbaz(Haji Yamin)               | 96         | 344  | 318    | 662              |
|        |               |                  | Allah Jiwaya Lar 2                            | 256        | 919  | 848    | 1766             |
| 4      |               | Ashraf Shah      | Basti Gopang Gorgage/Basti Manzoor Khan Koosh | 46         | 163  | 150    | 313              |
|        |               |                  | Basti Bado Lar                                | 38         | 134  | 124    | 258              |
|        |               |                  | Basti Abdul Majeed Khan Lashari               | 23         | 81   | 75     | 156              |
| 5      |               | Bahan Wala       | Bahan Wala                                    | 44         | 181  | 167    | 348              |
|        |               |                  | Basti Wahid Bux                               | 109        | 448  | 413    | 861              |
|        |               |                  | Basti Jam Abdullah Vihaa                      | 32         | 131  | 121    | 253              |
|        |               |                  | Basti Abdul Aziz                              | 38         | 156  | 144    | 300              |
|        |               |                  | Basti Thathaana                               | 52         | 214  | 197    | 411              |
|        |               |                  | Basti Ghsoora                                 | 88         | 362  | 334    | 695              |
|        |               |                  | Basti Dhoop Sari                              | 45         | 185  | 171    | 356              |
|        |               |                  | Basti Ahmad Din                               | 22         | 90   | 83     | 174              |
| 6      |               | Bahar Khaki      | Bahar Khaki                                   | 566        | 1943 | 1793   | 3736             |
|        |               |                  | Basti Waali                                   | 125        | 429  | 396    | 825              |
|        |               |                  | Basti Malik Moj Ali Gabar                     | 46         | 158  | 146    | 304              |
|        |               |                  | Basti Malik Anahal                            | 33         | 113  | 105    | 218              |
|        |               |                  | Basti Ameer Shah                              | 30         | 103  | 95     | 198              |
|        |               |                  | Basti Noor Da Kowaan                          | 39         | 134  | 124    | 257              |
|        |               |                  | Basti Malik Shameer Kulyar                    | 93         | 319  | 295    | 614              |
|        |               |                  | Basti Jam Bahadar                             | 78         | 268  | 247    | 515              |
|        |               |                  | Basti Allah Bux                               | 48         | 165  | 152    | 317              |
|        |               |                  | Basti Azam Bux                                | 54         | 185  | 171    | 356              |
| 7      |               | Chak No.116-A-NP | Chak 116 NP Alif                              | 49         | 191  | 177    | 368              |
| 8      |               | Chak No 116 NP   | Chak 116 NP Alif                              | 49         | 161  | 148    | 309              |
|        |               |                  | Chak 116 NP                                   | 49         | 161  | 148    | 309              |
| 9      |               | Chak No 117 NP   | Basti Seth M. Bux Chak 117 NP                 | 25         | 92   | 85     | 178              |
|        |               |                  | Basti Abdur Rehman Chak 117 NP                | 32         | 118  | 109    | 227              |
|        |               |                  | Basti Haji Abdul Ghani Chak 117 NP            | 46         | 170  | 157    | 327              |
| 10     |               | Chak No 118 NP   | Basti Allah Bux Chak 118 NP                   | 26         | 104  | 96     | 200              |
| 11     |               | Chak No 120 NP   | Chak No 120 NP                                | 11         | 53   | 49     | 101              |
| 12     |               | Chak No 121 NP   | Chak No 121 NP                                | 66         | 202  | 187    | 389              |
|        |               |                  | Basti Salwani                                 | 35         | 107  | 99     | 207              |
| 13     |               | Chak No 122 NP   | Chak No 122 NP                                | 332        | 1295 | 1195   | 2490             |
| 14     |               | Chak No 123 NP   | Basti Haji Lal                                | 52         | 187  | 172    | 359              |
| 15     |               | Chak No 124 NP   | Chak No 124 NP                                | 111        | 392  | 362    | 755              |
| 16     |               | Chak No 125 NP   | Chak No 125 NP                                | 100        | 296  | 274    | 570              |
|        |               |                  | Chak No 125 NP Colony                         | 40         | 119  | 109    | 228              |





| Sr. No | Tehsil & Zone             | Revenue Village         | Settlement Name                       | House Hold | Male | Female | Total Population |
|--------|---------------------------|-------------------------|---------------------------------------|------------|------|--------|------------------|
| 17     |                           | Chak No 126 NP          | Chak No 126 NP                        | 53         | 212  | 196    | 408              |
| 18     |                           | Chak No 127 NP          | Chak No 127 NP                        | 29         | 112  | 103    | 215              |
|        |                           |                         | Jam Banna                             | 242        | 931  | 860    | 1791             |
| 19     |                           | Chak No. 128 NP         | Basti Haji Kalo                       | 37         | 137  | 126    | 263              |
| 20     |                           | Chak No 129 NP          | Chak No 129 NP                        | 74         | 312  | 288    | 599              |
|        |                           |                         | Basti Shah Muhammad Chak 129-NP       | 56         | 236  | 218    | 454              |
| 21     |                           | Chak No 130 NP          | Chak No 130 NP                        | 38         | 126  | 117    | 243              |
| 22     |                           | Chak No 131 NP          | Chak No 131 NP                        | 119        | 402  | 371    | 774              |
| 23     |                           | Chak No 132 NP          | Chak No 132 NP                        | 177        | 690  | 637    | 1328             |
| 24     |                           | Chak No 133 NP          | Chak No 133 NP                        | 25         | 122  | 113    | 235              |
| 25     |                           | Chak No 138 NP          | Chak No 138 NP                        | 61         | 260  | 240    | 500              |
| 26     |                           | Chak No 34 Abbasia      | Chak No 34 Abbasia                    | 57         | 196  | 181    | 376              |
|        |                           |                         | Chak 34/A Colony                      | 79         | 271  | 250    | 521              |
|        |                           |                         | Basti Channaan Chak 34/A              | 35         | 120  | 111    | 231              |
| 27     |                           | Chak No 35 Abbasia      | Chak No 35 Abbasia                    | 207        | 893  | 825    | 1718             |
|        |                           |                         | Dera Kalluwan                         | 32         | 138  | 127    | 266              |
|        |                           |                         | Chak 35/A Colony/ Daiyaan Wali Colony | 329        | 1420 | 1311   | 2731             |
|        |                           |                         | Chak 35/A Jadid                       | 34         | 147  | 135    | 282              |
|        |                           |                         | Basti Shah Muhammad Chak 35/A         | 74         | 319  | 295    | 614              |
| 28     |                           | Chanjni                 | Basti Muhammad Naich                  | 84         | 332  | 306    | 638              |
|        |                           |                         | Basti Aziz Arain                      | 49         | 194  | 179    | 372              |
|        |                           |                         | Chanjni                               | 131        | 518  | 478    | 996              |
|        |                           |                         | Basti Abdul Rasheed Ganjri            | 59         | 233  | 215    | 448              |
| 29     |                           | Chohan                  | Chohan                                | 183        | 885  | 817    | 1702             |
| 30     |                           | Choudari                | Basti Malik Aslam Mesan               | 21         | 78   | 72     | 149              |
|        |                           |                         | Chaudhri                              | 56         | 207  | 191    | 398              |
|        |                           |                         | Basti Allah Ditta Khan Abbasi         | 63         | 233  | 215    | 447              |
|        |                           |                         | Basti Jato Sial                       | 144        | 532  | 491    | 1022             |
|        | Basti Jato Sial           |                         | 48                                    | 177        | 164  | 341    |                  |
|        | Basti Rais Allah Ditta    |                         | 95                                    | 351        | 324  | 675    |                  |
|        | Basti Rais Muhammad Bux   |                         | 55                                    | 203        | 187  | 391    |                  |
|        | Basti beti                |                         | 62                                    | 229        | 211  | 440    |                  |
|        | Basti Sandheela           |                         | 117                                   | 432        | 399  | 831    |                  |
|        | Basti Meher Abdullah Sial |                         | 73                                    | 270        | 249  | 518    |                  |
|        | Basti Manzoor Sial        |                         | 36                                    | 133        | 123  | 256    |                  |
|        | Basti Haider Nagar        |                         | 49                                    | 181        | 167  | 348    |                  |
| 31     | Chur Wala                 | Basti Abdul Aziz        | 74                                    | 242        | 224  | 466    |                  |
| 32     | Duda Naich                | Goind Wala              | 82                                    | 273        | 252  | 525    |                  |
|        |                           | Basti Machiyaan Solangi | 212                                   | 706        | 651  | 1357   |                  |



| Sr. No | Tehsil & Zone | Revenue Village | Settlement Name                       | House Hold | Male | Female | Total Population |
|--------|---------------|-----------------|---------------------------------------|------------|------|--------|------------------|
|        |               |                 | Basti Ghulam Haider                   | 117        | 389  | 359    | 749              |
| 33     |               | Gabrani         | Basti Gabraani                        | 607        | 2494 | 2302   | 4795             |
|        |               |                 | Basti Sultan Mehmood/Basti Nandaan    | 115        | 472  | 436    | 909              |
|        |               |                 | Basti Bakhet Ali                      | 69         | 283  | 262    | 545              |
|        |               |                 | Basti Allah Bachya                    | 70         | 288  | 265    | 553              |
|        |               |                 | Basti Khan Abbasi/Basti Dufli         | 33         | 136  | 125    | 261              |
| 34     |               | Gharib Shah     | Basti Jam Abdullah Malik              | 50         | 195  | 180    | 375              |
|        |               |                 | Basti Moosa Kaju                      | 65         | 254  | 234    | 488              |
|        |               |                 | Basti Jam Mushtaq Lar                 | 38         | 148  | 137    | 285              |
|        |               |                 | Basti Kulyar                          | 71         | 277  | 256    | 533              |
|        |               |                 | Basti Smaney Khan                     | 50         | 195  | 180    | 375              |
|        |               |                 | Basti Jam Pooly                       | 34         | 133  | 122    | 255              |
| 35     |               | Ghemi           | Ghemi                                 | 84         | 293  | 270    | 563              |
|        |               |                 | Shafique Abad                         | 100        | 348  | 322    | 670              |
|        |               |                 | Basti Kchala                          | 127        | 442  | 408    | 851              |
|        |               |                 | Basti Qalandar Shah                   | 65         | 226  | 209    | 436              |
|        |               |                 | Basti Haji Ahmad Jetaal Urf Khoo Wali | 71         | 247  | 228    | 476              |
|        |               |                 | Basti Jam Gaman                       | 77         | 268  | 248    | 516              |
| 36     |               | Ghuka           | Ghuka                                 | 45         | 145  | 134    | 279              |
|        |               |                 | Basti Theem                           | 86         | 277  | 256    | 533              |
| 37     |               | Goth Amin       | Goth Amin 2                           | 133        | 491  | 453    | 944              |
|        |               |                 | Goth Amin 1                           | 73         | 270  | 249    | 518              |
|        |               |                 | Basti Ghulam Muhammad                 | 84         | 310  | 286    | 596              |
|        |               |                 | Basti Arain                           | 80         | 295  | 273    | 568              |
| 38     |               | Goth Hayat      | Haji Ghulam Sarwar                    | 88         | 334  | 308    | 642              |
|        |               |                 | Goth Hayat                            | 116        | 440  | 406    | 847              |
|        |               |                 | Basti Faiz Ahmad Bohar                | 43         | 163  | 151    | 314              |
|        |               |                 | Adda Chouk Fareed Amin Abad           | 155        | 588  | 543    | 1132             |
|        |               |                 | Basti Jam Faiz                        | 61         | 232  | 214    | 445              |
|        |               |                 | Basti Meyani                          | 92         | 349  | 322    | 672              |
|        |               |                 | Basti Ghulam Haider Khokhar           | 48         | 182  | 168    | 350              |
| 39     |               | Goth Mahi       | Basti Ghulam Naich                    | 41         | 147  | 136    | 283              |
|        |               |                 | Goth Mahi                             | 104        | 373  | 344    | 718              |
|        |               |                 | Basti Panwaan                         | 160        | 574  | 530    | 1104             |
|        |               |                 | Basti Makool                          | 60         | 215  | 199    | 414              |
|        |               |                 | Basti M. Nawaz Shah                   | 50         | 179  | 166    | 345              |
|        |               |                 | Basti Nonari                          | 145        | 520  | 480    | 1001             |
|        |               |                 | Basti Ghunya                          | 70         | 251  | 232    | 483              |
|        |               |                 | Basti Malkan                          | 70         | 251  | 232    | 483              |



| Sr. No | Tehsil & Zone | Revenue Village  | Settlement Name                              | House Hold | Male | Female | Total Population |
|--------|---------------|------------------|----------------------------------------------|------------|------|--------|------------------|
|        |               |                  | Basti Gul Hasan Arain                        | 137        | 492  | 454    | 945              |
|        |               |                  | Basti Hafiz Nazar Old                        | 216        | 775  | 715    | 1490             |
|        |               |                  | Basti Khokhraan                              | 35         | 126  | 116    | 242              |
|        |               |                  | Basti Hafiz Nazar                            | 87         | 312  | 288    | 600              |
|        |               |                  | Basti Qulaalan                               | 56         | 201  | 185    | 386              |
|        |               |                  | Basti New Hafiz Nazar Waseer                 | 45         | 161  | 149    | 311              |
|        |               |                  | Basti Malik Shabeer Ahmad                    | 30         | 108  | 99     | 207              |
| 40     |               | Gous Abad        | Basti Doda Pally Khan                        | 186        | 764  | 705    | 1469             |
|        |               |                  | Basti Araain Da Baag                         | 281        | 1154 | 1066   | 2220             |
|        |               |                  | Basi Ahmad Ali                               | 56         | 230  | 212    | 442              |
|        |               |                  | Basti Amiabaa                                | 57         | 234  | 216    | 450              |
|        |               |                  | Basti Jam Bapar                              | 41         | 168  | 155    | 324              |
|        |               |                  | Basti Malik Noor Ahmad                       | 27         | 111  | 102    | 213              |
|        |               |                  | Basti Rehmat Nagar                           | 68         | 279  | 258    | 537              |
| 41     |               | Gul Muhammad Lar | Basti Noorpur Batwani                        | 428        | 1825 | 1685   | 3510             |
|        |               |                  | Basti Kalo Khan                              | 55         | 235  | 216    | 451              |
|        |               |                  | Basti Salar Lar                              | 140        | 597  | 551    | 1148             |
|        |               |                  | Gul Muhammad Lar                             | 23         | 98   | 91     | 189              |
|        |               |                  | Basti Makha Lar Paley Shah Darbar Haroonabad | 66         | 281  | 260    | 541              |
| 42     |               | Gulani           | Gulani                                       | 35         | 127  | 118    | 245              |
|        |               |                  | Malkani                                      | 83         | 302  | 279    | 581              |
|        |               |                  | Shabbir Abad                                 | 96         | 349  | 323    | 672              |
|        |               |                  | Basti Jajaan                                 | 172        | 626  | 578    | 1204             |
|        |               |                  | Basti Gulani                                 | 72         | 262  | 242    | 504              |
|        |               |                  | Basti Malik Hussain Bakhsh                   | 69         | 251  | 232    | 483              |
|        |               |                  | Basti Baloch(Haji Sarwar Khan)               | 43         | 157  | 144    | 301              |
|        |               |                  | Basti Jam Samijah                            | 40         | 146  | 134    | 280              |
|        |               |                  | Basti Ray Parhar                             | 30         | 109  | 101    | 210              |
|        |               |                  | Basti Molviyaan                              | 36         | 131  | 121    | 252              |
|        |               |                  | Basti Palley Khan                            | 51         | 186  | 171    | 357              |
|        |               |                  | Basti Mugerani                               | 51         | 186  | 171    | 357              |
|        |               |                  | Basti Gulshan e Iqbal                        | 48         | 175  | 161    | 336              |
|        |               |                  | Basti Haq Nawaz                              | 36         | 131  | 121    | 252              |
|        |               |                  | Basti Khair Muhammad Khan                    | 28         | 102  | 94     | 196              |
|        |               |                  | Basti Haji Hussain Bakhsh                    | 72         | 262  | 242    | 504              |
| 43     |               | Haroon Abad      | Haroon Abad                                  | 12         | 41   | 38     | 79               |
|        |               |                  | Kotla Raiwalhin                              | 117        | 402  | 371    | 772              |
|        |               |                  | Basti Shaikh Peer Bux                        | 170        | 583  | 539    | 1122             |



| Sr. No | Tehsil & Zone | Revenue Village | Settlement Name                 | House Hold | Male | Female | Total Population |
|--------|---------------|-----------------|---------------------------------|------------|------|--------|------------------|
|        |               |                 | Basti Kithraan+Basti Mochiaan   | 60         | 206  | 190    | 396              |
|        |               |                 | Basti Kamoo                     | 95         | 326  | 301    | 627              |
| 44     |               | Hussain Abad    | Hussain Abad                    | 24         | 90   | 83     | 173              |
| 45     |               | Jhoung Bilawal  | Jhoung Bilawal                  | 120        | 449  | 415    | 864              |
|        |               |                 | Basti Noor Ahmad Shah           | 38         | 142  | 131    | 274              |
|        |               |                 | Baseti M. Nawab Mehar           | 74         | 277  | 256    | 533              |
|        |               |                 | Basti Abdul Rasheed Sial        | 104        | 389  | 359    | 749              |
| 46     |               | Jumma Muhana    | Jam Gulan                       | 67         | 254  | 235    | 489              |
|        |               |                 | Basti Allah Jiwaya              | 31         | 118  | 109    | 226              |
|        |               |                 | Jumma Muhana                    | 61         | 232  | 214    | 445              |
|        |               |                 | Ayaz Lar                        | 49         | 186  | 172    | 358              |
|        |               |                 | Basti Abbasi                    | 139        | 528  | 487    | 1015             |
|        |               |                 | Basti Khokhran                  | 88         | 334  | 308    | 642              |
|        |               |                 | Basti Abdullah Treeli           | 65         | 247  | 228    | 475              |
|        |               |                 | Basti Jam Javed                 | 147        | 558  | 515    | 1073             |
| 47     |               | Kandani         | Kandani                         | 660        | 2094 | 1932   | 4026             |
|        |               |                 | Basti Moman                     | 91         | 289  | 266    | 555              |
|        |               |                 | Basti Sunnat Abad               | 192        | 609  | 562    | 1171             |
|        |               |                 | Basti Jam Abdullah Darkhan      | 55         | 174  | 161    | 336              |
|        |               |                 | Basti Elahi Bux Muhani          | 115        | 365  | 337    | 702              |
|        |               |                 | Basti Mehmoodabad               | 51         | 162  | 149    | 311              |
| 48     |               | Kotla Daaulat   | Basti Kotla Dulat               | 140        | 597  | 551    | 1148             |
|        |               |                 | Basti Elahi Bux Gopang          | 83         | 354  | 327    | 681              |
|        |               |                 | Basti Mughrani/Ahmad Bux Gopang | 122        | 520  | 480    | 1000             |
|        |               |                 | Basti Mughrani/M. Bux Gopang    | 89         | 379  | 350    | 730              |
|        |               |                 | Basti Jahani/Basti Janjh        | 55         | 235  | 216    | 451              |
|        |               |                 | Basti Jahani/Basti Janjh        | 72         | 307  | 283    | 590              |
|        |               |                 | Basti Kotla Gohraam             | 144        | 614  | 567    | 1181             |
|        |               |                 | Basti Kotla Gohraam             | 161        | 687  | 634    | 1320             |
|        |               |                 | Basti Muneer Khan               | 23         | 98   | 91     | 189              |
|        |               |                 | Basti Jahaniya                  | 64         | 273  | 252    | 525              |
| 49     |               | Kotla Mubarik   | Kotla Mubarik                   | 105        | 437  | 403    | 840              |
|        |               |                 | Basti Darkhan                   | 30         | 125  | 115    | 240              |
|        |               |                 | Basti Ghulam Haider             | 29         | 121  | 111    | 232              |
|        |               |                 | Basti Hafizaan                  | 46         | 191  | 177    | 368              |
| 50     |               | Kotla Nawab     | Kotla Nawab                     | 175        | 719  | 664    | 1383             |
|        |               |                 | Basti Ghani Machi               | 137        | 563  | 520    | 1082             |
|        |               |                 | Basti Nazam Wala                | 194        | 797  | 736    | 1533             |
|        |               |                 | Basti Qurashiaan                | 37         | 152  | 140    | 292              |
|        |               |                 | Basti Langah                    | 47         | 193  | 178    | 371              |



| Sr. No | Tehsil & Zone | Revenue Village | Settlement Name                   | House Hold | Male | Female | Total Population |
|--------|---------------|-----------------|-----------------------------------|------------|------|--------|------------------|
|        |               |                 | Basti Abdul Aziz Samejah          | 31         | 127  | 118    | 245              |
|        |               |                 | Basti Gaazer                      | 78         | 320  | 296    | 616              |
|        |               |                 | Basti Haji Imam Bux               | 43         | 177  | 163    | 340              |
|        |               |                 | Basti Jam Jango Wiha              | 20         | 82   | 76     | 158              |
|        |               |                 | Basti Shaikh Machian              | 40         | 164  | 152    | 316              |
| 51     |               | Kotla Niazi     | Kotla Niazi                       | 85         | 323  | 298    | 621              |
|        |               |                 | Basti Jatoi Balouch               | 61         | 232  | 214    | 445              |
|        |               |                 | Basti Mujawraan Mori              | 241        | 915  | 844    | 1759             |
|        |               |                 | Basti Hitam Khan                  | 43         | 163  | 151    | 314              |
|        |               |                 | Basti Abdul Kareem Saweetra       | 105        | 399  | 368    | 767              |
| 52     |               | Lakhani         | Lakhani                           | 82         | 260  | 240    | 500              |
|        |               |                 | Jailabad                          | 122        | 387  | 357    | 744              |
|        |               |                 | Basti Khuda Bux                   | 311        | 986  | 911    | 1897             |
|        |               |                 | Basti Hafiz Ghulam Mandi          | 253        | 803  | 741    | 1543             |
|        |               |                 | Basti Rais Haji Atta Ullah/Hafeez | 66         | 209  | 193    | 403              |
|        |               |                 | Basti Adil Arain                  | 70         | 222  | 205    | 427              |
|        |               |                 | Basti Rais Tahir/Basti Noor Ahmad | 33         | 105  | 97     | 201              |
| 53     |               | Lal Shah        | Lal Shah                          | 15         | 65   | 60     | 125              |
|        |               |                 | Chakaran                          | 156        | 673  | 622    | 1295             |
|        |               |                 | Basti Zaman Shah                  | 95         | 410  | 378    | 789              |
|        |               |                 | Azeempur                          | 128        | 552  | 510    | 1062             |
|        |               |                 | Basti Dad Potra                   | 68         | 293  | 271    | 564              |
| 54     |               | Laoon Wala      | Basti Jam Mehrab Wiha             | 28         | 98   | 90     | 188              |
|        |               |                 | Basti Jamal Arain                 | 93         | 324  | 299    | 623              |
|        |               |                 | Basti Sheerani                    | 77         | 268  | 248    | 516              |
|        |               |                 | Basti Jhamat                      | 61         | 213  | 196    | 409              |
|        |               |                 | Basti Wazeer Khan                 | 56         | 195  | 180    | 375              |
|        |               |                 | Basti Haji Abdul Hameed Pahoor    | 69         | 240  | 222    | 462              |
|        |               |                 | Basti Haji Ghulam Hussain         | 54         | 188  | 174    | 362              |
|        |               |                 | Basti Ghulam Nabi Wiha            | 40         | 139  | 129    | 268              |
| 55     |               | Malhani         | Mulhani                           | 31         | 118  | 109    | 226              |
|        |               |                 | Basti Afzal Ghasoora              | 195        | 740  | 683    | 1424             |
|        |               |                 | Basti Abdul Lateef Sial           | 88         | 334  | 308    | 642              |
|        |               |                 | Basti Dandey Naich                | 184        | 698  | 645    | 1343             |
|        |               |                 | Basti Haji Ghoos Bux              | 38         | 144  | 133    | 277              |
| 56     |               | Malik Pur       | Basti Khan Muhammad               | 42         | 140  | 129    | 269              |
|        |               |                 | Basti Durani/Basti Maachi         | 33         | 110  | 101    | 211              |
| 57     |               | Malkani         | Mayani Moza Malkani               | 66         | 268  | 247    | 515              |
|        |               |                 | Basti Roja Machi                  | 88         | 357  | 329    | 686              |



| Sr. No | Tehsil & Zone | Revenue Village  | Settlement Name               | House Hold | Male | Female | Total Population |
|--------|---------------|------------------|-------------------------------|------------|------|--------|------------------|
|        |               |                  | Basti Meero Khan              | 95         | 385  | 356    | 741              |
|        |               |                  | Basti Haji Bakhat Ali         | 40         | 162  | 150    | 312              |
|        |               |                  | Basti Meyani                  | 81         | 329  | 303    | 632              |
|        |               |                  | Basti Maande Machi            | 45         | 183  | 168    | 351              |
|        |               |                  | Basti Muhammad Pur            | 33         | 134  | 124    | 257              |
|        |               |                  | Basti Hakeem Abad             | 58         | 235  | 217    | 452              |
| 58     |               | Metla            | Metla                         | 44         | 146  | 135    | 282              |
|        |               |                  | Kurai                         | 61         | 203  | 187    | 390              |
|        |               |                  | Basti Jalmi                   | 81         | 270  | 249    | 518              |
|        |               |                  | Basti Saeed Metla             | 75         | 250  | 230    | 480              |
|        |               |                  | Basti Mehar                   | 135        | 449  | 415    | 864              |
| 59     |               | Mir Muhammad Lar | Basti Salwani                 | 101        | 294  | 271    | 566              |
|        |               |                  | Basti Bagga Lar               | 35         | 102  | 94     | 196              |
|        |               |                  | Basti Said Pur                | 30         | 87   | 81     | 168              |
| 60     |               | Muhammad Daha    | Fareed Shah Mor               | 14         | 55   | 51     | 106              |
|        |               |                  | Mohammad Daha                 | 127        | 502  | 463    | 965              |
|        |               |                  | Basti Kumharan                | 80         | 316  | 292    | 608              |
|        |               |                  | Basti Luqman Arain            | 125        | 494  | 456    | 950              |
|        |               |                  | Basti Nizam Din               | 49         | 194  | 179    | 372              |
|        |               |                  | Basti Shah Muhammad           | 69         | 273  | 252    | 524              |
|        |               |                  | Basti Rais Muhammad Yar       | 41         | 162  | 150    | 312              |
| 61     |               | Mujawraan        | Basti Manoor Mujawraan        | 54         | 258  | 238    | 497              |
|        |               |                  | Basti Haji Ramzan             | 50         | 239  | 221    | 460              |
|        |               |                  | Basti Fazal Balli             | 63         | 301  | 278    | 580              |
|        |               |                  | Basti Ali Khan                | 23         | 110  | 102    | 212              |
|        |               |                  | Basti Rana M. Usman           | 179        | 856  | 790    | 1647             |
|        |               |                  | Basti Gul M. Balli            | 76         | 364  | 336    | 699              |
|        |               |                  | Basti Peer Bux Balliaan       | 68         | 325  | 300    | 626              |
|        |               |                  | Basti Peer Bux Balliaan       | 100        | 478  | 442    | 920              |
| 62     |               | Nala Musani      | Nala Musani                   | 308        | 1169 | 1079   | 2248             |
|        |               |                  | Basti Kamley Wala             | 142        | 539  | 498    | 1037             |
|        |               |                  | Basti Haji Kalo               | 37         | 140  | 130    | 270              |
| 63     |               | Pakhi War        | Pakhi War                     | 118        | 491  | 453    | 944              |
|        |               |                  | Basti Niaz Khan               | 121        | 503  | 465    | 968              |
|        |               |                  | Basti Hayat M.                | 202        | 840  | 776    | 1616             |
|        |               |                  | Basti Punnar+Basti Niaz Ahmad | 61         | 254  | 234    | 488              |
|        |               |                  | Basti Ahmad Nagar             | 160        | 666  | 614    | 1280             |
| 64     |               | Pararan Sharif   | Pararan Sharif                | 67         | 286  | 264    | 549              |
|        |               |                  | Basti Kehri                   | 36         | 154  | 142    | 295              |
|        |               |                  | Basti Haslaan                 | 60         | 256  | 236    | 492              |
|        |               |                  | Basti Galgani                 | 45         | 192  | 177    | 369              |
|        |               |                  | Basti Jooya                   | 33         | 141  | 130    | 271              |





| Sr. No | Tehsil & Zone | Revenue Village | Settlement Name                        | House Hold | Male | Female | Total Population |
|--------|---------------|-----------------|----------------------------------------|------------|------|--------|------------------|
|        |               |                 | Basti Wazir Ahmad Derkhan              | 70         | 298  | 276    | 574              |
|        |               |                 | Basti Molvi Hanif                      | 52         | 222  | 205    | 426              |
|        |               |                 | Basti Huraan                           | 21         | 90   | 83     | 172              |
|        |               |                 | Basti Rinda                            | 30         | 128  | 118    | 246              |
| 65     |               | Qadu Wali       | Qadu Wali                              | 38         | 119  | 109    | 228              |
|        |               |                 | Habib Abad                             | 102        | 318  | 294    | 612              |
|        |               |                 | Basti Ahoora                           | 37         | 115  | 107    | 222              |
|        |               |                 | Basti Noor Jahaniya                    | 29         | 90   | 84     | 174              |
|        |               |                 | Basti Qadu Wali                        | 64         | 200  | 184    | 384              |
|        |               |                 | Basti Kandani                          | 51         | 159  | 147    | 306              |
|        |               |                 | Basti Malik Musa Naich                 | 21         | 66   | 60     | 126              |
|        |               |                 | Basti Malik Sadique                    | 13         | 41   | 37     | 78               |
|        |               |                 | Basti Gareebabad                       | 86         | 268  | 248    | 516              |
|        |               |                 | Basti Saymee Wali                      | 62         | 193  | 179    | 372              |
|        |               |                 | Basti Shaqlani                         | 52         | 162  | 150    | 312              |
|        |               |                 | Basti Allah Bux                        | 47         | 147  | 135    | 282              |
|        |               |                 | Basti Allah Bux                        | 25         | 78   | 72     | 150              |
|        |               |                 | Basti Ghulam Nabi Naich                | 17         | 53   | 49     | 102              |
| 66     |               | Rais Pathan     | Rais Pathan                            | 56         | 207  | 191    | 398              |
|        |               |                 | Basti Jhanjh                           | 42         | 155  | 143    | 298              |
|        |               |                 | Basti Mual                             | 192        | 709  | 654    | 1363             |
|        |               |                 | Basti Marrai Balouch                   | 69         | 255  | 235    | 490              |
|        |               |                 | Basti Khushal Khan                     | 221        | 816  | 753    | 1569             |
|        |               |                 | Basti Kalorran                         | 106        | 391  | 361    | 753              |
| 67     |               | Rashid Abad     | Rashid Abad Jadid                      | 75         | 281  | 259    | 540              |
|        |               |                 | Rashid Abad                            | 164        | 614  | 567    | 1181             |
|        |               |                 | Basti Karmaniyan                       | 71         | 266  | 245    | 511              |
| 68     |               | Rindan          | Rindan                                 | 147        | 527  | 487    | 1014             |
|        |               |                 | Basti Daim Khan                        | 38         | 136  | 126    | 262              |
|        |               |                 | Basti Haji Hazoor Bux Naich            | 55         | 197  | 182    | 380              |
|        |               |                 | Basti Gul Muhammad Naich               | 43         | 154  | 142    | 297              |
|        |               |                 | Basti Mehar M. Ismail/Basti M Bux Sial | 81         | 291  | 268    | 559              |
|        |               |                 | Basti Haji M Khan Rind                 | 82         | 294  | 272    | 566              |
|        |               |                 | Basti Malik Azeem Naich                | 101        | 362  | 335    | 697              |
|        |               |                 | Basti Ramzan Sial                      | 43         | 154  | 142    | 297              |
|        |               |                 | Basti Chanar/Basti Ghulam Nabi Khokhar | 36         | 129  | 119    | 248              |
|        |               |                 | Basti Molvi Ghulam Rasool              | 50         | 179  | 166    | 345              |
| 69     |               | Sadiqpur        | Sadiqpur                               | 55         | 177  | 164    | 341              |
| 70     |               | Said Pur        | Said Pur                               | 29         | 103  | 95     | 197              |



| Sr. No          | Tehsil & Zone                      | Revenue Village    | Settlement Name                         | House Hold | Male | Female | Total Population |
|-----------------|------------------------------------|--------------------|-----------------------------------------|------------|------|--------|------------------|
|                 |                                    |                    | Basti Kacha Pacca Arain                 | 83         | 293  | 271    | 564              |
|                 |                                    |                    | Basti Jam Shah Muhammad/Basti Mari Wala | 55         | 194  | 180    | 374              |
|                 |                                    |                    | Tibba Kareem Abad                       | 104        | 368  | 339    | 707              |
|                 |                                    |                    | Basti Pathan                            | 95         | 336  | 310    | 646              |
|                 |                                    |                    | Basti Jam Sumaar                        | 29         | 103  | 95     | 197              |
|                 |                                    |                    | Basti Kanal Lar                         | 42         | 149  | 137    | 286              |
|                 |                                    |                    | Basti Jam M. Bux/Basti Ali Shah         | 25         | 88   | 82     | 170              |
|                 |                                    |                    | Basti Bhattiyaan                        | 33         | 117  | 108    | 224              |
|                 |                                    |                    | Basti Balliyaan                         | 39         | 138  | 127    | 265              |
| 71              |                                    | Shahbaz Pur Gharbi | Basti Peer Iftekhar Shah                | 105        | 410  | 378    | 788              |
| Basti Veeha Lar |                                    |                    | 26                                      | 101        | 94   | 195    |                  |
| 72              |                                    | Shamsabad          | Babay Da Khara                          | 89         | 324  | 299    | 623              |
|                 |                                    |                    | Shamsabad                               | 114        | 415  | 383    | 798              |
|                 |                                    |                    | Shamsabad                               | 114        | 415  | 383    | 798              |
| 73              |                                    | Shidani Sharif     | Pul Wataran                             | 32         | 126  | 117    | 243              |
|                 |                                    |                    | Shidani Sharif                          | 606        | 2395 | 2211   | 4606             |
|                 |                                    |                    | Basti Ghulam                            | 97         | 383  | 354    | 737              |
|                 |                                    |                    | Pul Watran Machi                        | 172        | 680  | 627    | 1307             |
|                 |                                    |                    | Basti Qade Machi                        | 89         | 352  | 325    | 676              |
|                 |                                    |                    | Basti Nabi Bux                          | 100        | 395  | 365    | 760              |
|                 |                                    |                    | Basti Sadat                             | 160        | 632  | 584    | 1216             |
| 74              |                                    | Talbani            | Utera                                   | 29         | 97   | 89     | 186              |
|                 |                                    |                    | Talbani                                 | 618        | 2057 | 1898   | 3955             |
|                 |                                    |                    | Adda Pul Basti Korai/Basti Korai        | 240        | 799  | 737    | 1536             |
|                 |                                    |                    | Basti Bhanad Blouch                     | 60         | 200  | 184    | 384              |
|                 |                                    |                    | Chouk Maharvi and Bhatti                | 55         | 183  | 169    | 352              |
|                 |                                    |                    | Basti Sial                              | 70         | 233  | 215    | 448              |
|                 |                                    |                    | Basti Haji Ghulam Sarwar Sameja         | 27         | 90   | 83     | 173              |
|                 |                                    |                    | Basti Allah Diwya/Allah Wasya Sial      | 22         | 73   | 68     | 141              |
|                 | Basti Allah Diwya/Allah Wasya Sial |                    | 23                                      | 77         | 71   | 147    |                  |
|                 | Basti Shahbaz Khan Abbasi          |                    | 111                                     | 369        | 341  | 710    |                  |
|                 | Basti Pathan                       |                    | 63                                      | 210        | 194  | 403    |                  |
|                 | Basti Utera                        |                    | 32                                      | 106        | 98   | 205    |                  |
|                 | Basti Khalifa                      |                    | 120                                     | 399        | 369  | 768    |                  |
|                 | Basti Sameja                       |                    | 26                                      | 87         | 80   | 166    |                  |
| 75              | Tanwari                            | Moosa Chouk        | 57                                      | 210        | 194  | 405    |                  |
|                 |                                    | Tanwari            | 259                                     | 956        | 883  | 1839   |                  |
|                 |                                    | Basti Bapraan      | 22                                      | 81         | 75   | 156    |                  |



| Sr. No | Tehsil & Zone | Revenue Village  | Settlement Name                     | House Hold | Male | Female | Total Population |
|--------|---------------|------------------|-------------------------------------|------------|------|--------|------------------|
|        |               |                  | Basti Jan Muhammad                  | 103        | 380  | 351    | 731              |
|        |               |                  | Basti Pehlwan                       | 44         | 162  | 150    | 312              |
|        |               |                  | Basti Chaki wali                    | 29         | 107  | 99     | 206              |
|        |               |                  | Kotla Punjabiyan                    | 37         | 137  | 126    | 263              |
| 76     |               | Tarinda Mir Khan | Basti Peer Bux Jath Malik           | 138        | 452  | 417    | 869              |
|        |               |                  | Tarinda Mir Khan                    | 379        | 1242 | 1146   | 2388             |
|        |               |                  | Basti Malik Soobah                  | 92         | 301  | 278    | 580              |
|        |               |                  | Basti Ali Gabbar                    | 88         | 288  | 266    | 554              |
|        |               |                  | Basti Theekri                       | 61         | 200  | 184    | 384              |
|        |               |                  | Basti Usman Arain                   | 54         | 177  | 163    | 340              |
|        |               |                  | Basti Haleem Arain                  | 37         | 121  | 112    | 233              |
|        |               |                  | Basti Noor Ahmad Jhanj              | 27         | 88   | 82     | 170              |
|        |               |                  | Basti Paari Malik                   | 59         | 193  | 178    | 372              |
|        |               |                  | Basti Khan Muhammad Lar             | 37         | 121  | 112    | 233              |
|        |               |                  | Basti Aarib Shaikhaan               | 56         | 183  | 169    | 353              |
|        |               |                  | Basti Umar Wada Janjh               | 42         | 138  | 127    | 265              |
|        |               |                  | Basti Daiyat                        | 22         | 72   | 67     | 139              |
|        |               |                  | Basti Shahbaz pur Adda Chanji Chouk | 165        | 541  | 499    | 1040             |
|        |               |                  | Basti Hamdaabad                     | 104        | 341  | 314    | 655              |
| 77     |               | Ther Posti       | Adda Ther Posti                     | 152        | 537  | 496    | 1034             |
|        |               |                  | Basti Ahmad Khan Kehwani            | 32         | 113  | 104    | 218              |
|        |               |                  | Basti Gul Muhammad                  | 48         | 170  | 157    | 326              |
| 78     |               | Tibbi Sayyadan   | Basti Milan Machi                   | 74         | 296  | 274    | 570              |
|        |               |                  | Basti Malik Hussain Bakhsh          | 74         | 296  | 274    | 570              |
|        |               |                  | Rais Usman Moza Tibbi Sayyadan      | 64         | 256  | 237    | 493              |
|        |               |                  | Basti Shahoo                        | 78         | 312  | 288    | 601              |
|        |               |                  | Basti Lamucha                       | 56         | 224  | 207    | 431              |
|        |               |                  | Basti Malik Mubarak                 | 33         | 132  | 122    | 254              |
|        |               |                  | Basti Dr. Abbasi                    | 51         | 204  | 188    | 393              |
| 79     |               | Wahid Bux Sial   | Wahid Bux Sial 2                    | 72         | 243  | 225    | 468              |
|        |               |                  | Wahid Bux Sial 1                    | 65         | 220  | 203    | 423              |
|        |               |                  | Basti Langah                        | 100        | 338  | 312    | 650              |
|        |               |                  | Basti Chaty Khan                    | 100        | 338  | 312    | 650              |
| 80     |               | Yakhtar Maha     | Yakhtar Maha 2                      | 41         | 139  | 128    | 267              |
|        |               |                  | Yakhtar Maha 1                      | 27         | 91   | 84     | 176              |
|        |               |                  | Basti Baba Ali                      | 31         | 105  | 97     | 202              |
| 81     |               | Zaffar Abad      | Basti Gaman Khan                    | 79         | 246  | 228    | 474              |
|        |               |                  | Basti Mushtafabad/ Dera Lahoriaan   | 49         | 153  | 141    | 294              |
|        |               |                  | Zaffar Abad                         | 636        | 1984 | 1832   | 3816             |



| Sr. No | Tehsil & Zone | Revenue Village     | Settlement Name                  | House Hold | Male  | Female | Total Population |
|--------|---------------|---------------------|----------------------------------|------------|-------|--------|------------------|
|        |               |                     | Basti Mian Muhammad Akbar        | 83         | 259   | 239    | 498              |
|        |               |                     | Basti Varmat Lar                 | 56         | 175   | 161    | 336              |
|        |               |                     | Basti Bahawal Shah               | 52         | 162   | 150    | 312              |
|        |               |                     | Basti Gous Bux Shah              | 125        | 390   | 360    | 750              |
|        |               |                     | Basti Haji Jummah                | 59         | 184   | 170    | 354              |
| 82     |               | Chak No 119-A- NP   | Chak No 119-A- NP                | 47         | 276   | 255    | 531              |
| 83     |               | Chak No 119 NP      | Chak No 119 NP                   | 96         | 354   | 327    | 682              |
| 84     |               | Chak No 137 NP      | Chak No 137 NP                   | 16         | 53    | 49     | 102              |
| 85     |               | Unran               | Raufabad                         | 22         | 72    | 67     | 139              |
|        |               |                     | Basti Haji Bakhat Ali            | 93         | 305   | 281    | 586              |
|        |               |                     | Basti Gul Muhammad               | 30         | 98    | 91     | 189              |
|        |               |                     | Basti Rook Allah Jawayia         | 22         | 72    | 67     | 139              |
|        |               |                     | Basti Ahmad Bux                  | 37         | 121   | 112    | 233              |
|        |               |                     | Basti Elahi Bux Bhutta           | 24         | 79    | 73     | 151              |
| 86     |               | Ahmed Yar           | Ahmad Yar Tanwari                | 151        | 535   | 492    | 1,027            |
|        |               |                     | Basti Noor Muhammad              | 74         | 262   | 241    | 503              |
|        |               |                     | Basti Hussain Abad               | 93         | 329   | 303    | 632              |
|        |               |                     | Basti Marri                      | 55         | 195   | 179    | 374              |
| 87     |               | Arif Baloch         | Basti Khokhran                   | 100        | 313   | 287    | 600              |
| 88     |               | Chak 315/6R         | Chak 315/6R                      | 65         | 271   | 249    | 520              |
| 89     |               | Chak 316/6R         | Chak 316/6R                      | 80         | 333   | 307    | 640              |
| 90     |               | Chak 317/6R         | Chak 317/6R                      | 135        | 570   | 524    | 1,094            |
| 91     |               | Chak No 08 Abbasia  | Chak No 08 Abbasia               | 332        | 1,280 | 1,177  | 2,457            |
|        |               |                     | Chak No 08 Abbasia Jinnah Colony | 70         | 270   | 248    | 518              |
| 92     |               | Chak No 09 Abbasia  | Chak No 09 Abbasia               | 120        | 419   | 385    | 804              |
|        |               |                     | Chak No 09 Abbasia Colony        | 110        | 384   | 353    | 737              |
|        |               |                     | Chak No 09 Abbasia Shiekhan      | 50         | 175   | 160    | 335              |
| 93     |               | Chak No 11 Abbasia  | Chak No 11 Abbasia               | 346        | 1,208 | 1,110  | 2,318            |
| 94     |               | Chak No 12 Abbasia  | Chak No 12 Abbasia               | 164        | 684   | 628    | 1,312            |
| 95     |               | Chak No 313/6R      | Chak No 313/6R                   | 70         | 295   | 272    | 567              |
| 96     |               | Chak No 134 NP      | Chak No 134 NP                   | 158        | 790   | 727    | 1,517            |
| 97     |               | Chak No 135 NP      | Chak No 135 NP                   | 54         | 180   | 166    | 346              |
| 98     |               | Chak No 136 NP      | Chak No 136 NP                   | 53         | 204   | 188    | 392              |
| 99     |               | Chak No 139 NP      | Chak No 139 NP                   | 50         | 206   | 189    | 395              |
|        |               |                     | Basti Elahi Bux Toor             | 63         | 259   | 239    | 498              |
| 100    |               | Chak No 140 NP      | Chak No 140 NP                   | 73         | 270   | 248    | 518              |
| 101    |               | Chak No 143 Abbasia | Chak No 143 Abbasia              | 222        | 787   | 723    | 1,510            |
| 102    |               | Chak No 144/ 5R     | Chak No 144/ 5R                  | 80         | 396   | 364    | 760              |
| 103    |               | Chak No 145/ 5R     | Chak No 145/ 5R                  | 52         | 201   | 184    | 385              |
| 104    |               | Chak No 147/ 5R     | Chak No 147/ 5R                  | 151        | 519   | 478    | 997              |



| Sr. No | Tehsil & Zone | Revenue Village           | Settlement Name                  | House Hold | Male  | Female | Total Population |
|--------|---------------|---------------------------|----------------------------------|------------|-------|--------|------------------|
| 105    |               | Chak No 148/ 5R           | Chak No 148/ 5R                  | 59         | 292   | 269    | 561              |
| 106    |               | Chak No 150 Abbasia       | Chak No 150 Abbasia              | 63         | 210   | 193    | 403              |
| 107    |               | Chak No 152 7R            | Chak No 152 7R                   | 111        | 538   | 494    | 1,032            |
| 108    |               | Chak No 153 7R            | Chak No 153 7R                   | 101        | 500   | 460    | 960              |
| 109    |               | Chak No 154 7R            | Chak No 154 7R                   | 133        | 603   | 554    | 1,157            |
| 110    |               | Chak No 155 7R            | Chak No 155 7R                   | 120        | 488   | 448    | 936              |
| 111    |               | Chak No 156 7R            | Chak No 156 7R                   | 106        | 514   | 472    | 986              |
| 112    |               | Chak No 157 7R            | Chak No 157 7R                   | 193        | 975   | 897    | 1,872            |
| 113    |               | Chak No 159 7R            | Chak No 159 7R                   | 92         | 369   | 339    | 708              |
| 114    |               | Chak No 174 7R            | Chak No 174 7R                   | 91         | 422   | 388    | 810              |
| 115    |               | Chak No 175 7R            | Chak No 175 7R                   | 180        | 994   | 914    | 1,908            |
| 116    |               | Chak No 177 7R            | Chak No 177 7R                   | 51         | 231   | 213    | 444              |
| 117    |               | Chak No 178 7R            | Chak No 178 7R                   | 119        | 440   | 405    | 845              |
| 118    |               | Chak No 179 7R            | Chak No 179 7R                   | 53         | 227   | 208    | 435              |
| 119    |               | Chak No 180 7R            | Chak No 180 7R                   | 87         | 440   | 404    | 844              |
| 120    |               | Chak No 182 1L            | Chak No 182 1L                   | 88         | 376   | 346    | 722              |
| 121    |               | Chak No 183 7R            | Chak No 183 7R                   | 117        | 451   | 415    | 866              |
| 122    |               | Chak No 186 7R            | Chak No 186 7R                   | 127        | 252   | 231    | 483              |
| 123    |               | Chak No 19 Abbasia        | Chak No 19 Abbasia               | 411        | 1,456 | 1,339  | 2,795            |
| 124    |               | Chak No 191 1L            | Chak No 191 1L                   | 60         | 218   | 202    | 420              |
| 125    |               | Chak No 194 1L            | Chak No 194 1L                   | 134        | 649   | 597    | 1,246            |
| 126    |               | Chak No 195 1L            | Chak No 195 1L                   | 56         | 251   | 231    | 482              |
| 127    |               | <b>Chak No 20 Abbasia</b> | Chak No 20 Abbasia Colony        | 400        | 1,271 | 1,169  | 2,440            |
|        |               |                           | Chak No 20 Abbasia               | 305        | 970   | 891    | 1,861            |
| 128    |               | <b>Chak No 22 Abbasia</b> | Chak No 22 Abbasia Jinnah Colony | 393        | 1,413 | 1,299  | 2,712            |
|        |               |                           | Chak No 22 Abbasia               | 180        | 647   | 595    | 1,242            |
| 129    |               | <b>Chak No 23 Abbasia</b> | Chak No 23 Abbasia               | 226        | 824   | 758    | 1,582            |
|        |               |                           | Chak No 23 Abbasia Colony_1      | 350        | 1,276 | 1,174  | 2,450            |
|        |               |                           | Chak No 23 Abbasia Colony_2      | 70         | 255   | 235    | 490              |
| 130    |               | Chak No 28 Abbasia        | Chak No 28 Abbasia               | 105        | 432   | 398    | 830              |
| 131    |               | Chak No 31 Abbasia        | Chak No 31 Abbasia Colony_2      | 80         | 300   | 276    | 576              |
|        |               |                           | Chak No 31 Abbasia               | 158        | 593   | 545    | 1,138            |
|        |               |                           | Chak No 31 Abbasia Colony_1      | 180        | 675   | 621    | 1,296            |
| 132    |               | Chak No 32 Abbasia        | Chak No 32 Abbasia               | 564        | 2,263 | 2,080  | 4,343            |
| 133    |               | Chak No 33 Abbasia        | Chak No 33 Abbasia               | 147        | 490   | 451    | 941              |
| 134    |               | Chak No 36 Abbasia        | Chak No 36 Abbasia               | 115        | 407   | 375    | 782              |
| 135    |               | Chak No 37 Abbasia        | Chak No 37 Abbasia               | 358        | 1,343 | 1,235  | 2,578            |



| Sr. No | Tehsil & Zone | Revenue Village           | Settlement Name               | House Hold | Male  | Female | Total Population |
|--------|---------------|---------------------------|-------------------------------|------------|-------|--------|------------------|
| 136    |               | <b>Chak No 38 Abbasia</b> | Zia Colony Chak No 38 Abbasia | 72         | 289   | 265    | 554              |
|        |               |                           | Murad Colony Chak 38-A        | 60         | 241   | 221    | 462              |
| 137    |               | Chak No 39 Abbasia        | Chak No 39 Abbasia            | 220        | 837   | 769    | 1,606            |
| 138    |               | <b>Chak No 3A</b>         | Chak No 3 Abbasia             | 130        | 433   | 399    | 832              |
|        |               |                           | Chak No 3A Colony             | 155        | 517   | 475    | 992              |
| 139    |               | Chak No 40 Abbasia        | Chak No 40 Abbasia            | 129        | 551   | 507    | 1,058            |
| 140    |               | Chak No 41 Abbasia        | Chak No 41 Abbasia            | 184        | 623   | 573    | 1,196            |
| 141    |               | Chak No 42 Abbasia        | Chak No 42 Abbasia            | 303        | 979   | 900    | 1,879            |
| 142    |               | <b>Chak No 43 Abbasia</b> | Chak No 43 Abbasia            | 334        | 1,201 | 1,104  | 2,305            |
|        |               |                           | Chak No 43 Abbasia Colony     | 120        | 431   | 397    | 828              |
| 143    |               | Chak No 46 Abbasia        | Chak No 46 Abbasia            | 237        | 840   | 772    | 1,612            |
| 144    |               | Chak No 47 Abbasia        | Chak No 47 Abbasia            | 271        | 1,045 | 960    | 2,005            |
| 145    |               | Chak No 48 Abbasia        | Chak No 48 Abbasia            | 134        | 517   | 475    | 992              |
| 146    |               | <b>Chak No 4A</b>         | Chak No 4 Abbasia             | 52         | 181   | 167    | 348              |
|        |               |                           | Basti Chak 04A                | 65         | 227   | 209    | 436              |
| 147    |               | Chak No 63 Abbasia        | Chak No 63 Abbasia            | 384        | 1,320 | 1,214  | 2,534            |
| 148    |               | Chak No 64 Abbasia        | Chak No 64 Abbasia            | 157        | 540   | 496    | 1,036            |
| 149    |               | <b>Chak No 65 Abbasia</b> | Chak No 65 Abbasia            | 171        | 588   | 541    | 1,129            |
|        |               |                           | Chak No 65 Abbasia Colony     | 135        | 464   | 427    | 891              |
| 150    |               | <b>Chak No 68 Abbasia</b> | Chak No 68 Abbasia            | 137        | 457   | 420    | 877              |
|        |               |                           | Chak No 68 Abbasia Colony_1   | 180        | 600   | 552    | 1,152            |
| 151    |               | Chak No 69 Abbasia        | Chak No 69 Abbasia            | 159        | 530   | 488    | 1,018            |
| 152    |               | Chak No 75 Abbasia        | Chak No 75 Abbasia            | 362        | 1,320 | 1,214  | 2,534            |
| 153    |               | Chak No 77 Abbasia        | Chak No 77 Abbasia            | 305        | 1,144 | 1,052  | 2,196            |
| 154    |               | <b>Chak No 78 Abbasia</b> | Chak No 78 Abbasia New        | 55         | 195   | 179    | 374              |
|        |               |                           | Chak No 78 Abbasia Old        | 145        | 514   | 472    | 986              |
| 155    |               | Chak No 79 Abbasia        | Chak No 79 Abbasia            | 423        | 1,455 | 1,337  | 2,792            |
| 156    |               | Chak No 80 Abbasia        | Chak No 80 Abbasia            | 262        | 1,010 | 929    | 1,939            |
| 157    |               | Chak No 81 Abbasia        | Chak No 81 Abbasia            | 384        | 1,281 | 1,177  | 2,458            |
| 158    |               | Chak No 82 Abbasia        | Chak No 82 Abbasia            | 261        | 1,006 | 925    | 1,931            |
| 159    |               | <b>Chak No 83 Abbasia</b> | Chak No 83 Abbasia            | 424        | 1,193 | 1,097  | 2,290            |
|        |               |                           | Chak No 83 Abbasia Colony     | 90         | 253   | 233    | 486              |
| 160    |               | <b>Chak No 84 Abbasia</b> | Chak No 84 Abbasia            | 113        | 377   | 346    | 723              |
|        |               |                           | Chak No 84 Abbasia Colony     | 105        | 350   | 322    | 672              |
| 161    |               | Chak No 85 Abbasia Colony | Chak No 85 Abbasia Colony     | 250        | 834   | 766    | 1,600            |
| 162    |               | Chak No 86 Abbasia        | Chak No 86 Abbasia            | 168        | 735   | 676    | 1,411            |
| 163    |               | <b>Chak No 87 Abbasia</b> | Chak No 87 Abbasia            | 432        | 1,710 | 1,573  | 3,283            |
|        |               |                           | Adda Chak No 87 Abbasia       | 222        | 879   | 808    | 1,687            |





| Sr. No | Tehsil & Zone | Revenue Village           | Settlement Name                 | House Hold | Male  | Female | Total Population |
|--------|---------------|---------------------------|---------------------------------|------------|-------|--------|------------------|
|        |               |                           | Basti Abdul Ghafooor            | 65         | 257   | 237    | 494              |
| 164    |               | <b>Chak No 88 Abbasia</b> | Chak No 88 Abbasia Bara         | 199        | 653   | 601    | 1,254            |
|        |               |                           | Chak No 88 Abbasia Chota        | 253        | 830   | 764    | 1,594            |
| 165    |               | Chak No 89 Abbasia        | Chak No 89 Abbasia              | 93         | 295   | 272    | 567              |
| 166    |               | Basti Noor Din            | Basti Noor Din                  | 85         | 315   | 289    | 604              |
| 167    |               | Adda Gulshan Farid        | Adda Gulshan Farid              | 224        | 934   | 858    | 1,792            |
| 168    |               | <b>Hayat Lar</b>          | Basti Tok                       | 212        | 740   | 680    | 1,420            |
|        |               |                           | Basti Saleh Muhammad            | 75         | 262   | 241    | 503              |
| 169    |               | <b>Kanjki Wala</b>        | Basti Ghalo                     | 86         | 336   | 309    | 645              |
|        |               |                           | Basti Kukara                    | 100        | 391   | 359    | 750              |
|        |               |                           | Basti Malik Pervaiz Akhter      | 76         | 297   | 273    | 570              |
| 170    |               | <b>Kotla Darigh</b>       | Basti Haji Mehar Ali Drig       | 82         | 329   | 302    | 631              |
|        |               |                           | Basti Abdul Rasheed Lar         | 50         | 201   | 184    | 385              |
|        |               |                           | Basti Manzoor Ahmed Lar         | 67         | 269   | 247    | 516              |
|        |               |                           | Basti Malik Lal Machi           | 75         | 301   | 277    | 578              |
|        |               |                           | Basti Marral                    | 145        | 582   | 535    | 1,117            |
| 171    |               | <b>Kotla Khairey Khan</b> | Basti Malik Allah Ditta Solangi | 92         | 340   | 313    | 653              |
| 172    |               | <b>Muradpur Sail</b>      | Basti Buraha                    | 70         | 252   | 231    | 483              |
|        |               |                           | Basti Haji Kamal                | 63         | 227   | 208    | 435              |
|        |               |                           | Basti Bhattian                  | 63         | 227   | 208    | 435              |
|        |               |                           | Basti Jam M. Mazhar Mah         | 65         | 234   | 215    | 449              |
|        |               |                           | Basti Ameer Bux                 | 50         | 180   | 165    | 345              |
|        |               |                           | Basti Haji Abdur Rehman Khosa   | 70         | 252   | 231    | 483              |
| 173    |               | <b>Tranda Gurgajj</b>     | Taranda Gurgajj                 | 109        | 454   | 418    | 872              |
|        |               |                           | Basti Goth Mehtab Shah          | 153        | 638   | 586    | 1,224            |
|        |               |                           | Khangah                         | 103        | 429   | 395    | 824              |
|        |               |                           | Basti Sadiq Khan Gorgaje        | 77         | 321   | 295    | 616              |
|        |               |                           | Basti Sanaullah Khan            | 56         | 233   | 215    | 448              |
| 174    |               | <b>Turkary</b>            | Basti Azmat Lar                 | 60         | 213   | 195    | 408              |
|        |               |                           | Jindu Pir Kamal                 | 465        | 1,647 | 1,515  | 3,162            |
|        |               |                           | Tarukri                         | 89         | 315   | 290    | 605              |
|        |               |                           | Basti Allah Bux/M. Murad        | 78         | 276   | 254    | 530              |
|        |               |                           | Basti Waryam Solangi            | 86         | 305   | 280    | 585              |
|        |               |                           | Basti Imam Bux                  | 69         | 244   | 225    | 469              |
| 175    |               | <b>Firoza</b>             | Chak 70/A Firoza                | 320        | 1,117 | 1,027  | 2,144            |
|        |               |                           | Ghudam Wala Chak 70/A           | 130        | 454   | 417    | 871              |
| 176    |               | Chak 140 Abbsia           | Chak 140 Abbsia                 | 213        | 320   | 326    | 646              |
| 177    |               | Chak 51 Abbsia            | Chak 51 Abbsia                  | 206        | 780   | 765    | 1545             |
| 178    |               | Chak 53 Abbasia           | Chak 53 Abbasia                 | 58         | 283   | 280    | 563              |



| Sr. No       | Tehsil & Zone | Revenue Village     | Settlement Name     | House Hold   | Male          | Female        | Total Population |
|--------------|---------------|---------------------|---------------------|--------------|---------------|---------------|------------------|
| 179          |               | Chak No 02 Abbasia  | Chak No 02 Abbasia  | 103          | 395           | 388           | 783              |
| 180          |               | Chak No 06 Abbasia  | Chak No 06 Abbasia  | 120          | 440           | 436           | 876              |
| 181          |               | Chak No 07 Abbasia  | Chak No 07 Abbasia  | 77           | 310           | 298           | 608              |
| 182          |               | Chak No 10 Abbasia  | Chak No 10 Abbasia  | 205          | 728           | 728           | 1456             |
| 183          |               | Chak No 13 Abbasia  | Chak No 13 Abbasia  | 223          | 990           | 983           | 1973             |
| 184          |               | Chak No 138 Abbasia | Chak No 138 Abbasia | 62           | 717           | 710           | 1427             |
| 185          |               | Chak No 139 Abbasia | Chak No 139 Abbasia | 293          | 1150          | 1135          | 2285             |
| 186          |               | Chak No 14 Abbasia  | Chak No 14 Abbasia  | 205          | 812           | 808           | 1620             |
| 187          |               | Chak No 142 Abbasia | Chak No 142 Abbasia | 183          | 550           | 548           | 1098             |
| 188          |               | Chak No 15 Abbasia  | Chak No 15 Abbasia  | 170          | 670           | 673           | 1343             |
| 189          |               | Chak No 16 Abbasia  | Chak No 16 Abbasia  | 294          | 1120          | 1114          | 2234             |
| 190          |               | Chak No 27 Abbasia  | Chak No 27 Abbasia  | 172          | 65            | 57            | 122              |
| 191          |               | Chak No 52 Abbasia  | Chak No 52 Abbasia  | 353          | 1210          | 1192          | 2402             |
| 192          |               | Chak No 54 Abbasia  | Chak No 54 Abbasia  | 121          | 510           | 494           | 1004             |
| 193          |               | Chak No 55 Abbasia  | Chak No 55 Abbasia  | 157          | 530           | 522           | 1052             |
| <b>Total</b> |               |                     |                     | <b>60059</b> | <b>222642</b> | <b>206014</b> | <b>428664</b>    |

## 6.6.2 Findings of Socio-Economic Survey

### A. Occupational Status

Due to the availability of fertile land in the tehsil, agriculture is the primary occupation in the project area, followed by labour as the second largest profession because of weak socio-economic conditions of the population. The occupational trend in the tehsil can be observed in figure below which presents percentages of the various occupations in the project area, based on interactions with project communities during field visits, consultations and limited surveys.

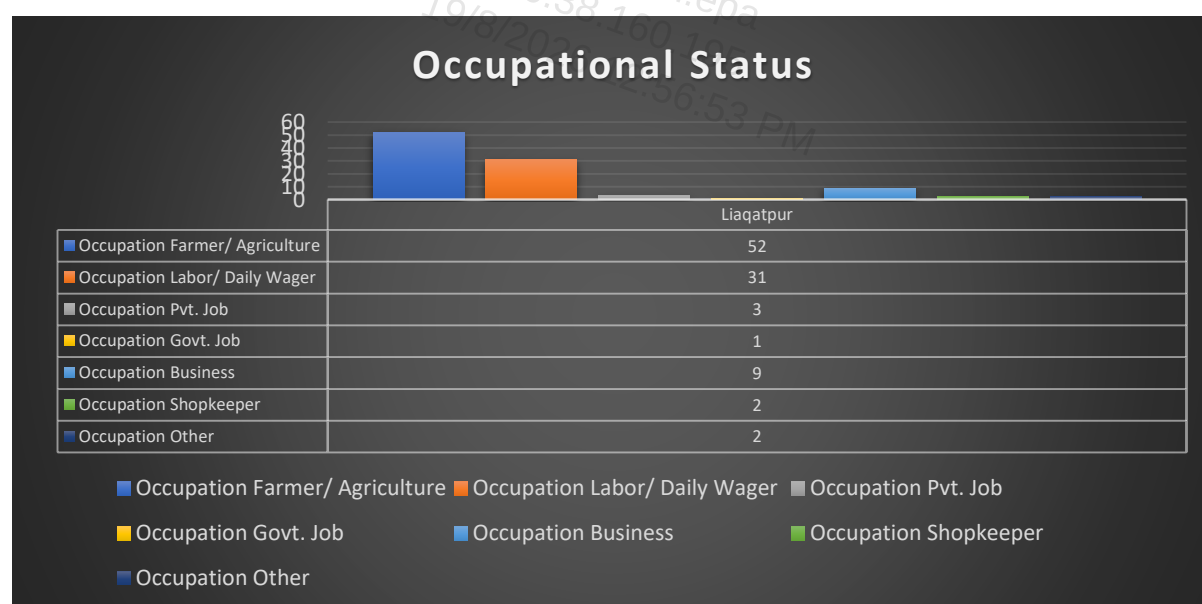


**Figure 6.3: Occupational Status of the Respondents**



## B. Religion

Islam is the dominant religion in Punjab where, according to the 2023 census, Muslims constitute 97.75% of the population. The minorities include Christians (1.93%), followed by Hindus (0.20%), and other minority groups (0.12%). Based on the primary data collected all respondents were Muslims.

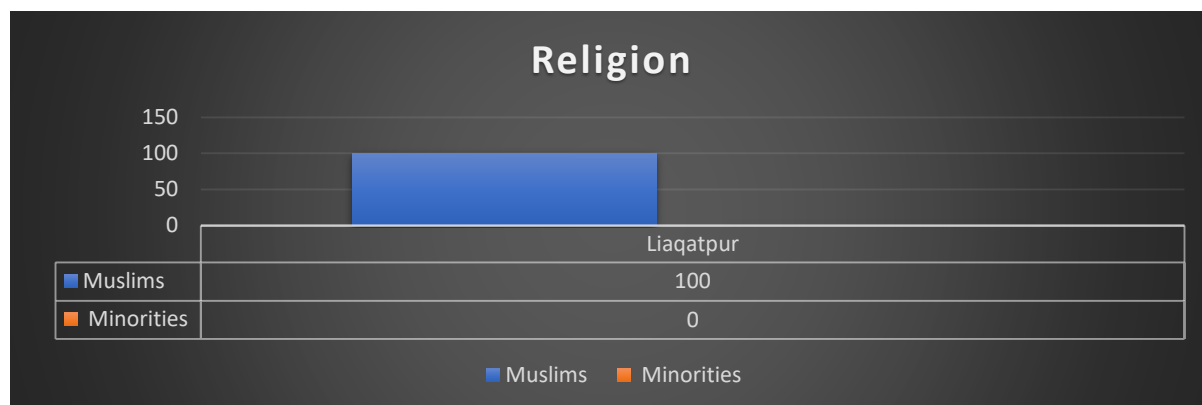


Figure 6.4: Religious Status of the Respondents

## C. Caste System

Several castes/clans have been reported in the project area., Rajput, Kanju, kumbhar, solangi, Jutt, Arain, Syed, and Awan are also found in the tehsil.

### Income Levels

The monthly income earned by individuals from various sources varies widely ranging from less than Rs. 20,000 to above Rs. 50,000. Majority of the population reported that their income barely covers the basis of household expenses.

In general, the agriculturists and landlords in the project area are well to do, with incomes exceeding Rs. 50,000 per month. Similarly, due to rich land fertility and high yields. A significant proportion also earns below 20,000 PKR due to poverty and limited livelihood opportunities. Percentage of the average monthly income of the respondents is shown in Figure 6.5.

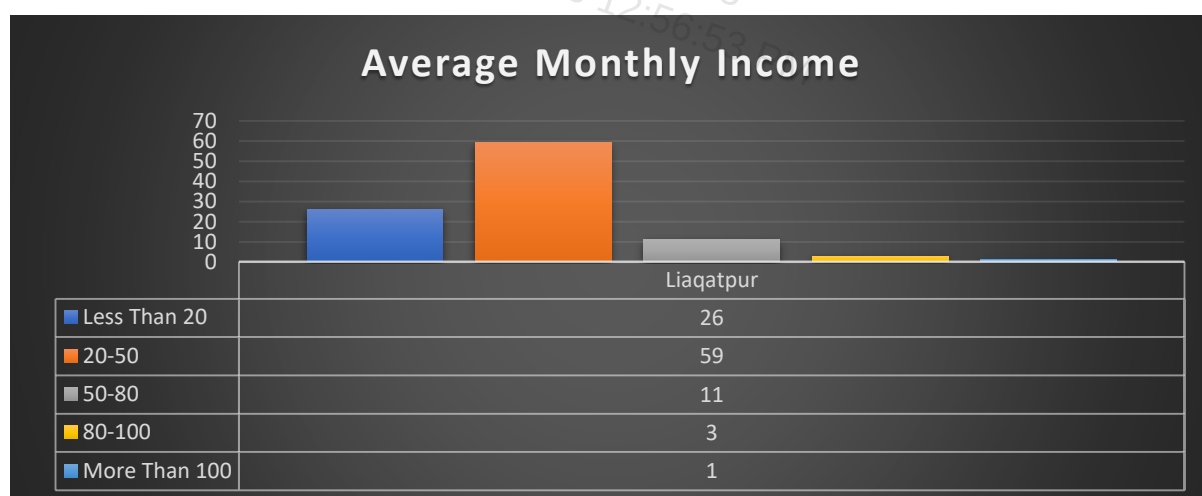


Figure 6.5: Monthly Income of the Respondents



#### D. Source of Drinking Water

The analysis shows that handpumps are the dominant source of drinking water across all villages. most residents rely on deep handpumps installed at depths of around 200 ft for drinking water, as shallow groundwater near ground level is brackish. Handpumps installed within houses in Liaquatpur, typically at depths of 25-40 ft, yield brackish water and are not suitable for drinking purposes. Therefore, the local community depends on deep handpumps located outside their houses to meet drinking water needs. Borehole-motor usage is comparatively lower but remains a significant secondary source, particularly in Liaquatpur. RO filter plants are negligible, and reflecting minimal reliance on treated water systems in the study area.

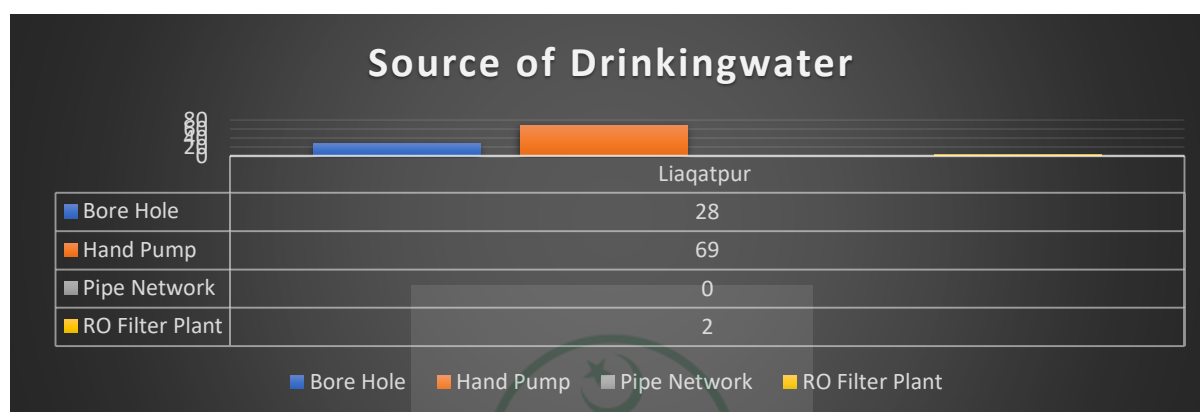


Figure 6.6: Source of Drinking Water

#### E. Satisfaction with Household Water Quality

The analysis indicates low satisfaction with household water quality across all villages, with a clear majority of respondents reporting dissatisfaction. Tehsil Liaquatpur shows, where 100% of households are not satisfied with water quality.

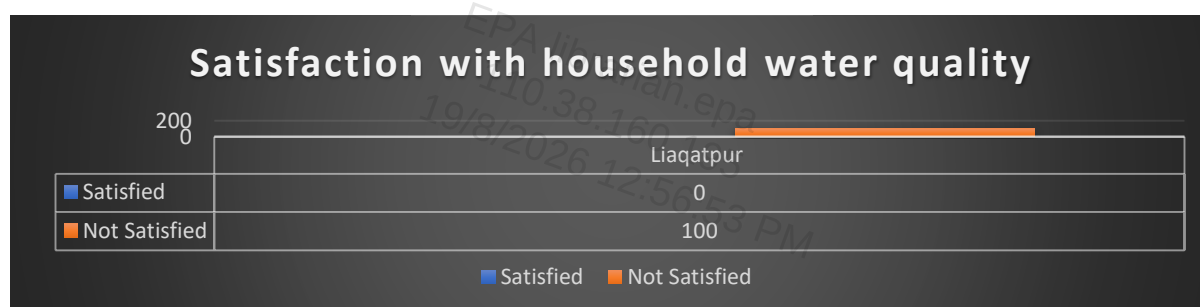


Figure 6.7: Satisfaction with household water quality

#### F. Type of Sewerage System

The analysis shows that open drains are the predominant sewerage system in most villages, indicating inadequate sanitation infrastructure. Septic tanks and kacha soakage pits are present in Liaquatpur. Villages where Drains were present their wastewater was ultimately discharge into open fields or nearby nullahs. Poorly designed and uncovered drains have resulted in sewage overflow and stagnation on streets, adversely affecting sanitation conditions.

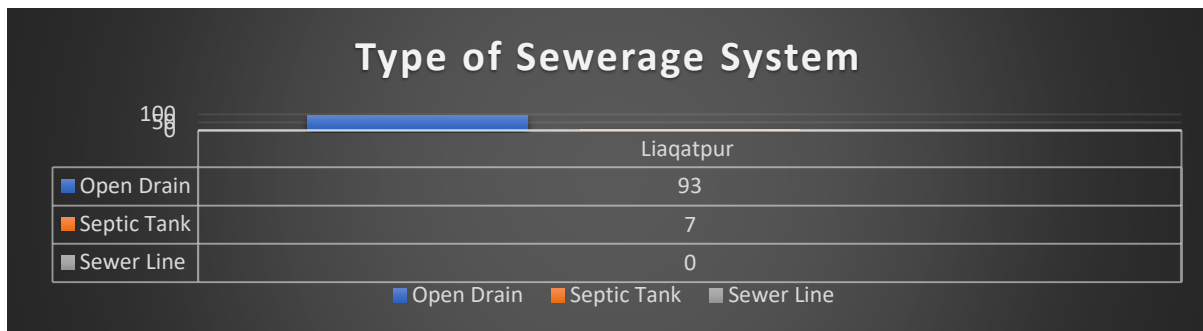


Figure 6.8: Type of Sewerage System

#### G. Type of sanitation Facility

The analysis indicates that toilet facilities are available to the majority of households in the villages of Liaquatpur tehsil. However, open defecation was also observed in the tehsil and reflecting gaps in sanitation access and behavior. Overall, the data highlight the need for improved sanitation facilities and awareness to achieve full coverage.

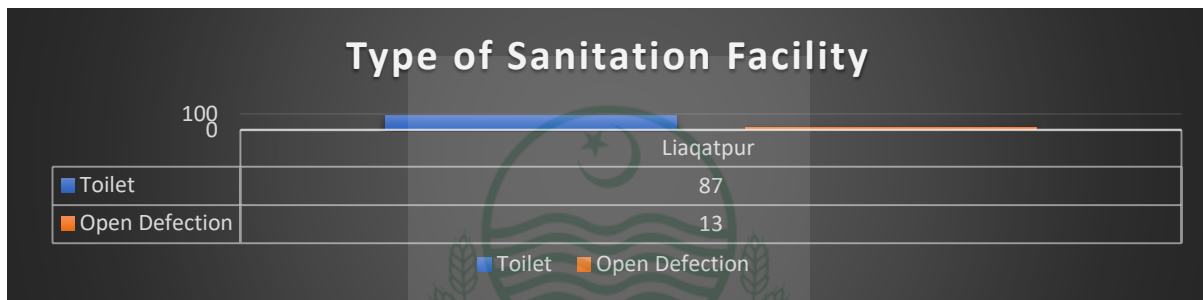


Figure 6.9: Type of Sanitation Facility

#### H. Solid Waste Facility

The analysis shows that solid waste management facilities are not fully available in Liaquatpur tehsil.

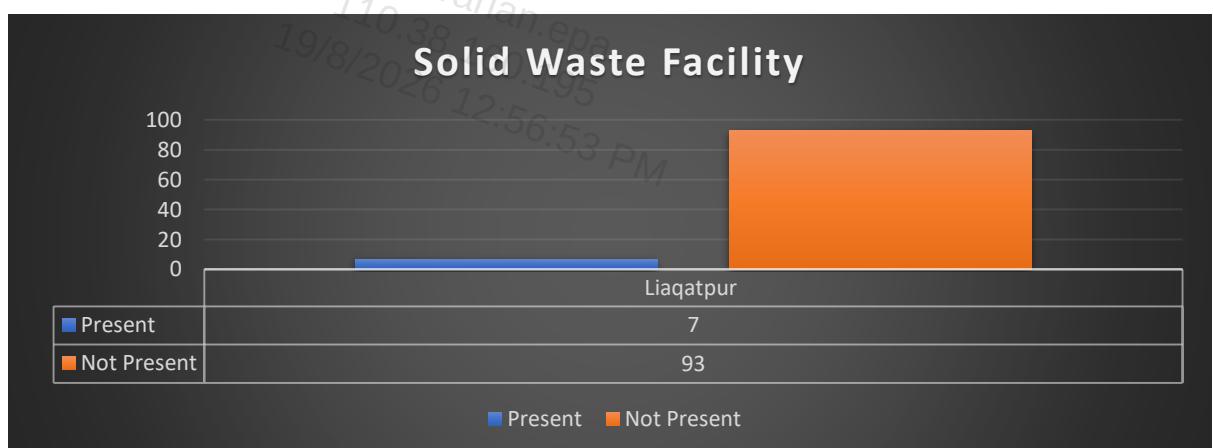


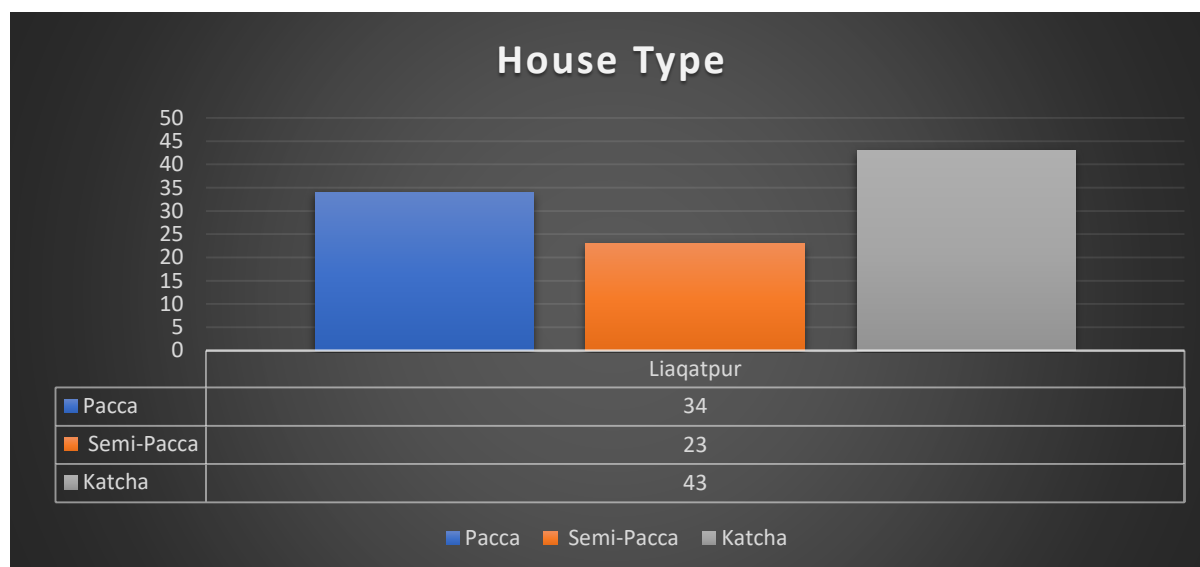
Figure 6.10: Type of Solid Waste Facility

#### I. Housing Construction Pattern

During field visits, it was observed that the proposed project areas lack basic amenities. However, the trend of *Semi-Pacca* houses has diminished and most people have built *pacca* houses with RCC roofs, stone walls with cement mortar, cement plastering & flooring.



Similarly, In Liaquatpur tehsil, a large portion of houses in the tehsil consists of kacha (mud – built) structures.



Note: Kacha = A structure constructed of mud.

Semi-Pacca = A structure constructed of a mixture of mud and bricks.

Pacca = A structure constructed of concrete and cement blocks/bricks.

**Figure 6.11: Type of Construction of House**

#### **J. Mode of Transport**

Public transport facilities are not sufficiently present in the south area and people use their personal motorbikes, cycles, and cars, etc. for traveling. However, people also use Chungchi Rickshaws. In case of emergencies, they call Rescue 1122 and get aid within minutes of time. The project activities are unlikely to impact the transportation modes. However, it will be ensured that access of Rescue 1122 vehicles is not hindered due to project activities.

#### **K. Communications**

The project area has telephone connections for internet services and mobile phone coverage is also available, allowing people to access to the internet through their mobile phones. The access roads to all the project sites are in good condition, although the situation of internal streets and roads is poor. The national and provincial highways are present in all tehsil of the project area.

#### **L. Health Conditions and Facilities**

The poor health conditions in the project area are one of the reasons for initiating the proposed project. The quality of potable water available throughout the project area is highly compromised, this has led to the prevalence of several waterborne disease and stunted growth in the project area. The most common diseases in these areas include typhoid, cholera, hepatitis, diarrhea, intestinal worms and skin allergies.

#### **M. Educational Facilities**

Primary, Middle and High schools are present in some of the proposed villages. The list of educational facilities located close to the proposed construction and excavation sites is provided as social sensitive receptors in Table 6.8.





#### **N. Basic Civic Amenities in the Project Area**

The proposed project area lacks basic civic amenities including water supply, sewerage system, stormwater drainage, solid waste management, gas supply. Telephone connections are available in the project area, but are limited in some areas. The only facility available in the proposed project area is electricity, which is also inadequate as people suffer long hours of load-shedding and low voltage issues.

#### **O. Mechanism of Conflict Resolution**

During the field survey, the project team conducted discussions with local communities to identify the types of disputes commonly prevailing in the project area. The survey revealed that disputes over land, water resources, and property inheritance are the most common causes of conflict. These disputes tend to escalate quickly and often result in violence, thereby causing loss of life, property damage, and displacement of communities. In some cases, the police and judicial system have been ineffective in resolving these conflicts, leading to a lack of trust in state institutions, especially in southern region of project area. In addition, inter-caste tensions, religious differences, and political affiliations may also contribute to the conflict, though no major fault-lines were observed along these.

At the community level in project area, conflict resolution is often handled through informal methods of mediation and negotiation. Local elders, community leaders, and religious figures play a significant role in resolving conflicts in proposed project villages. The traditional methods of dispute resolution include Jirgas (councils of elders) and Panchayats also called Kathis (village councils). These methods often involve face-to-face meetings, with both parties presenting their case and a neutral third party facilitating the resolution. In addition to these informal methods, legal systems such as the Punjab Local Government Act 2019 and the Alternative Dispute Resolution Act 2017 also provide a formal mechanism for resolving disputes. However, the use of formal systems is limited in project areas due to lack of accessibility, awareness and enforcement of aforementioned acts. Overall, conflict resolution at the community level in project area is a combination of traditional and modern approaches, with a focus on finding mutually agreeable solutions that maintain social harmony. The proposed GRM system of the project will also strengthen present conflict resolution systems (Village Councils, Jirgas, Panchayats etc.) of the project area. The proposed GRM system will not only improve but also make the Village Councils, Jirgas and Panchayats inclusive and will also sensitize the community about GRM.

#### **P. Presence of NGOs/ CBOs**

There are several INGOs, NGOs and CBOs present in the project area. According to stakeholder consultations and institutional stakeholder consultations, Punjab Rural Support Programme (PRSP) and National Rural Support Programme (NRSP) are working in Tehsil Liaquatpur. CBOs can play an important role in social mobilization, behavior change in target villages, and tariff collection and O&M of the schemes.

#### **6.6.3 Results of Gender Situation Survey**

- A gender situation analysis was conducted in selected villages/sub-villages across the tehsil through focus group discussions. The purpose of this qualitative survey was to identify women-related concerns, gender roles and responsibilities, education levels, occupational status, involvement in agriculture and livestock, access to health facilities,



willingness to pay, access to power and resources, prevalence of gender-based violence, and needs assessment.

- Traditional gender roles and responsibilities in rural Punjab South are almost identical, with women primarily responsible for domestic and caregiving tasks and men serving as the primary breadwinners. Although females are engaged in agricultural and subsistence farming operations and livestock-related activities, they encounter obstacles in controlling resources, accessing land, credit, and other resources, limiting their productivity and economic opportunities in rural settings.
- Waterborne diseases are a significant public health concern for females and children in the surveyed areas, according to focus group discussions.
- Women-headed households are not uncommon in the surveyed areas, especially in South where men migrate for work to other cities or abroad.
- The majority of female respondents in South, areas are not involved in decision-making processes, with their decisions limited to day-to-day household affairs. Males make major and decisive decisions.
- Although there were few reported violent incidents in South, respondents in other areas considered gender-based violence an act of boldness rather than a crime. The consultation found a lack of knowledge about sexual harassment (SH) and sexual exploitation and abuse (SEA) as crimes and how to report this while having social pressure to keep these incidents secret and treated as a matter of honor.





## SECTION -7 STAKEHOLDER CONSULTATION

### 7.1 General

This section describes the outcomes of the stakeholder consultation sessions held with different stakeholders that may be directly or indirectly affected by the proposed project. The consultation with community and institutional stakeholders during project planning, designing and implementation stages is a key to sustainable development. Likewise, participation of stakeholders is essential to meet the objectives of meaningful consultation for preparation of EIA.

### 7.2 Objectives and Principles of Consultation

The consultation process provided a forum where information relevant to the project was disseminated to the stakeholder. This participation enabled the integration of local and indigenous knowledge into the project design. This not only fosters goodwill and success in the project but also leads to a conflict- free project implementation.

The stakeholders including local community of 193 villages, government representatives, other regulators and the NGOs were met to appraise and discuss the environmental and social perspective of project activities. Their valuable concerns and suggestions were noted and thereafter incorporated in the Environmental Impact Assessment(EIA) report.

The objectives of the consultation process were to:

- Identify, Inform and involve all stakeholders and local residents including females, minorities and disables, in the consultative and participation process;
- Share information with stakeholders on the construction of the proposed project and expected impacts on the physical, biological and socio-economic environment;
- Understand stakeholders' concerns and perceptions regarding various aspects of the project, including the existing available facilities and the likely impacts of construction and operation related activities of proposed Project; and
- Provide an opportunity to the public to provide valuable suggestions in the project design in a positive manner.

### 7.3 Consultation and Participation Process

To ascertain the perceptions of different stakeholders about the project scope, its implementation, operation and evaluation, consultation meetings were conducted. The consultation process was carried out in accordance with the World Bank Guidelines on public consultation. A series of consultation sessions were carried out with stakeholders (Govt. departments, farmers, teachers, businessman, women etc.), in September 2025 to April 2026. Total 245 stakeholder consultation sessions were conducted details of sessions are presented in Annex-2.

The project team chose sites that are easily accessible and barrier-free to accommodate all persons. The consultative sessions/meetings are held mostly at Monasteries (Dera) with both men and women separately. The minutes of the meeting from the focus group discussions and community meetings have been noted down (listed in Table 7.1, Table 7.2 and Table 7.3) and can be shared with the participants (that chose to share their contact information) and the community. These consultative sessions were designed to exchange information, to discuss



the strengths, weaknesses, opportunities, and threats of an idea or project. The consultation meetings proved very useful in information sharing and consensus building.

#### 7.4 Identification of Stakeholders

Project stakeholders were engaged in the review and discussions on various project aspects, social and environmental issues at the early stage of impact assessments for feedback. There are two categories of stakeholders in the project:

##### Individual/Community Stakeholders

- Project beneficiaries for instance, Residents of the project area, Shopkeepers, Employees, Customers, Road Users, Vulnerable and Gender.

##### Institutional Stakeholders

- Board of Revenue and Tehsil and District Administration, Environmental Protection Agency Punjab (EPA), Agriculture Department, Forest Department, Livestock Department Punjab, Tehsil Headquarter Hospital THQ.

#### 7.5 Information Dissemination

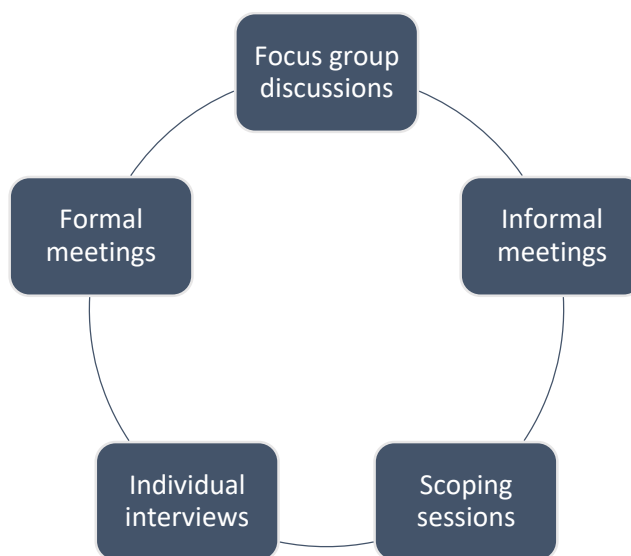
Following information was discussed and disclosed to the stakeholders during the consultation meetings:

- Introduction of the project;
- Description of various project components, their activities and impacts;
- Discuss social and environmental impacts;
- Needs, priorities and reactions of the affected people regarding the proposed projects' impacts; and
- Need of Grievance Redress Mechanism (GRM) in all villages to address the issues & concerns of stakeholders.

For information dissemination to community, culturally appropriate techniques and local language was used.

#### 7.6 Methods of Public Consultation

Public Consultations were carried out in order to establish stakeholder's opinions regarding project implementation. The following methods were used for public consultation and stakeholder's participation:



## 7.7 Approach Adopted for the Consultation

To hold the meetings, people were informed one day before the meeting to assemble in the villages. In addition, the Tehsil Office team contacted the council members and community representatives of each village and informed about the purpose of these consultation meetings. The representatives played a positive role in information dissemination to locals of villages. The meetings held in an encouraging environment where people expressed their concerns and views freely. Formal meetings and interviews were also conducted with female, vulnerable and disabled of the affected community, to explore their needs, problems and priorities related to project execution. In addition to the formal meetings, individual meetings/interviews were also held with the affected females to efficiently involve them in planning process.

## 7.8 Stakeholders Concerns towards the Project

Concerns raised by the participants, particularly with regard to environmental and social impacts of the project have been listed in following Tables which shows concern and responses as derived from scheme wise consultation meetings.

### 7.8.1 Concerns and Issues

Following Table 7.1 shows concerns and responses of public consultation meetings.

**Table 7.1: Findings of the Consultation Meetings**

| Sr. No | Concerns Raised                                                                                                | Locations            | Response                                                                                                                                                                                  |
|--------|----------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | The water is not drinkable and there are several waterborne diseases including intestinal issues               | All project villages | Provision of clean water is already part of our project, so waterborne diseases shall be reduced and there will be an improvement in public health.                                       |
| 2      | Will employment opportunities be generated for locals during the construction phase?                           | All project villages | It will be made sure that 75% of the workforce will be employed from the sub-project area.                                                                                                |
| 3      | Arrangements should be made to suppress dust, curtail high-noise activities, and control the vibrations caused | All project villages | Regular sprinkling of water will be carried out over the loose soil to suppress the dust, the noisy activities will not be planned at night and the community will be informed before the |



| Sr. No | Concerns Raised                                                                                                                                         | Locations            | Response                                                                                                                                                       |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | due to machinery, to protect the community's health                                                                                                     |                      | execution of any activity that would generate vibrations                                                                                                       |
| 4      | Privacy of people should be upheld during construction phase of the sub-project.                                                                        | All project villages | Contractor will provide trainings to workers regarding gender and privacy issues.                                                                              |
| 5      | Construction activities should be minimized during schools' opening and closing times.                                                                  | All project villages | Contractor will be bound to minimize construction activities during schools' opening and closing times.                                                        |
| 6      | Will there be any closure of roads during construction phase?                                                                                           | All project villages | In case of road closures, the nearby community will be informed beforehand and alternative routes will be provided.                                            |
| 7      | Solid waste production during construction time is a major concern and that should not be piled up in the project area.                                 | All project villages | The construction and other waste generated at the site shall be collected, stored and transported to the final disposal site by the contractor on daily basis. |
| 8      | Will there be any tree cutting?                                                                                                                         | All project villages | No trees will be cut during the execution of the project.                                                                                                      |
| 9      | The construction activities will cause inconvenience to local residents due to hindrance in routine activities                                          | All project villages | The contractor will ensure that construction work do not create disturbance for local people's access to the local route and their routine life activities.    |
| 10     | Will this project cover all households in the village?                                                                                                  | All project villages | Yes, all households located in the deh boundary in the selected villages will be covered.                                                                      |
| 11     | Who will bear the cost of operation and maintenance (O&M)?                                                                                              | All project villages | The community pay O&M in the form of water charges per month. Government or project may provide initial support.                                               |
| 12     | What about wastewater and drainage system?                                                                                                              | All project villages | Proper drainage and wastewater disposal points will be included where technically and socially feasible.                                                       |
| 13     | Will there be water meters or fixed charges?                                                                                                            | All project villages | There will be fixed water charges. The Client may re-consider it whether meter or fixed charges.                                                               |
| 14     | What if the water supply stops or gets damaged?                                                                                                         | All project villages | The complaint can be registered in the office.                                                                                                                 |
| 15     | Local people claims that the construction of the project will lead to noise pollutions and social disturbances during construction of the water supply. | All project villages | Regular maintenance of construction machinery to prevent excessive noise. Provide early and continuous information disclosure.                                 |

## 7.9 Consultations with Female Community Members

Following Table 7.2 shows concerns and responses of gender consultation meetings.

**Table 7.2: Findings of the Female Consultation Meetings**

| Sr. No | Community Consultation with Women                                                                                   | Locations            | Response                                                                                                                                     |
|--------|---------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Most of the women have to go out to the watercourses for washing clothes.                                           | All project villages | This issue will be resolved by executing this project after the provision of water at the doorsteps.                                         |
| 2      | Many females raised their concerns about the health issues due to poor water supply system. Usage of hand pumps and | All project villages | Waterborne disease will be reduced and there will be an improvement in public health with the provision of clean and healthy drinking water. |





| Sr. No | Community Consultation with Women                                                                                                                                                                                                                                 | Locations            | Response                                                                                                                                                                                                          |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | boreholes water, may cause many diseases like kidney, hepatitis, liver problems and diarrhea.                                                                                                                                                                     |                      |                                                                                                                                                                                                                   |
| 3      | Inadequate sanitation facilities and the need to travel long distances to collect water exposes women and girls to different kind of harassment.                                                                                                                  | All project villages | To a significant extent, the issues of different kind of harassment will be mitigated through the implementation of the project, which seeks to facilitate doorstep access to clean water sources.                |
| 4      | Constrained accessibility to clean water and sanitation facilities imposes impediments in the effective management of hygiene during pregnancy and childbirth. Additionally, it affects the ability to care for newborns, thereby contributing to child stunting. | All project villages | The project will ensure the provision of improved WASH conditions to address these concerns for improved women's and their children's health as reduction in child stunting is the core objective of the project. |
| 5      | Fetching water is the responsibility of women and they daily cover the passage of 3-4 kilometers to fulfill this duty.                                                                                                                                            | All project villages | The infrastructure of the said project will make clean water more accessible and reduce the time and effort required for water collection.                                                                        |
| 6      | The burden of fetching water negatively impacts on women's health, as well as limit their ability to pursue education, employment, and other opportunities.                                                                                                       | All project villages | The implementation of the PRSWSSP project will reduce the burden of women, improve the quality of life and free up time for other pursuits, including education and income-generating activities.                 |
| 7      | Increase in water borne disease due to poor sanitation or unsafe water sources.                                                                                                                                                                                   | All project villages | The project aims to mitigate this by providing safe and treated drinking water to the community.                                                                                                                  |

#### 7.10 Consultation with Institutional Stakeholders

Table 7.3 shows the concerns of institutional stakeholders.

**Table 7.3: Concerns of Relevant Government Departments**

| Sr. No. | Department                                  | Coverage      | Points of Discussion / Apprehensions                                                                                                                                                                                                                                                                                                                                                                                                         | Response                                                                                                                                                     |
|---------|---------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | <b>Environmental Protection Department.</b> | Rahimyar Khan | <p>The project team described the project location and proposed activities to District Environmental Officer and inquired about their apprehensions/ suggestions regarding the project;</p> <ul style="list-style-type: none"> <li>In conducting EIA, Scoping sessions, and Individual interviews should be conducted with all stakeholders.</li> <li>Social issues regarding private land acquisition, were discussed in detail.</li> </ul> | All the suggestions shall be incorporated. Institutional consultations are already underway and efforts shall be made to take all the stakeholders on board. |



| Sr. No. | Department                    | Coverage       | Points of Discussion / Apprehensions                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Response                                                                                                                                                                                                                                          |
|---------|-------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                               |                | <ul style="list-style-type: none"> <li>Baseline should be developed separately according to the baseline conditions.</li> <li><b>Public Hearings must be done so that stakeholders who have different types of stakes along with their apprehensions can be listed down easily.</b></li> </ul>                                                                                                                                                                                                       |                                                                                                                                                                                                                                                   |
| 2.      | <b>Board of Revenue</b>       | Punjab         | <p>The Project team described the project location and proposed activities and also briefed them about the requirement of state land for the construction of infrastructure in the project villages.</p> <p>Moreover, consultation meetings were also conducted with Tehsil and District Administrations of almost all the areas of the project.</p>                                                                                                                                                 | The Board of Revenue and the respective Tehsil and District officials promised their full cooperation.                                                                                                                                            |
| 3.      | <b>Municipal Committee</b>    | Project Tehsil | <p>The Project team described the project location and proposed activities Tehsil Manager and Assistant Manager and inquired about their apprehensions/ suggestions regarding the project;</p> <ul style="list-style-type: none"> <li>Discussion on field planning and effective approach to adequately cover all the field aspects and collect requisite data.</li> </ul> <p>The possible constraints in data acquisition were discussed and an effective way out was decided.</p>                  | Discussed the scope and main features of the project.                                                                                                                                                                                             |
| 4.      | <b>Tehsil Headquarter</b>     | Project Tehsil | <p>The project team described the project location and proposed activities to MS Hospital and inquired about their apprehensions/ suggestions regarding the project;</p> <ul style="list-style-type: none"> <li>Show some serious concern regarding waterborne diseases.</li> <li>Every third person in Tehsil Bhawana suffers from Hepatitis.</li> </ul> <p>Due to the lack of infrastructure and transportation facilities in villages, it becomes difficult for the patient to reach the THQ.</p> | The objective of the proposed project is to provide clean drinking water to all the residents of the selected villages at their doorsteps through a piped network. Waterborne diseases will be resolved after the implementation of this project. |
| 5.      | <b>Agriculture Department</b> | Rahimyar Khan  | <p>The Project team described the project location and proposed activities Field officer inquired about their apprehensions/ suggestions regarding the project;</p> <ul style="list-style-type: none"> <li>Field officer talked about the major crops Wheat and cotton cultivated in the project area.</li> </ul>                                                                                                                                                                                    | PRMSC will ensure that wastewater will be used for irrigation (if needed) after adequate treatment.                                                                                                                                               |



| Sr. No. | Department                                  | Coverage                                  | Points of Discussion / Apprehensions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Response                                                                                                                                                                                                                                                                              |
|---------|---------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                             |                                           | <ul style="list-style-type: none"> <li>The wastewater should not be used for agriculture purposes without treatment</li> <li>Treated water is used for irrigation purposes</li> </ul> <p>Only individual-level solar tube well is present</p>                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                       |
| 6.      | <b>Irrigation Department</b>                | Tehsil Liaqatpur & District Rahimyar Khan | <p>The sub-project details were shared with the representatives of the Irrigation department to obtain land for project activities. The Project team described the project location and proposed activities to Executive Engineer and inquired about their apprehensions/ suggestions regarding the project;</p> <ul style="list-style-type: none"> <li>The wastewater should not be used for agriculture purposes without treatment</li> <li>Treated water is used for irrigation purposes</li> </ul> <p>Treated waste should not be disposed of in canals.</p> | PRMSC will ensure that wastewater will be used for irrigation (if needed) after adequate treatment. No wastewater is going to be disposed of in any canal/ nearby water body.                                                                                                         |
| 7.      | <b>Public Health Engineering Department</b> | Tehsil Liaqatpur & District Rahimyar Khan | The Consultant team described the project location and objectives, as PHED is also working in the same domain it was requested to share their work plan for the relevant tehsil with PRMSC to avoid duplication of services or infrastructure. Moreover, PHED shares the lesson learned to improve service delivery.                                                                                                                                                                                                                                             | Lessons learned will be considered in the project planning and designing phase to improve service delivery.                                                                                                                                                                           |
| 8.      | <b>Livestock Department</b>                 | Tehsil Liaqatpur                          | The project team described the project location and proposed activities Deputy Director Livestock inquired about their apprehensions/ suggestions regarding the project; Waterborne disease and viral disease in animals were discussed                                                                                                                                                                                                                                                                                                                          | The proposed project will provide clean drinking water to all the residents of the selected villages and the provision of water for portable use include water for the animal's activities. Waterborne diseases in animals will be resolved after the implementation of this project. |
| 9.      | <b>Fisheries Department</b>                 | Punjab                                    | The project team described the project location and proposed activities Field officer inquired about their apprehensions/ suggestions regarding the project: Deputy Director District Office tells about the breed of fish in that area.                                                                                                                                                                                                                                                                                                                         | No wastewater is going to be disposed of in any nearby water body. So, no aquatic life is going to be affected by this project.                                                                                                                                                       |



| Sr. No. | Department           | Coverage                                  | Points of Discussion / Apprehensions                                                                                                                   | Response                                                                                            |
|---------|----------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 10.     | Department of Forest | Tehsil Liaqatpur & District Rahimyar Khan | The project team described the project location and proposed activities DFO and inquired about their apprehensions/ suggestions regarding the project. | There is no forest in the project boundary or near the project boundary that is going to be affect. |

#### 7.11 Consultation with NGO

There are several INGOs, NGOs and CBOs present in the project area. According to stakeholder consultations and institutional stakeholder consultations, Punjab Rural Support Programme (PRSP) and National Rural Support Programme (NRSP) are working in Tehsil Liaqatpur. The scope of both NGOs is WASH, which is also within the mandate of PRMSC. Moreover, UNICEF, WaterAid Pakistan, JICA, Save the Children, WHO, International Rescue Committee (IRC), UNOPS, Muslimaid, Qatar Charity, Plan International have also been reported to be working in Tehsil Liaqatpur.

#### 7.12 Pressing Needs of the Consulted Villages Suggested by Local People

Local people were consulted to determine the most pressing needs in the project area as perceived by them. The most important needs identified were the provision of water supply and sewerage systems, as well as schools, hospitals/dispensaries, and vocational training institutes for construction work. Due to restricted mobility, locals suggested that a friendly grievance mechanism be developed in all villages to address their concerns during the construction period. Additionally, they recommended that guidance and support be provided to local people for registration of complaints in proposed grievance mechanism.

#### 7.13 Disclosure of EIA

Public disclosure enables affected groups and interested parties to understand likely implications of the project and to provide input into project design. It promotes dialogue among stakeholders i.e. government, community, NGOs and implementing agencies. As per OP 4.01, the environmental and social aspects must be discussed with the stakeholders.

The objectives of public disclosure are to aid meaningful public consultation and to ensure transparency of World Bank operations to its stakeholders and constituents.

The safeguard documents will be disclosed on the website of PRMSC and on the World Bank external website.

Presentations containing project information and relevant aspects of public interest will be delivered to the public. Furthermore, project brochures, handouts of presentations, and executive summaries of EIA in Urdu and English languages will also be distributed to the public.

After the approval, Copies of the EIA shall be made available to communities and interested parties in accessible locations through local government authorities, (e.g., Village councils, district offices etc.)



## **SECTION -8 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

### **8.1 General**

This section identifies the beneficial as well as the potentially significant adverse environmental and social impacts of the proposed project activities during design/ pre-construction, construction and operational phases of the proposed project on the physical, ecological and socio-economic domains of the environment. The appropriate mitigation and remedial measures are proposed in this section. A brief description of each aspect and the affected environment in the project area are presented below.

### **8.2 Scoping of Impacts**

Potential environmental and social impacts from the proposed Project on key environmental and socio-economic features were identified through the following actions:

- Demarcation of the Area of Influence (Aol);
- Desk study of engineering investigations, studies and designs;
- Environmental monitoring of air, noise, surface water, wastewater and groundwater;
- Detailed review and analysis of primary and secondary data available for all environmental parameters in Project area such as physical, ecological and social resources;
- Socio-Economic survey to assess the extent of land acquisition, occupation, income and poverty levels of the affected households;
- Consultations with executing and implementing agencies, local government, affected community, and traditional and religious leaders of the community;
- Stakeholder consultations with relevant departments, government agencies, NGOs and locals; and
- Knowledge assimilation of international best practices on environmental assessment of infrastructure projects.

### **8.3 Methodology**

Selection of an appropriate and customized methodology for the impact assessment is critical for the EIA study. The impacts have been assessed based on the proposed project life cycle i.e., in Pre-Construction, Construction and Operational and Maintenance (O&M) stages. For the identification of the potentially significant and non-significant environmental and social impacts, different tools were utilized as detailed below:

#### **8.3.1 Screening Checklist**

Based on the findings of desk studies and processed satellite imageries, screening checklists were prepared to screen out the potentially significant adverse environmental and social impacts during pre-construction, construction and operational phase of the proposed project. The objective of the impact screening is to assess the significance of the issues related to the atmosphere, climate, water resources, land resources, ecological environment, socio-economic environment, transport, infrastructure and communication, natural risks, hazards





and external constraints of the Project for the proposed development. After the compilation of baseline information and processing of acquired satellite imagery, the screening checklist was filled to screen out the adverse impact of the proposed Project during the pre-construction, construction and operational phases.

### 8.3.2 Notion of Significance

Taking into account these criteria, potential significance was classified as either:

**Low:** an impact for which no mitigation is necessary;

**Medium/moderate:** an impact that requires effective mitigation; and

**High:** an impact, which, if not mitigated, could stop the Project from proceeding.

**Reversible/Irreversible:** Changes considered irreversible, for example, the loss of biodiversity due to a change in water quality;

The potentially significant impacts were then further investigated in more detail to make a comprehensive assessment of the actual impacts.

### 8.3.3 Study Area/ Area of Influence

Refer Section 6: Description of the Environment, **Section 6.2.**

## 8.4 Environmental & Social Considerations (E&S) in Project Design

Environmental and social (E&S) aspects have been given due considerations in the project design to make the project sustainable, environmentally friendly and socially acceptable. E&S considerations in project design are summarized below:

- The depth of sewer lines has been kept low in waterlogged villages of Liaquatpur; to avoid groundwater contamination of shallow aquifer. Same practices will be applicable for similar conditions.
- Sewers shall be laid at least 1m away from water supply lines (except for few streets in each village, where the street width is less than 2 meters).
- In all cases, the sewer lines shall be laid below water pipeline (the difference between top of the sewer and bottom of water pipeline shall be at least 300 mm);
- Designed manhole covers to withstand anticipated loads & ensure that the covers can be readily replaced if broken to minimize silt/ garbage entry;
- Ensured sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to ensure self-cleansing velocity in order to prevent built up of solids and hydrogen sulfide generation;
- All structural, layout and engineering designing are in strict accordance with the applicable codes and engineering standard;
- The location of overhead water tanks, pumping station and STP have been finalized in close consultation with local community and representatives of local authorities;
- Tree cutting has been avoided;
- Efficient seepage control measures have been considered in selection of pipe materials during the planning stage;





- Effluent generated during construction phase will be treated through septic tanks.
- Alignments of sewerage and water supply lines have been carefully selected to minimize disturbance to public utilities;
- Relocation of the public utilities, if any, shall be planned and approved in consultation with relevant departments/authorities/stakeholders before project commencement to avoid inconvenience to the public;

### **8.5 Anticipated Impacts during Pre-Construction/Design Phase**

Impacts envisaged during Pre-construction/ Design Phase and the recommended mitigation measures are given below:

#### **8.5.1 Layout Planning & Design**

##### **Potential Impact**

Incompatible layout plans and engineering designs of the proposed project can undermine the overall aesthetics and ambience of the project area. Mis-utilization of the available spaces may result in a design with low social acceptability and functionality. This impact will be permanent and moderately adverse.

##### **Mitigation Measures**

- All structural, layout and engineering designs of the project are in strict accordance with the applicable national and international guidelines/ codes/ standards and engineering practices;
- The layouts of water supply and sewerage networks have been adjusted to cover the whole project area. The water supply system is a loop-based system and the sewerage system is based on gravity where the slopes have been provided to ensure gravity flow with adequate velocity.

#### **8.5.2 Soil Instability**

The sandy soil conditions in the project area may create challenges for laying water supply and sewer lines/drains. Trenches in sandy ground are prone to collapse, increasing excavation risks and construction difficulties. Higher infiltration rates in sandy areas may also lead to leakage and contamination concerns if pipes are not properly sealed. Stability of manholes and other structures could be compromised due to weak soil bearing capacity. These conditions may result in increased construction costs, time delays, and the need for additional stabilization measures.

##### **Mitigation Measures**

- Use proper shoring and trench support systems to prevent collapse in sandy soils.
- Seal pipes and joints with high-quality materials to control leakage and infiltration.
- Provide adequate bedding and foundation treatment for manholes and structures.
- Ensure regular site supervision for safe practices and timely corrective measures.



### 8.5.3 Impacts of Drains construction

Inadequate sizing or gradients may lead to poor flow, blockages, or flooding during peak conditions. Improper alignment can cause conflict with existing utilities and affect land use. Selection of unsuitable materials or inadequate lining may result in erosion, siltation, or structural failure. Therefore, proper hydraulic design, durable materials, and integration with the overall sewerage system are critical for long-term performance.

Drain slab structures are vulnerable to damage when subjected to vehicular movement, especially from loads exceeding their design capacity. Continuous stress from unsuitable vehicles leads to cracks, structural deterioration, and eventual failure of the slabs. This not only disrupts drainage flow but also creates safety hazards in the project area.

#### Mitigation Measures

- Plan proper alignment and depth to avoid conflicts with existing utilities and infrastructure.
- Ensure accurate hydraulic design with proper gradients to maintain self-cleansing velocity and avoid blockages.
- Provide adequate cross-sections and freeboard to handle peak stormwater flows safely.
- Incorporate silt traps and access points for ease of maintenance and prevention of clogging and
- Use reinforced, traffic-rated slabs designed for expected vehicle loads, and restrict heavy vehicle movement over drains. Regular inspection and timely maintenance should also be ensured to prevent structural failure.

### 8.5.4 Environmentally Responsive Design Considerations

#### Potential Impact

Designing the project components without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality. Improper-designed sewers may not carry the waste load, leading to system-failure and financial losses. The alignment of sewer lines and locations of sewerage pumping station and STP must be properly planned, or else it may lead to both technical and social problems along with environmental issues of backflow creating foul smell and unhygienic conditions.

There are chances of infiltration from sewers which may contaminate the soil and underground water resources. The seepage may also affect the water supply lines and contaminate the potable water.

The construction of high-rise overhead water tanks may cause visual obstruction. The surrounding community may face privacy issues and it may also cause blockage of direct sunlight.

#### Mitigation Measures

- All sewer lines including trunk, lateral and branch sewer lines have been designed considering the future population and waste generation rate;
- Limit the sewer depth where possible;



- Sewers will be laid 1m away from water supply lines if the width of the street will be sufficient to do so.
- In all cases, the sewer lines shall be laid below water pipeline (the difference between top of the sewer and bottom of water pipeline shall be at least 300 mm);
- Designed manhole covers to withstand anticipated loads & ensure that the covers can be readily replaced if broken to minimize silt/ garbage entry;
- Ensured sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to ensure self-cleansing velocity in order prevent to built-up of solids.
- The location of overhead water tanks, pumping stations and STP have been finalized in close consultation with local community and representatives of local authorities.

### 8.5.5 Groundwater

#### Potential Impact

Groundwater contamination may occur during construction by the improper handling of construction material (fuel, lubricant, bitumen, asphalt etc.) or sanitary water from construction camps and domestic sewage. During operation probability of seepage through the sewers may also contaminate groundwater. This impact is permanent and moderate negative in nature.

#### Mitigation Measures

- Construction materials that may lead to groundwater contamination will be properly handled and stored.
- Procedure for efficient jointing of selected sewer pipes will be applied to avoid leakage from pipes;
- Alternate sewage disposal arrangements have been suggested in design to cater the sewage flow, generated from the project area, during construction phase.

### 8.5.6 Surface Water

#### Potential Impact

There is no existing piped sewerage network or pumping station in the village. There is one large sewage pond in the villages where sewage is disposed by unplanned drains. Thus, endangering the environment of the vicinity. The openly flooded sewage causes nuisance in terms of foul smell and serves as breeding ground for disease causing vectors. Some sewage is also used to irrigate nearby crops.

There will be net environmental improvement in terms of sewage collection thus reducing sewage ponding in the project area and enabling adequate treatment of wastewater.

#### Mitigation Measures

- The sewage will be collected through a piped network;
- An STP based on ABR technology will be established to treat the sewage;
- The treated effluent as per PEQS will be discharged into the existing watercourses i.e nullahs, for agricultural purposes.



### 8.5.7 Seismic & Other Hazard

#### Potential Impact

According to the seismic zoning map of Pakistan, the project area of Liaquatpur located in Seismic Zone 2A. The tehsil lies within a low to moderate seismic zone, flooding represents the more significant natural hazard in recent years. Flooding is mainly driven by monsoon rainfall, canal overtopping or breaches, inadequate surface drainage, and backflow from irrigation systems rather than riverine sources. Approximately 20-25% of the tehsil is classified as high flood hazard, 35-40% as moderate risk, and the remaining 35-45% as low flood hazard. Vulnerability is highest in low-lying chaks near canals and drains, where prolonged waterlogging causes damage to housing, agriculture, and access infrastructure.

In view of the associated flood risk, all proposed structural facilities have been designed with appropriate flood-resilience measures. These measures include elevating the structures approximately 3–4 feet above the existing ground level to reduce the risk of floodwater ingress and associated damage. The raised design is intended to enhance the safety, functionality, and long-term resilience of the infrastructure during seasonal flooding events.

This factor requires special consideration of the designers as project structures (especially overhead water tanks and STP) may be affected negatively in case of earthquake tremors and the significance of damage depends upon the severity of earthquake.

#### Mitigation Measures

- The components of the proposed project include laying of underground water supply network, sewer lines, construction of overhead water tanks, pumping station and STP have been designed to withstand moderate earthquakes; and
- To mitigate the seismic hazard, Seismic Building Code of Pakistan 2007 (SBC-07) has been adopted. This code specifies minimum requirements for seismic safety of buildings/ structures and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural, geotechnical and earthquake engineering.
- Avoid siting critical infrastructure in flood-prone villages where feasible;
- Raise plinth levels of buildings above known flood levels;
- Strengthen canal embankments and improve desilting of drains;
- Introduce flood-resilient sanitation designs (sealed latrines, raised platforms);
- Establish community-based flood early warning and evacuation plans.
- Improve surface drainage networks and regular maintenance of existing drains;
- Ensure proper solid waste management to prevent blockage of drainage paths;
- Promote flood-resilient housing improvements and water source protection measures.

### 8.5.8 Damage to Existing Infrastructure

#### Potential Impact

The proposed project interventions are mostly subsurface activities and are likely to affect the existing infrastructure. Public utilities such as electric poles might get affected during



construction activities and movement of machinery and the community will face temporary electricity cuts. Furthermore, the roads will be cut for laying of water and sewerage pipes and will create accessibility issues.

#### **Mitigation Measures**

- Alignment of water supply and sewerage network carefully selected to minimize disturbance to public utilities;
- Relocation of the public utilities shall be planned and approved in consultation with relevant departments/authorities/stakeholders before project commencement if any, to avoid inconvenience to the public;
- The local community will be informed before the relocation of services (if any) and schedule of relocation services will be prepared after consultation with the community to minimize inconvenience to the public;

#### **8.5.9 Physical Cultural Resources**

##### **Potential Impact**

No historical/ archeological site is present in the project area. However, some cultural resources including mosques, graveyard and shrines are present. People visit the mosques five times a day. Shrines and graveyard are visited occasionally by the surrounding community and devotees. These will not be directly affected but the people may face access issues in visiting these facilities.

##### **Mitigation Measures**

- The alternative access routes will be provided in case the access has to be restricted during execution period; and
- There must not be any physical impact on the physical and cultural resources in the project area.
- The possible discovery of archaeological sites or random findings during the excavation and earthworks may occur. In such case, World Bank's OP 4.11 will be triggered. Furthermore, Chance Find Procedures will also be implemented.

#### **8.5.10 Fire Fighting System**

##### **Potential Impact**

Absence of a firefighting system may cause severe damage to the camp site and surrounding crops and houses during construction phase.

##### **Mitigation Measures**

- Contractor will provide an efficient firefighting system (i.e fire alarm and fire extinguishers) for campsite, workshop and construction site; and
- Campsite will be established in an area with easy access to the water source, helpful in firefighting in case of any incident.



### 8.5.11 Land Acquisition

The main focus of the project is to install sewers and water supply lines, which requires the use of existing streets and roads for right-of-way (ROW). If private streets or roads are encountered, the project team consults landowners prior to commencing any construction activities to gain permission for the use of their land. Moreover, land is also required for the construction of water supply infrastructure: stand-post, tube well, and OHR; wastewater treatment plant; and solid waste collection points. State land has been the priority for the project activities, a total of 2190.24 marla private land through voluntary land donation (VLD) is being used.

Priority has been given to the state land that is free of encumbrances i.e. free from any legal/illegal claims of any squatters, illegal occupants, etc. Therefore, the implementation of RAP/ARAP is not required in the villages.

#### Mitigation Measures

- Primarily, state land was used for the project infrastructure activities, however, private land through Voluntary Land Donation (VLD) is also being used in case of unavailability of state land.
- Additionally, in order to minimize the potential negative socio-economic impacts of land acquisition, minimum parcel of land has been proposed to meet the needs of the proposed project in case of private land; unlike in the cases of state land where – considering the future needs of the project expansion – sufficient parcel of state land has been acquired/ proposed.
- In case there is no state land or private land through VLD is available, PRMSC will consider the option of land acquisition, after developing and implementing a Resettlement Action Plan (RAP) approved by the World Bank. Compensation will be paid in accordance with the resettlement framework outlined in the Environmental and Social Management Framework (ESMF).
- Furthermore, the approval / NoL for each VLD case will be sought exclusively from the World Bank.
- A VLD checklist form has also been developed to assess the potential negative socio-economic and livelihood impacts of private land acquisition.
- Besides the VLD checklist, VLD tracking sheet has also been developed which will be continuously updated, the same will be available for monitoring of VLD status.
- Without any transparent consent land will not be used through VLD;
- In case of private donors, only less than 10% of their land could be obtained;
- 100% compliance will be ensured of VLD procedure given in EIA;
- VLD process will be executed by the PRMSC itself, and will not be devolved to any private parties (consultants or contractors).
- Before start of construction activities, it will be ensured that the land (private or public) is free from any form of encumbrances or where there are informal users, they are appropriately provided relocation assistance - in accordance with OP 4.12 – Involuntary Resettlement - before taking possession of land.





## 8.6 Anticipated Impacts during Construction Phase

Anticipated Impacts during Construction Phase and the recommended mitigation measures are given below:

### 8.6.1 Topography

#### Potential Impact

The construction activities are not expected to impact the topography of the area significantly except for those areas where physical activities i.e., earthwork is involved as well as stocking of material. The excavated material is to be mostly backfilled and the excessive material will be transported to strengthen the roadsides or will be dumped at the designated locations. This impact is site-specific, temporary, reversible, possible, and low significant.

#### Mitigation Measures

- Material stockpiles will be removed as soon as work is completed and the area will be reinstated;
- Temporary storage sites will be allocated for the storage of excavated material;
- Temporary storage sites will be lined and must not allow infiltration;
- The stockpiles must be covered with tarpaulin sheets or other adequate material;
- Piling of material at large extent will not be allowed and the contractor will timely remove excavated material from the site.

### 8.6.2 Soil Erosion

#### Potential Impact

The soil would be exposed to erosion due to excavations for laying of sewers and water supply pipes. Construction activities such as clearing, excavation, filling, grading and setting up construction camps will affect the existing soil condition in the study area/ Aol. The clearing of vegetation can also loosen the soil and make it more susceptible to erosion due to wind and rain. There is also a possibility of silt runoff during rainy season causing soil erosion. This impact can be categorized as low adverse, site-specific, long-term, highly probable and reversible.

#### Mitigation Measures

- Good engineering practices such as proper compaction of backfill material and special slope protection measures will be adopted during the construction stage.
- Use of heavy machinery will be restricted as far as possible to avoid the destruction of soil structure;
- Confining excavations to the specified spots as per the approved engineering drawings and unnecessary excavations should be avoided;
- Stored excavated material shall be covered and preferably reused, e.g., in construction as backfill etc.
- Cutting of trees will be avoided to the best possibility to avoid soil erosion.



### 8.6.3 Soil Contamination

#### Potential Impact

Contamination of soil may be caused by oil and chemical spills from construction machinery or uncontrolled runoff from equipment washing yards. This impact is permanent and minor negative in nature.

#### Mitigation Measures

- Chemicals/ hazardous products and wastes will be stored on impermeable surfaces in secure, covered areas with clear labelling of containers and with a tray or bund to contain leaks;
- All construction wastes from the site will be regularly collected and transported to approved waste disposal sites;
- Awareness of emergency spill response procedures will be provided to the workers on-site;

### 8.6.4 Trench Failure

#### Potential Impact

The major construction activities involve excavation operations for laying water supply and sewerage lines. The major hazard associated with the excavation operations is trench failure. The unstable slopes may fail and settle in the trenches which may cause injuries and fatalities to the workers. This impact is probable, site specific and high adverse in nature.

#### Mitigation Measures

- Careful selection of the site for excavation in light of soil investigation is inevitable
- Provision of adequate shuttering in the trenches;
- Leftover shuttering may also be used in case of loose soil strata.

### 8.6.5 Construction Camps/Camp Sites

#### Potential Impact

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

#### Mitigation Measures

- Working hours of noisy activities will be limited to normal daytime working hours when near identified sensitive receptors;
- Waste Management Plan will be implemented to include procedures for the classification, storage and disposal of all construction wastes and the training of employees who handle hazardous materials; and



- Construction camps will be established away from populated areas and NOC/lease agreement will be obtained from private land owners.
- Regular training of workers will be carried out regarding local cultural norms, human behaviour, gender issues and GRM by the contractor during construction activities at site.
- Implementation of code of conduct

#### 8.6.6 Water Quality

##### Potential Impact

Runoff from the construction works site may contain an increased load of sediments, suspended solids and other contaminants. Potential sources of pollution from the site include:

- Runoff and erosion from exposed soil surfaces, earthwork areas and stockpiles e.g., grouting and cement material with the rain;
- Wash water from dust suppression sprays;
- Fuel and lubricants from maintenance of construction vehicles and mechanical equipment;
- Spillage of liquids stored on-site such as oil, diesel, and solvents etc. are likely to result in water pollution; and
- Uncontrolled discharge of debris and garbage such as packaging, construction material and refuse.

Construction waste, 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 groundwater. There is a probability that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater and channels carrying water.

There is no major surface water body near the project sites, however, canal distributaries and watercourses are present for irrigation purposes which may get contaminated.

##### Mitigation Measures

- Protection of groundwater reserves from any source of contamination such as the construction and oil waste by making the ground impermeable through sheets or compaction;
- Stockpiles of cement and other construction materials will be kept covered when not being used;
- Maintenance of vehicles will be carried out only in impermeable areas where any oil spillages can be contained;
- Careful planning of the works to avoid soil excavation works during rainy seasons;
- Controlled activities will be undertaken during monsoon and careful attention must be paid to weather forecast before excavation operations.
- All kinds of waste will be stored in covered containers and disposed of safely as soon as possible; and



- By proper C&D waste management system in place, the contractor will ensure that construction debris does not find its way into the drainage or irrigation channels.

#### 8.6.7 Air Quality

##### Potential Impact

Air quality will be affected by various construction activities like emissions from generator stack vehicular exhaust, VOCs from uncovered gasoline i.e petrol/diesel, and manoeuvring of construction and public vehicles on construction site. Emissions may be spread over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. In certain climatic condition such as hot summer, airborne dust can become a major nuisance if control techniques are not properly employed.

The air emissions may cause health impacts such as dryness and roughness of the throat, eyes, nose, etc. to the workers, staff of the contractor and the residents of area. These emissions may also affect the bio-physical environment. The impact is negative and temporary in nature.

##### Mitigation Measures

- All vehicles, machinery, equipment and generators used during construction activities will be kept in good working condition, properly tuned and maintained to minimize the exhaust emissions;
- Open burning of solid waste from the contractor's camps will be strictly banned;
- Personal Protective Equipment (PPEs) like masks, goggles and gloves etc. will be provided to workers;
- PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery will be enforced during construction works.
- Regular water sprinkling on the site and access roads will be carried out to suppress excessive dust emission(s);
- Blowing of dust and particulate matter from stockpiled loose materials (e.g., sand, soil) will be avoided either by sheeting them with tarpaulin or plastic sheets or by sprinkling them with light shower of water;
- The vehicles carrying construction materials and the construction material storage areas will be covered with tarpaulin.
- Sensitive receptors of the area will be informed accordingly

#### 8.6.8 Noise

##### Potential Impact

Noise level is expected to increase during construction activities. Main sources of noise and vibration will be heavy machinery such as excavators and other equipment. Noise generated by construction machinery is likely to affect sensitive receptors located within AoI. Health risks associated with exposure to continuous noise levels include high blood pressure, hypertension, annoyance and sleep disturbance, temporary threshold shift etc. The impacts of noise will be temporary and highly adverse in nature.



### **Mitigation Measures**

- Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and training them in their use;
- Selection of up-to-date and well-maintained equipment with reduced noise levels will be ensured by suitable in-built damping techniques or appropriate muffling devices; and
- Residents will be notified earlier before the commencement of excavation operations.
- Construction activities will be restricted to the day-time.
- Sensitive receptors will be informed accordingly.

### **8.6.9 Municipal and Construction Waste/ Wastewater**

#### **Potential Impact**

Due to construction activities municipal and construction waste will be generated from construction activities. The waste will include wastewater, domestic waste and construction waste etc.

Improper dumping of waste may generate odor and attract mosquitoes and other disease vectors. Waste bins containing toxic, flammable and corrosive materials may pose a hazard to the workers when handled without PPEs. Unsited waste disposal site selection may pose a serious health concern to the locals and workers onsite. The impact is temporary and minor negative in nature.

#### **Mitigation Measures**

- Solid waste generated during construction and campsites will be safely stored, collected, transported and disposed of at the selected disposal site and the contractor will provide and implement a comprehensive solid waste management plan;
- Burning of waste will be prohibited;
- Proper labeling of containers, including the identification and quantity of the contents, hazard contact information etc;
- Closed waste storage bins will be provided on-site to store waste.

### **8.6.10 Chance of Finding Artifacts**

#### **Potential Impact**

During excavation, there is a chance of finding artifacts. In case of finding any artifact, the contractor will immediately stop the activities and report through Supervision Consultant to Directorate General (DG) of Archeology, Government of Punjab to take further appropriate action to preserve those antiques or sensitive remains.

### **8.6.11 Resource Conservation**

#### **Potential Impact**

The materials used in the construction of proposed project would include coarse aggregates (crush), fine aggregates (sand), brick ballast, water 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 future use.

Large quantities of water will be used in the construction of concrete pipes, drains, pumping stations, STP, cradles and in watering the unfinished surfaces.

Diesel and residual fuel oils will be used to operate construction machinery and equipment. Sustainable use of energy resources is very important and it will also help to reduce air emissions. For conservation of energy, efficiency of the engines and burning processes is very important.

### **Mitigation Measures**

- Wastage of water will be reduced by training the workers involved in water use;
- Water jets and sprays will be used for watering surfaces rather than using overflow system.
- Reuse of construction waste materials will be considered.
- The efficient and well-maintained equipment and machinery will be used.
- The equipment and machinery will be turned off when not in use.

### **8.6.12 Biodiversity Conservation**

#### **Flora**

#### **Potential Impact**

On account of construction of the proposed water supply and sewerage system, no trees are envisaged to be cut/disturbed but some herbs or shrubs may be required to be removed for excavation. The dust emissions due to excavation operations will stick to the leaves of existing trees and may close their stomata thus hindering the photosynthesis process. Reduced photosynthesis may also reduce the productivity of existing trees. This impact is however temporary but minor negative in nature.

Further, during construction activities the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camp's requirements).

#### **Mitigation Measures**

- The Contractor's staff and labour will be strictly directed not to damage any vegetation such as trees or bushes. They will use the paths and tracks for movement and will not be allowed to trespass through farmlands;
- Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/ bushes for fuel will not be allowed.

#### **Fauna**

#### **Potential Impact**

There will be no damage to health and life of local animals mostly cats, dogs and jackals and especially the livestock i.e., goats and cows due to construction activities. Some reptiles and insects may get killed/ injured during excavation operations.





### Mitigation Measures

- Excavations will be limited to the approved engineering drawings;
- Physical barricades will be provided at critical location near construction sites for restricted movement
- Harassing of animals will be prohibited.

#### 8.6.13 Health and Safety

##### A. Occupational Health and Safety

##### Potential Impact

OHS-related risks include working at height (at excavation site & OHT construction site) Health risks and worker's safety problems may result at the workplace if the working conditions provide an unsafe and/or unfavorable working environment. The health and safety issues are also associated with the operation of construction machinery and equipment, which may cause minor and severe injuries to workers. It will be a long-term and severe negative impact.

##### Mitigation Measures

- Obligatory insurance against accidents for labourers/workers;
- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- The Contractor's Health and Safety Officer will identify, record, and subsequently send the deployment and activity plan to the supervision consultant's Health & Safety Expert (HSE) who will analyze the hazards of the job and issue the No Objection Certificate (NOC), accordingly.
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g., firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Use of Personal Protective Equipment (PPE) i.e., ear muffs, masks, safety shoes, gloves etc.;
- Use of safety signs at the construction site, as shown below.



- Contractor will immediately inform the consultant about the project related incident. The consultant will then submit a preliminary report to the PRMSC within 24 hours. Resultantly, PRMSC will promptly notify the World Bank for project-related incident within a maximum timeframe of 48 hours.



## **B. Community Health and Safety**

### **Potential Impact**

The construction activities and vehicular movement at construction sites may result in roadside accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. This is a temporary and moderate negative impact. Open trenches and deep manhole may cause trip & fall accidents for the local residents.

### **Mitigation Measures**

- Medical screening of the laborers for communicable diseases will be conducted before hiring. Medical screenings are a basic requirement before the hiring of labour to prevent the spread of communicable diseases. However, on the basis of these screenings, diseased potential workers will not be barred from work; instead, necessary measures will be taken to prevent the spread of these diseases.
- The site will be restricted for the entry of irrelevant people particularly children.
- Provision of proper safety and diversion signage, particularly at sensitive/accident-prone spots;
- Setting up speed limits within the village.
- Open trenches and deep excavated manholes will be protected by fence/barricade to avoid any accident.
- Night time lighting will also be provided.
- Awareness campaign regarding HSE will also be provided to local community including at schools.
- Awareness/ training session of labourers will be conducted to promote clean behaviour practices and to curtail medical issues.
- Special consultation session will be held with the nearby medical facility to ensure that it is well informed and well equipped to handle any dust allergy cases if required.
- Contractor will immediately inform the consultant about the project related incident. The consultant will then submit a preliminary report to the PRMSC within 24 hours. Resultantly, PRMSC will promptly notify the World Bank for project-related incident within a maximum timeframe of 48 hours.

## **C. Emergency Response (Natural and Man-Made Disasters)**

### **Potential Impact**

Natural calamities such as flood and man-made disasters such as fire, falls, slips and trips may result in injuries, financial losses and may even lead to deaths. Flooding can result in inundation of the village area and excavation / trenches which may leads to accidents or can damage the infrastructure of the project activities. Similarly, during operation it can affect the water supply, and sewerage system. The workers will be trained and facilitated to cope with such emergencies.

### **Mitigation Measures**

- Training of the staff/employees regarding the emergency procedures/plans will be regularly conducted;



- Emergency numbers will be clearly posted; and
- First aid boxes will be provided.
- Minor incidents and near misses will be reported and preventive measures will be formulated accordingly.

#### **8.6.14 Traffic Management**

##### **Potential Impact**

The traffic influx within the villages is very low. Most of the traffic within the villages include motorbikes and few cars. The project interventions will not create traffic congestion issues in the project area. However, their movement will be disturbed due to the excavation and construction works and people may face accessibility issues. This impact is temporary and major negative in nature.

##### **Mitigation Measures**

- The construction activities will be carried out in pockets/reaches, once a patch has been completed (i.e., pipes are laid and covered) then excavation on new patch shall be started;
- Local community will be taken on board to plan alternate access routes in connecting streets to ensure mobility of local traffic; and
- Plan work in a minimum possible time.

#### **8.6.15 Nuisance/ Disturbance to Sensitive Receptors (Educational, Health and Religious Places)**

##### **Potential Impact**

Since the proposed interventions will be carried out within the village boundaries, therefore, the socially sensitive sites/places including schools, hospitals and religious centers will be temporarily affected due to dust, noise and the community will face accessibility issues due to open trenches. Dust due to earthworks will create health hazard to children and people with ailments. This impact is temporary and major negative in nature.

##### **Mitigation Measures**

- Work will be conducted near the religious places with due social diligence and after informing all stakeholders
- Material transport to the site will be scheduled considering school timings;
- Notify concerned schools, hospitals/dispensary etc. 2 weeks prior to the work; conduct a 30 minutes' awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts; and
- Implement all measures suggested in this report viz. dust and noise control, public safety, traffic management, strictly at the sites.



### 8.6.16 Accessibility

#### Potential Impact

Excavation of trenches and pipe/sewer laying work in the project area will obstruct access to residences, commercial buildings and businesses adjacent to the proposed project alignment. Disruption of access to commercial establishments may affect livelihood. The potential impacts are negative and moderate but short-term and temporary.

#### Mitigation Measures

- Leave space for access between mounds of excavated soil;
- Consult affected people to inform them in advance about the work schedule;
- If there are any holidays (i.e., Eid or Muharram etc.), the Contractor will complete the backfilling work of the trenches and will not leave any trench open before holidays;
- Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

### 8.6.17 Gender-Based Violence (GBV)

#### Potential Impacts

During the construction phase, gender-based violence might arise due to influx of outside labor. Sexual harassment against women might occur as a consequence of mixing of men and women at the construction site, and moving on the roads and markets.

#### Mitigation Measures

With the effective measures and monitoring, the risk of gender-based violence will be minimized by adopting the following mitigation measures:

- Awareness will be created among the females at community levels about the construction.
- Workers will not be allowed to crowd in the residential area/villages.
- Alternative routes and traffic management plans for the safety of the community particularly for women and children will be ensured.
- Raise awareness among the communities regarding the potential risks of GBV, and establish response services in the nearby communities that can respond to instances of GBV (particularly those related to issues of labor influx);
- Contractor will take proper measures and will ensure Gender Sensitive Grievance Redressal Mechanism to address and resolve issues relating to harassment, intimidation, and exploitation.
- GBV-related issues will be recorded through GRM, two separate focal persons for males and females are part of Village Organization VO – which will also work as members of the Grievance Redressal Committee (GRC) Tier-I. The female focal person – trained on the social protection referral directory – will be responsible for further referral of GBV-related complaints to the forums concerned. A multi-sectoral referral system is proposed, which will include referral to The Punjab Women's Toll-Free Helpline 1043 available 24/7. It is managed and supervised by Punjab



Commission on the Status of Women (PCSW). Their helpline team comprises all-women call agents, three legal advisors, a psychosocial counsellor, supervisors, and management staff. The Punjab Commission on the Status of Women (PCSW) has been identified as a key stakeholder. PCSW will be informed of the project activities and an institutional link will be established.

- At the PRMSC Tehsil Office, the Behavior Change and Communication (BCC) Officer – in addition to being member of GRC Tier-I&II – will initially deal with gender related issues/ complaints and further refer the same to the Gender Specialist at Head Office, PRMSC.
- The Contractor will prepare the Codes of Conduct to prevent occurrence of GBV and get it signed by all workers, and effectively communicate to all workers and project beneficiaries.

#### 8.6.18 Influx of Labor

##### Potential Impacts

For the implementation of project activities, skilled and unskilled labor is required by the contractor. Mostly, skilled and unskilled workers have been associated with the contractor since a long which they utilize, where they are required for the projects, and while other workers are hired from different areas that belong to different cultural backgrounds. Social problems and conflicts that are associated with labor influx are as follows:

- **Risk of social conflict:** Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources;
- **Increased risk of illegitimate behavior and crime:** The influx of workers and service providers into communities may increase the rate of crimes and perception of insecurity by the local community. Such illegitimate behavior and crimes can include theft, physical assaults, substance abuse, sexual assault and human trafficking;
- **Increased risk of communicable diseases and burden on Tehsil & District health services:** The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to the nearby medical center, this can result in an additional burden on tehsil & district health centres; and
- **Local inflation of prices, accommodations and rents:** A significant increase in demand for goods and services due to labor influx may lead to local price hikes and crowding out of community consumers. Depending on project worker income and form of accommodation provided, there may be increased demand for accommodations, which again may lead to price hikes and crowding out of local residents.

##### Mitigation Measures

- Labour camp(s) will be established away from residential areas;



- Preference will be given to the local people to work with contractor, and contractor should hire maximum labour force from the project area because this will reduce the labour influx;
- Awareness will be created among the workforce to ensure respect for local customs;
- An effective GRM has been established for the project to resolve all issues related to the community. Thus, progress regarding resolving the issues should be monitored closely.
- Create awareness among workers on proper sanitation and hygiene practices to endorse proper health and maintain good housekeeping practices at all project sites;
- Make arrangements to treat the affected workers on time to control the movement of vectors disease;
- Provide proper and free medical screening and counselling for site workers and community members;
- Develop and enforce a strict code of conduct for workers to regulate behaviour in the local communities;
- Labour will be required to sign a code of conduct translated into their local languages at the time of hiring.
- Prohibiting drugs, alcohol, weapons, and ammunition on the worksite among personnel;
- Appropriate fencing, security checkpoints, gates and security guards should be provided at the construction sites to ensure the security of all plant, equipment, machinery and materials, as well as to secure the safety of site staff; and
- The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft.

#### 8.6.19 Social/ Cultural Conflicts

##### Potential Impact

During the construction phase of the project, conflicts may arise between labor force and local community. Furthermore, differences in cultural values may also cause discomfort to local residents. This impact is temporary and minor negative in nature.

##### Mitigation Measures

- Plan for social grievance redress mechanisms including the local leaders and community representatives;
- Local labor will preferably be employed for construction works;
- Careful planning and training of the workforce to minimize disturbance to the local people;
- Robust and transparent GRM will be implemented





### 8.6.20 Child Labor

#### Potential Impact

Due to poverty and the feeble financial situation of the area, the underage children might get involved with the contractor various construction works. This will be the violation of the Child Labor Act. Furthermore, SEA/SH issues might arise which will create social conflicts. This impact is adverse and temporary in nature.

#### Mitigation Measures

- Standard clause in the contracts related to child labor explicit prohibitions, etc. and contractor will ensure compliance to the contractual provisions as per law of land. Similarly, equal wages for similar work will be followed.

### 8.6.21 Economic Activity

#### Potential Impact

Due to the construction of the proposed Project, economic activity will be generated in the project area as the laborers and semi-skilled staff will have an opportunity to work in the project area. This will provide them an opportunity to develop their skills and capacities. It will also benefit the local vendors of the project area. This is a positive impact.

### 8.7 Anticipated Impacts during Operational Phase

Anticipated impacts during Operational Phase and the recommended mitigation measures have been described under biophysical and socio-economic categories as follows:

#### 8.7.1 Soil

##### Potential Impact of STP

The soil quality may be affected due to leakage/ infiltration from sewer lines and STP bed. The sludge generated from cleaning/ maintenance of pumping stations, manholes, sewers and STP may contaminate the soil. The liner of the STP, while desludging may get dried and cracks may lead to the seepage of wastewater and thus contaminate the soil. Improper disposal of scum and sludge is another concern. This is a moderate negative impact.

##### Potential Impact of Leachate from Dumping Site

The collected solid waste will be dumped into the existing dumping sites of Tehsils. There is no arrangement of leachate collection and no liner material is present there which will result in contamination of soil due to leachate. The situation will exacerbate in the rainy seasons. This is moderate negative impact.

#### Mitigation Measures

- Sludge shall be treated before ultimate use/disposal. Various options for sludge treatment include Digestion, Drying/ Dewatering, Composting, Lime Stabilization, Heat Treatment must be considered etc;
- The liner of STP must be regularly maintained and checked for any cracks and leakages;
- Treated sludge should be properly disposed of in an environmentally friendly manner.



### 8.7.2 Air Quality

#### Potential Impact of Sewerage System

The operation of sewerage scheme will result in generation of gases including  $H_2S$  and  $CH_4$ .  $H_2S$  is a foul-smelling poisonous gas that might be harmful to the sewer men and could be fatal sometimes.  $CH_4$  is natural gas also referred to as a greenhouse gas. Pakistan is signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and adopted Kyoto Protocol in 1997. Under the Kyoto Protocol, Pakistan is committed to reduce GHG emissions into the environment to prevent interference with climate change. The GHG emissions for the proposed project are a concern due to the anaerobic conditions in the sewer lines and wet wells of the disposal station.

#### Mitigation Measures

- Provision of exhaust gas vents at appropriate locations in the design;
- Sewer-men will cover their faces with gas mask while entering the sewer for cleaning or maintenance purposes;
- It's better to use sucking machinery for cleaning of sewers;
- Use gas detector before inspection;
- Adequate tree plantation must be done around the STP to control the spread of odour;

### 8.7.3 Odour

#### Potential Impact of STP

STP are designed on adequate waste loading and function well if they are not overloaded. The overloading will result in malfunctioning of STP and it will result in significant odour generation in the vicinity. This impact is temporary and high adverse in nature.

#### Mitigation Measures

- The STP should not be overloaded and personnel dealing in operation should be trained to avoid operational issues;
- Adequate tree plantation must be undertaken to avoid spread of odour in the vicinity.

### 8.7.4 Elite Capture

During the VLD process it was ensured that land will not be donated by landowners having more than 25 acres' land size to avoid elite capture. This has resulted in a situation where the elites have disproportionate control over resources, policies, and decision-making processes in all over the province. Elite capture is often facilitated by corruption, nepotism, and patronage networks, which enable the elites to manipulate the system in their favor. The consequences of elite capture are far-reaching, with the general public often left without access to basic amenities such as health, education, water and sanitation. This has resulted in widespread inequality, marginalization, and poverty in Punjab. Landowners play role as elite capture while donating the land to get the rights to use of water, sewage treated water for agriculture.

#### Mitigation Measures

- To avoid elite, capture the VLD will not be accepted from the person having more than 25 acres' land.



- To increase transparency and accountability in decision-making processes.
- Involving multiple stakeholders, including community members, in decision-making processes related to project activities.
- To promote the participation of marginalized groups, such as women and minorities, in decision-making processes. By ensuring that these groups have a voice in decision-making, the risk of elite capture can be reduced.
- Strengthening institutions such as VO's/VC's and regulatory agencies can help ensure that decisions are made in a fair and equitable manner, without undue influence from elites.
- To ensure an effective grievance mechanism for monitoring and reporting any cases of elite capture.
- Robust and transparent GRM will be implemented
- VO's will be strengthened to play a role during distribution of treated water to prioritize the needs of the entire community rather than just a select few elites.
- Due diligence will be held during VLD process to absolve the doner from all the associated land rights.

#### 8.7.5 Social Inclusion

Social inclusion is the process in which individuals and groups take part in the society. Social inclusion in proposed project area is an important aspect for the overall development of the interventions. It is crucial to ensure that every stakeholder of the community have equal access on the provision of clean drinking water and sanitation facilities, improved healthcare facilities, educational facilities and on economic excess and job opportunities. In this proposed project efforts will be made to promote the participation of marginalized groups, such as women and minorities, elderly person in decision-making processes and community activities. These efforts include the participation of the public including marginalized groups in the community meetings for project disclosure, corner meetings for the nomination of their representatives for the Village Organizations/ Village Councils (VOs/VCs), and monthly community meetings. Moreover, due representation for these marginalized groups has also been ensured in the VO membership. In addition to the open electoral process, a minimum of 50% share of the total membership has been allocated for the women members, one seat reserved for the minority, and in case of other socio-lingual differences further quota has also been ensured. These efforts will help to improve the overall quality of life for residents in proposed project area to promote opportunities in inclusive manner.

#### Mitigation Measures

- Providing awareness campaigns to increase knowledge and understanding of the project, and challenges faced by marginalized groups.
- Ensuring the implementing policies that promote diversity and inclusion, such as affirmative action policies and anti-discrimination laws.
- Providing awareness on the importance of clean drinking water & sanitation, education, job training, and community services to underserved and marginalized populations.



- Encouraging and supporting the active participation of marginalized groups in decision-making processes through VO's to providing opportunities for leadership.
- Fostering partnerships between PRMSC-TO and VOs/VCs to promote social inclusion to address the root causes of social exclusion.
- Regular monitoring and evaluation of project policies and programs to ensure they are effective and inclusive.

#### **8.7.6 End Water User of Treated Wastewater**

End wastewater users are the individuals and communities who will use the treated water for various irrigation purpose. These end-users play a crucial role in ensuring the sustainable use of treated wastewater. It is important to understand the value of treated water and the impact of their actions on wastewater availability. The treated wastewater will be available to all the peasants having lands in the proximity of ABR. However, in case of disputes, VO of the village will decide the distribution rights of treated wastewater in consultation with the community demands.

##### **Mitigation Measures**

- End water users will adopt water conservation measures such as reducing water wastage, using efficient irrigation methods
- Awareness campaigns will be conducted on the understanding and importance of water conservation and its impacts.
- VO will ensure monitoring and evaluation on regular basis regarding the usage and conservation of treated water.
- Distribution of treated wastewater will be decided by VO's/VCs in village
- Equal rights of the community on the usage of treated water will be ensured by the VOs.

#### **8.7.7 Solid Waste**

Domestic and hazardous wastes would be generated during cleaning and maintenance activities. The solid waste during operational phase will consist of plastics, metal and organic wastes present in sewer lines which can cause blockage in sewerage system. This impact is major negative and permanent in nature.

##### **Potential Impact of Solid Waste Management**

The waste containers, if not emptied timely, will create nuisance and attract mosquitoes and disease vectors. The situation will exacerbate in the rainy seasons. Furthermore, there would be littering during transportation of waste from the villages to the dumping site.

##### **Mitigation Measures**

- Waste shall be collected, stored and disposed of according to relevant standards in approved facilities;
- An organized collection system and its implementation through a licensed contractor;
- The containers will be timely removed and a fine will be imposed on contractor in case of violations;



- Closed containers will be used for transportation of waste to the dumping site;
- Schedule inspection of the sewer lines and STP to keep it clean and to identify any hazardous material; and
- Solid waste bins shall be placed at appropriate locations to avoid mixing in wastewater.

#### 8.7.8 Sludge

##### Potential Impact

Sludge is semi-solid material which will be settled at the bottom of the STP due to anaerobic decomposition of biomass. Significant amount of sludge will not be produced in ABR, however, periodic desludging will be done to achieve good removal efficiency. The removed sludge in wet form, if left unattended will create nuisance i.e., odor, soil contamination, groundwater contamination (through percolation/ seepage) and will serve as a breeding ground for vector diseases. Sludge will be removed from the ABR once the 50% of the ABR is filled with the sludge.

##### Mitigation Measures

- Appropriate sludge treatment must be undertaken before disposal of sludge; sludge dewater and drying through sludge drying beds in case of ABR.
- Sludge testing / horticulture purpose/ campaigns. Priority will be given to the use of dried sludge as a land conditioner in the fields.
- If required remaining sludge will be transferred to a nearby dumping site designated by Tehsil Municipal Authority, these sites are already being used for dumping of solid waste.
- Sludge management plan will be followed for proper handling and disposal (Annexure-5).

#### 8.7.9 Impact of Brine Disposal

In case of operation of Reverse Osmosis (RO) filtration Plants, around 75% of water is rejected and 25% is consumed as treated product water. It means that for every 2000 lph capacity RO plant; we require 6000 lph of raw water to be treated from which 4000 lph will be the RO reject or brine. So, per day 32000 litres of wastewater will be generated from a single RO. The rejected water is free from bacteria, viruses and other pathogens but has only dissolved particles in it. RO concentrate disposal issues present significant design and operational challenges that must be addressed. Conventional disposal techniques mostly suffer from direct or indirect contamination of water/soil.

##### Mitigation Measures

- Reuse of brine for dust suppression on unpaved roads can be considered where environmentally acceptable.
- Planting halophytic grasses and shrubs in designated areas can help utilize saline water while stabilizing soil.
- Small-scale ponds with brine-tolerant fish or shrimp species can be developed in suitable areas.



- Brine can be discharged into a borehole to safely isolate it from surface water and allow controlled infiltration or dilution.
- RO brine can be discharged into water ponds (if present nearby) for reuse in irrigation only if the pond has adequate dilution and circulation to reduce salinity to safe levels.
- Brine can be managed through controlled dilution with treated effluent to reduce salinity before reuse for irrigation of non-food vegetation e.g, in Barley

## **8.8 Positive Impacts**

### **8.8.1 Improved Water Supply System**

Clean tap water is a dire need of all project tehsils. The provision of adequate water supply system with a reasonable supply of water will provide relief to the community and will resolve the major issue of “water” in the project area. Further, there will be a net improvement in community’s health.

### **8.8.2 Improved Sewerage System**

The proposed project will improve the overall sewerage and drainage system of the project area. Currently, the open wastewater drains in the streets result in foul odor, serves as breeding ground for disease vector and results in inconvenience to the road users and local community. The project will improve this situation by controlling overflows and proper disposal of wastewater/ storm water.

### **8.8.3 Improvement in Public Health, Hygiene and Sanitation**

With the improvement in sewerage and drainage system, improvement in health, hygiene and sanitation will also be observed. Foul odor will be eliminated and there would be no breeding grounds for diseases vectors. Thus, the project will improve public health, hygiene and sanitation conditions in the project area.

### **8.8.4 Landscape**

#### **Potential Impact**

During the operation stage, new saplings of different plants would be planted to enhance the aesthetics to create a buffer zone and to compensate the environmental losses. This will have a positive impact of permanent nature. The presence of adequate flora at available spaces will help in absorbing flue gases and other air quality related impacts of proposed project operation. The plants will be beneficial in dust and noise suppression for the nearby community.

#### **Mitigation Measures**

- The saplings planted in the project area against the trees affected and for enhancement of environment should be properly maintained throughout their growth.

### **8.8.5 Commulative Impacts of Water Extraction & Sewerage Treatment**

#### **Potential Impact**

Cumulative impact may occur as a result of development of several treatment plants or several water extraction points, currently there is only one water extraction point for each selected village and the people in project area are fulfilling their water demands majorly from ground





water resource (agriculture and domestic purpose respectively). The current intervention will provide treated water in the replacement of raw water to the locals which will improve the health and reduce exposure to water borne diseases. Supply of treated water at door set will also discourage the installation of pumps in houses. Furthermore, this project will basically replace the one practice to another practice and will not majorly impact on the consumption rate as people reliance on existing water extraction system will become minimum after the completion of the project. However, there will be no cumulative impact in terms of depleting ground water resources.

On the other hand, for each project village, one Sewerage Treatment Plant (STP) will be installed, and the treated water will be discharged into an existing sewerage pond. This practice will also have no impact on quality of water resources because sewerage water is already dumped directly into existing sewerage ponds and after this project sewerage water will be discharged into the ponds after treatment which will help to improve the quality of sewerage pond. However, there will be more or less zero cumulative impact after the installation of ABR

### **Mitigation Measures**

- Water quality monitoring should be done by the third party on quarterly basis to ensure the supply of safe drinking water.
- ground water table will be monitored periodically.
- Water metering system should be installed to know the total consumption of water.
- Ensure the treated effluent follows the National Environmental Quality Standards
- Maintenance of ABR should be done annually for its smooth operations.

### **8.8.6 Other Positive Impacts**

Some other positive impacts include the following:

- Economic development
- Employment generation
- Development of deprived areas
- Formation of model villages of tehsil Bhawana

### **8.9 Operational Sustainability**

The sewer pipes water supply lines and other components of the project will not function with improper operation and maintenance of sewerage system and water supply system which is the responsibility of the client.

### **Mitigation Measures**

- Routine/ preventative maintenance shall be carried out as with the passage of time
- Major causes of deposition of silt and floating matters in the sewers are the mixing of solid waste and smaller diameter sewer pipes. Placement of sufficient number of solid waste litter bins/containers shall be ensured along the roads and in streets to avoid entrance of solid waste into sewers;
- Immediate response to all sewer/drainage related complaints followed by prompt correction of defective condition;



- Regular cleaning of sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning shall be conducted more frequently for problem areas;
- Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or ex-filtration;
- Any repairs will be conducted by sealing off the affected sewer and pumping the contents into tankers, after which the faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Trenches will be dug around the faulty section and the leaking joint will be re-sealed, or the pipe will be removed and replaced.
- Water supply lines will be inspected on regular basis to avoid any leakages and loss of resources.

#### 8.10 Induced Impacts

Beside some direct environmental social and economic impacts, the proposed project may have some induced impacts to the physical features of environment. The project is envisaged to improve the infrastructure of the project area.



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## SECTION -9 ENVIRONMENTAL & SOCIAL MANAGEMENT & MONITORING PLAN

### 9.1 General

This section aims to address the measures which need to be adopted during each phase of the project to avoid, contain, mitigate or compensate for the potential impacts identified in **Section 8**. The Environmental & Social Management Plan (ESMP) is the major part of this section and forms the gist of this study. ESMP not only includes Best Management Practices (BMPs) but also includes monitoring indicators, frequency, responsibility, and estimated environmental budget. This ensures that mitigation, monitoring, and management consideration form a part of the documentation used for decision making and the basic benefit of defining the responsibilities is to make sure that the suggested mitigation measure will be implemented at the construction and operation stages of the project. A summary of the mitigation measures for potential impacts have also been given in this section to support ESMP. Moreover, a framework for the implementation of ESMP has been discussed in this section.

### 9.2 Implementation of Environmental & Social Management Plan (ESMP)

**The institutional arrangement** for the implementation of ESMP for PRSWSSP is presented below. The proponent PRMSC and supervisory consultants will be responsible for compliance of with environmental and social safeguard requirements of the proposed project.

The proposed project activities will be monitored and managed by the PIMU-PRMSC. The Environmental and Social Cell (ESC) staffed by qualified environmental and social specialists has already been established under PRSWSSP. The ESC will be the custodian of the ESMP. ESC will support ensuring the compliance of ESMP. ESC will submit progress reports for the implementation of the ESMP to WB and PEPA as per environmental approval/ NOC conditions for the PRSWSSP.

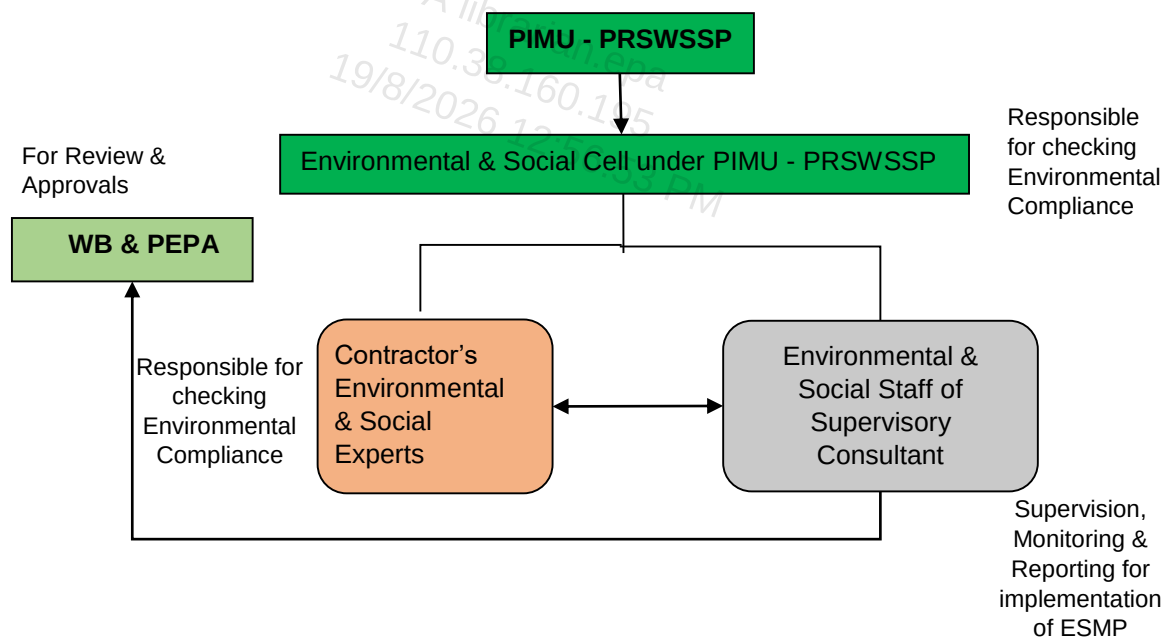


**Figure 9.1: Organizational Setup for implementation of ESMP**



## **9.2.1 Roles and Responsibilities of the Functionaries involved in ESMP Implementation**

### **A. World Bank**

The current proposed project falls under category E2 as per ESMF guidelines; in view of limited environmental and social impacts and thus require an ESMP. World Bank shall review and approve the safeguard documents including ESMP. The Bank shall also review and approve the quarterly and biannually prepared progress reports.

### **B. Punjab Environmental Protection Department**

As per Punjab Environmental Protection (Amendment) Act, 2012, Punjab EPD is responsible for environmental protection and pollution control. The Punjab EPD is responsible for the approval of the EIA/ IEE of all the developmental projects under their jurisdictions. As per Punjab Environmental Protection (Review of Initial IEE/EIA) Regulations 2022, Schedule-II, EIA is required for 'Water Supply, Sewerage System and Treatment (Category F) Based on the EIA and ESMP, Punjab EPD will monitor (as and when required) the project activities.

### **C. PRMSC**

The Project Director of PRMSC is the in-charge for the financial and technical matters related to PRSWSSP. His responsibilities for monitoring the ESMP will consist of:

- Ensuring that the required environmental training is provided to the concerned PIU staff;
- To carry out random site visits to the construction sites to review the environmental performance of the Contractor;
- Review monitoring reports for the progress of environment-related activities;
- Make sure that the Contractor is implementing the additional measures suggested by the Supervision Consultant (SC) in environmental monitoring reports;
- To assist the Contractor in obtaining necessary approvals from the concerned departments;
- Maintaining interface with the other line departments/ stakeholders; and
- Reporting to the Punjab EPD on the status of ESMP implementation.

### **D. Environmental and Social Cell (ESC)**

ESC has already been established in the PRMSC which is responsible to:

- Make sure that all the contractual obligations related to environmental and social compliance are met;
- Monitor the progress regarding the implementation of environmental and social safeguards as provided in the ESMP;
- Oversee the compliance of all the monitoring programs as given in ESMP;
- Check randomly whether monitoring of the environmental aspects of the proposed project during construction and operational phases is being properly carried out;



- Document and disclose monitoring results and identify necessary corrective and preventive actions in the periodic monitoring reports, and make follow-up on these actions to ensure progress toward the desired outcomes;
- Make sure that the contractor implements the additional measures suggested by the SC and PIMU; and
- Report the status of ESMP compliance to the Project Director, PRMSC.

#### **E. Supervisory Consultant (SC)**

The roles and responsibilities of SC will be:

- To oversee the performance of the Contractor to make sure that the Contractor is complying with ESMP;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Strong coordination with the Contractor and PRMSC;
- Preparing training materials and implementing programs;
- Ensure the implementation of the mitigation measures suggested in ESMP;
- To supervise and monitor environmental activities being performed at the site;
- Periodic reporting as mentioned in ESMP; and
- Suggest any additional mitigation measures (if required).

#### **F. Construction Contractor (CC)**

Contractors will be bound to appoint site-based Environmental and Social managers with relevant educational backgrounds and experience for PRSWSSP. The contractors' Environmental and Social manager will carry out the following activities:

- Implementation of the mitigation measures at the construction site;
- Contractor will be bound through the contract to take actions against all the special and general provisions of the contract document;
- Contractor will make sure the compliance of ESMP recommendations related to construction and will also be responsible for effective liaison with local heads of the community;
- Provision of proper Personal Protective Equipment (PPE) to the workers and train them for their proper use;
- To conduct the environmental and health & safety trainings to the workers/labour; and
- Coordinate with the Environmental Specialist and Social Development Specialist (SDS) of SC and PIMU.

#### **9.2.2 Institutional Arrangement for Implementation of ESMP by PRMSC during O&M Phase**

The proposed project will be administrated by PRMSC during the O&M phase. The Project Director, PRMSC with his ESC will be responsible for the following:



- Compliance with ESMP requirements for the O&M phase;
- Coordinating with the operational staff working under the ESC to monitor environmental compliance during project operation;
- Advising on, and monitoring tree plantations along the stagnant pool of water in the project area;
- Reporting on the progress of environmental compliance to the Punjab EPD;
- Assessing the long-term environmental impacts of project operation;
- Sustaining a working partnership among the PRMSC, Punjab Local Government Department, Punjab EPD, Agriculture, Irrigation, Forest and Wildlife departments of Punjab, NGOs, and other related public-private sector organizations.

### 9.3 Reporting

The contractor will prepare and submit monthly monitoring reports for compliance of implementation to the supervision consultant (SC) environmental team.

The distribution of periodic reports is given in Table 9.1.

**Table 9.1: Distribution of Periodic Reports**

| Report    | Prepared by | Reviewed by                                   | Distribution                           |
|-----------|-------------|-----------------------------------------------|----------------------------------------|
| Monthly   | Contractor  | Reviewed by PRMSC-Environmental Unit; PRSWSSP | The Engineer and PRMSC                 |
| Quarterly | Contractor  | Reviewed by PRMSC-Environmental Unit; PRSWSSP | The Engineer, PRMSC and The World Bank |
| Annual    | Contractor  | Reviewed by PRMSC-Environmental Unit; PRSWSSP | The Engineer, PRMSC and The World Bank |
| Final     | Contractor  | Reviewed by PRMSC-Environmental Unit; PRSWSSP | The Engineer, PRMSC and The World Bank |

### 9.4 Non-Compliance with the ESMP

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

### 9.5 Contractors ESMP

The contractor will prepare a site-specific Contractor's ESMP (C-ESMP) based on the current ESMP and will get it approved by PRMSC before the start of work. This will ensure the implementation of the ESMP based on the site conditions at the time of execution, by the contractor.

The C-ESMP will include the following sub-plans:

- Traffic management plan,





- OHS plan,
- Pollution prevention plan,
- Camp management plan

#### 9.6 Inclusion of ESMP in Bidding/ Contract Documents

The present ESMP will be included in the bidding/ contract documents and their implementation will be contractual binding for the contractors.

#### 9.7 Environmental and Social Monitoring Plan

Monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be performed at three levels. At the PRMCS level, the ESC will do ESMP monitoring to ensure that the mitigation plans are being effectively implemented. The environmental engineer of the Supervision Consultant will regularly monitor the ESMP implementation by the contractor. At the contractor's level, the environmental monitoring checklist will be filled on daily basis by their environmental manager and countersigned by the environmental engineer (EE) of the Supervision Consultant. Table 9.2 outlines the parameters that will be monitored, the expected frequencies of monitoring, and the responsible agency for monitoring.



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**Table 9.2: Environmental and Social Management Plan (ESMP)**

| Activity                               | Impacts                                                                                                                                                                                                                                                                                                 | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                              | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency                       | Monitoring Responsibility | Cost |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|--------------------------------------------|---------------------------|------|
| <b>Pre-Construction / Design Phase</b> |                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                  |                               |                       |                                            |                           |      |
| Layout Planning & Design               | Incompatible layout plans and engineering designs of the proposed project can undermine the overall aesthetics and ambiance of the project area                                                                                                                                                         | All structural, layout and engineering designs of the project are in strict accordance with the applicable national and international guidelines/ codes/ standards and engineering practices;                                                                                                                                                                                                    | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
| Impacts of Drains construction         | Inadequate sizing or gradients may lead to poor flow, blockages, or flooding during peak conditions. Improper alignment can cause conflict with existing utilities and affect land use. Selection of unsuitable materials or inadequate lining may result in erosion, siltation, or structural failure. | Plan proper alignment and depth to avoid conflicts with existing utilities and infrastructure.<br>Ensure accurate hydraulic design with proper gradients to maintain self-cleansing velocity and avoid blockages.<br>Provide adequate cross-sections and freeboard to handle peak stormwater flows safely.<br>Incorporate silt traps and access points for ease of maintenance and prevention of | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
| Risk to Structures                     | In certain areas, katcha houses are present. This impact is considered sensitive due to its potential effect on local communities. Weak soil-bearing capacity of these structures makes them particularly vulnerable to vibration, settlement, or                                                       | Conduct pre-construction structural surveys of nearby katcha houses to assess vulnerability and design protective measures accordingly.<br>Implement controlled dewatering and soil compaction techniques to maintain ground stability and prevent settlement around excavated areas.                                                                                                            | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |



| Activity                          | Impacts                                                                                                                                                                                           | Mitigation Measures                                                                                                                                                                                           | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency                       | Monitoring Responsibility | Cost |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|--------------------------------------------|---------------------------|------|
|                                   | lateral soil movement during construction.                                                                                                                                                        |                                                                                                                                                                                                               |                               |                       |                                            |                           |      |
| Improperly Designed Sewers        | Improper designed sewers may not carry the waste load, leading to system-failure and financial loss.                                                                                              | All sewer lines including trunk, lateral and branch sewer lines have been designed considering the future population and waste generation rate;                                                               | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
|                                   | The construction of high-rise overhead water tanks may cause visual obstruction.                                                                                                                  | The location of groundwater storage tanks, overhead water tanks, pumping stations and STP have been finalized in close consultation with local community and representatives of local authorities.            | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
| Groundwater                       | During operation probability of seepage through the sewers may also contaminate groundwater.                                                                                                      | Efficient seepage control measures have been considered in selection of pipe materials during the planning stage                                                                                              | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
|                                   |                                                                                                                                                                                                   | Procedure for efficient jointing of selected sewer pipes will be applied to avoid leakage from pipes                                                                                                          | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
| Damage to Existing Infrastructure | There are no public utilities except the electric poles which might get affected during construction activities and movement of machinery and the community will face temporary electricity cuts. | Alignment has been selected carefully to minimize disturbance to public utilities;                                                                                                                            | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |
|                                   |                                                                                                                                                                                                   | Relocation of the public utilities shall be planned and approved in consultation with relevant departments/authorities/stakeholders before project commencement if any, to avoid inconvenience to the public. | DC, PRMSC                     | Design provisions     | Once (after completion of Detailed Design) | PIMU                      | N/A  |



| Activity                                          | Impacts                                                                                                                                                                                                                                                           | Mitigation Measures                                                                                                            | Implementation Responsibility | Monitoring Indicators                              | Monitoring Frequency                       | Monitoring Responsibility | Cost |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------|--------------------------------------------|---------------------------|------|
| Physical Cultural Resources                       | No historical/ archeological site is present in the project area. However, some cultural resources including mosques, graveyards and shrines are present. These will not be directly affected but the people may face access issues in visiting these facilities. | The alternative access routes will be provided in case the access has to be restricted during the execution period             | DC, PRMSC                     | Design provisions                                  | Once (after completion of Detailed Design) | PIMU                      | N/A  |
| Fire Fighting System                              | In case of fire hazards, inefficient firefighting system at campsite may cause severe damage to the camp site and surrounding crops and houses. This will be a moderate adverse impact.                                                                           | Contractor will provide firefighting system for construction camp, workshop and construction site;                             | DC, PRMSC                     | Design provisions                                  | Once (after completion of Detailed Design) | PIMU                      | N/A  |
|                                                   |                                                                                                                                                                                                                                                                   | A separate fire alarm system will also be installed at construction camp and near the construction site.                       | DC, PRMSC                     | Design provisions                                  | Once (after completion of Detailed Design) | PIMU                      | N/A  |
| Land Acquisition                                  | Private land will be taken through VLD; State land will be used through NOC procedure. There will be no purchase of land, involuntary resettlement and no relocation of people or businesses.                                                                     | No one will be forced or pressurized to donate land<br>VLD should not be more than 10 % of the total land holding of the owner | DC, PRMSC                     | VLD procedure of ESMF                              | Once at the time of land acquisition       | PIMU                      | N/A  |
| Anticipated Impacts during the Construction Phase |                                                                                                                                                                                                                                                                   |                                                                                                                                |                               |                                                    |                                            |                           |      |
| Topography                                        | The construction activities are not expected to impact the topography of the area significantly except for                                                                                                                                                        | Material stockpiles will be removed as soon as work is completed and the area will be reinstated;                              | CC, SC, PRMSC                 | Stockpiles and heaps of waste visible at the site. | Weekly                                     | SC and PIMU               | N/A  |



| Activity     | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mitigation Measures                                                                                                                                                | Implementation Responsibility | Monitoring Indicators                              | Monitoring Frequency                  | Monitoring Responsibility | Cost                                                 |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------|---------------------------------------|---------------------------|------------------------------------------------------|
|              | those areas where physical activities i.e., earthwork is involved as well as stocking of material. The excavated material is to be mostly backfilled and the excessive material will be transported to strengthen the roadsides or will be dumped at the designated locations. This impact is site-specific, temporary, reversible, possible, and low significant                                                                                              | Temporary storage sites will be allocated for the storage of excavated material;                                                                                   | CC, SC, PRMSC                 | Site allocation and preparation                    | Once before the excavation activity   | SC and PIMU               | N/A                                                  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Temporary storage sites will be lined and must not allow infiltration                                                                                              | CC, SC, PRMSC                 | Site allocation and preparation                    | Before utilization of storage site    | SC and PIMU               | N/A                                                  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The stockpiles must be covered with tarpaulin sheets or other adequate material;                                                                                   | CC, SC, PRMSC                 | Provision of tarpaulin                             | Before start of construction activity | SC and PIMU               | The cost of tarpaulin is provided in the ESMP Budget |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Pilling of material at large extent will not be allowed and the contractor will timely remove excavated material from the site.                                    | CC, SC, PRMSC                 | Stockpiles and heaps of waste visible at the site. | Weekly                                | SC and PIMU               | N/A                                                  |
| Soil Erosion | The soil would be exposed to erosion due to excavations for laying of sewers and water supply pipes. Construction activities such as clearing, excavation, filling, grading and setting up construction camps will affect the existing soil condition in the study area/ AoI. The clearing of vegetation can also loosen the soil and make it more susceptible to erosion due to wind and rain. There is also a possibility of silt runoff during rainy season | Good engineering practices will help to control or minimize soil erosion both at the construction sites and in peripheral areas including provision of shuttering; | CC, SC, PRMSC                 | Provision of shuttering                            | Once                                  | SC and PIMU               | N/A                                                  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Use of heavy machinery will be restricted as far as possible to avoid the destruction of soil structure;                                                           | CC, SC, PRMSC                 | Movement of machinery                              | During Construction Work              | SC and PIMU               | N/A                                                  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Confining excavations to the specified spots as per the approved engineering drawings and unnecessary excavations should be avoided;                               | CC, SC, PRMSC                 | Excavations beyond the specified spots             | During excavation works               | SC and PIMU               | N/A                                                  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Stored excavated material shall be covered and preferably reused, e.g., in construction as backfill etc.                                                           | CC, SC, PRMSC                 | Wastage of excavated material; Backfilling         | During backfilling                    | SC and PIMU               |                                                      |



| Activity           | Impacts                                                                                                                                                                                                                                                                                                                                                       | Mitigation Measures                                                                                                                                                                   | Implementation Responsibility | Monitoring Indicators                                                                              | Monitoring Frequency | Monitoring Responsibility | Cost |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------|----------------------|---------------------------|------|
|                    | causing soil erosion. During the rain, the eroded soil will mix with stagnant water to transform into slush, which can affect movement of vehicles and machinery and construction workers as well as limit the movements of local people. This impact can be categorized as low adverse, site-specific, long term, permanent, highly probable and reversible. |                                                                                                                                                                                       |                               |                                                                                                    |                      |                           |      |
| Soil Contamination | Contamination of soil may be caused by oil and chemical spills from construction machinery or uncontrolled runoff from equipment washing yards. This impact is permanent and minor negative in nature.                                                                                                                                                        | Chemicals/ hazardous products and wastes will be stored on impermeable surfaces in secure, covered areas with clear labelling of containers and with a tray or bund to contain leaks; | CC, SC, PRMSC                 | Monitoring compliance to Regular disposal of Chemical/ Hazardous waste; Photographic record;       | Monthly              | SC and PIMU               | N/A  |
|                    |                                                                                                                                                                                                                                                                                                                                                               | All construction wastes from the site will be regularly removed and transported to approved waste disposal sites                                                                      | CC, SC, PRMSC                 | No fall of transported material; Damaged road repaired. Record of harmful incidents that occurred. | Weekly               | SC and PIMU               | N/A  |





| Activity                      | Impacts                                                                                                                                                                                                                                                                                                                                                                      | Mitigation Measures                                                                                                                                               | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency | Monitoring Responsibility | Cost |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|----------------------|---------------------------|------|
|                               |                                                                                                                                                                                                                                                                                                                                                                              | Washing yards will be paved to avoid seepage of runoff from the yard;                                                                                             | CC, SC, PRMSC                 | Visual Inspection     | Weekly               | SC and PIMU               | N/A  |
|                               |                                                                                                                                                                                                                                                                                                                                                                              | Awareness in emergency spill response procedures will be conducted through trainings;                                                                             | CC, SC, PRMSC                 | Training Sessions     | Once                 | SC and PIMU               | N/A  |
|                               |                                                                                                                                                                                                                                                                                                                                                                              | Oil leakages, chemicals and other liquids spills will be avoided/ minimized by providing appropriate storage places depending on the type of material for storage | CC, SC, PRMSC                 | Visual Inspection     | Weekly               | SC and PIMU               | N/A  |
| Trench Failure                | The major construction activities involve excavation operations for laying water supply and sewerage lines. The major hazard associated with the excavation operations is trench failure. The unstable slopes may fail and settle in the trenches which may cause injuries and fatalities to the workers. This impact is probable, site specific and high adverse in nature. | Provision of adequate shuttering in the trenches;                                                                                                                 | CC, SC, PRMSC                 | Visual Inspection     | Weekly               | SC and PIMU               | N/A  |
|                               |                                                                                                                                                                                                                                                                                                                                                                              | Leftover shuttering may also be used in case of loose soil strata.                                                                                                | CC, SC, PRMSC                 | Visual Inspection     | Weekly               | SC and PIMU               | N/A  |
| Construction Camps/Camp Sites | Improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which may include noise,                                                                                                                                                                                                          | Working hours of noisy activities will be limited to normal daytime working hours when near identified sensitive receptors;                                       | CC, SC, PRMSC                 | Field Observations    | Weekly               | SC and PIMU               | N/A  |
|                               |                                                                                                                                                                                                                                                                                                                                                                              | Waste Management Plan will be implemented to include procedures for the classification, storage and disposal                                                      | CC, SC, PRMSC                 | Compliance to waste   | Monthly              | SC and PIMU               | N/A  |



| Activity      | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                         | Mitigation Measures                                                                                                                                                        | Implementation Responsibility | Monitoring Indicators                                                                  | Monitoring Frequency              | Monitoring Responsibility | Cost                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------|-----------------------------------|---------------------------|------------------------------------|
|               | health and safety, traffic problems, soil degradation, loss of vegetation and assets on the selected land, solid waste and water pollution. Furthermore, cultural differences, behavior of construction workers, potential disregard for local cultural norms can lead to increased tension between local communities and workers residing in the construction camps. This impact is temporary and moderate negative in nature. | of all construction wastes and the training of employees who handle hazardous materials;                                                                                   |                               | management plan;                                                                       |                                   |                           |                                    |
|               |                                                                                                                                                                                                                                                                                                                                                                                                                                 | Construction camps will be established away from populated areas                                                                                                           | CC, SC, PRMSC                 | Camp established at least 500m away from the nearest community; Local hired workforce; | Once                              | SC and PIMU               | N/A                                |
|               |                                                                                                                                                                                                                                                                                                                                                                                                                                 | NOC/ lease agreement will be signed between landowners and contractors.                                                                                                    | CC, SC, PRMSC                 | Lease agreement signed / NOC obtained                                                  | Once before start of construction | SC and PIMU               | N/A                                |
|               |                                                                                                                                                                                                                                                                                                                                                                                                                                 | Regular training of workers will be carried out regarding local cultural norms, human behaviour, gender issues by the contractor during construction activities at site.   | CC, SC, PRMSC                 | Any complaint from the local community.                                                | Weekly check complaint register   | SC and PIMU               | Cost is provide in the ESMP Budget |
| Water Quality | Runoff and erosion from exposed soil surfaces, earthwork areas and stockpiles e.g., grouting and cement material with the rain. Construction waste, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table                                                                                                                                       | Protection of groundwater reserves from any source of contamination such as the construction and oily waste by making the ground impermeable through sheets or compaction; | CC, SC, PRMSC                 | Monitoring compliance; Water quality testing.                                          | Quadrimesterly                    | SC and PIMU               | N/A                                |
|               |                                                                                                                                                                                                                                                                                                                                                                                                                                 | Stockpiles of cement and other construction materials will be kept covered when not being used;                                                                            | CC, SC, PRMSC                 | Use of tarpaulin for protection; Visual Inspection                                     | Weekly                            | SC and PIMU               | N/A                                |



| Activity    | Impacts                                                                                                                                                                                                                                                 | Mitigation Measures                                                                                                                          | Implementation Responsibility | Monitoring Indicators                                                                                                                     | Monitoring Frequency | Monitoring Responsibility | Cost |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------|------|
|             | and hence, will end up contaminating groundwater. There is a probability that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater and channels carrying water. | Maintenance of vehicles will be carried out only in impermeable areas where any oil spillages can be contained;                              | CC, SC, PRMSC                 | Any spill observed;<br>Availability of sealed containers for used oils and lubricants;<br>Disposal options (e.g., local vendor) explored. | Weekly               | SC and PIMU               | N/A  |
|             |                                                                                                                                                                                                                                                         | Careful planning of the works to avoid soil excavation works during rainy seasons;                                                           | CC, SC, PRMSC                 | Visual Inspection                                                                                                                         | During rainy season  | SC and PIMU               | N/A  |
|             |                                                                                                                                                                                                                                                         | No activity will be undertaken in monsoon and careful attention must be paid to the weather forecast before excavation operations.           | CC, SC, PRMSC                 | Visual Inspection                                                                                                                         | During rainy season  | SC and PIMU               | N/A  |
|             |                                                                                                                                                                                                                                                         | All kinds of waste will be stored in covered containers and disposed of safely as soon as possible;                                          | CC, SC, PRMSC                 | Visual Inspection                                                                                                                         | Weekly               | SC and PIMU               | N/A  |
|             |                                                                                                                                                                                                                                                         | The contractor will ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged.      | CC, SC, PRMSC                 | Visual Inspection                                                                                                                         | Weekly               | SC and PIMU               | N/A  |
| Air Quality | Air quality will be affected by various construction activities. Emissions may be spread over longer distances                                                                                                                                          | All vehicles, machinery, equipment and generators used during construction activities will be kept in good working condition, properly tuned | CC, SC, PRMSC                 | Dust emission controlled;                                                                                                                 | Weekly               | SC and PIMU               | N/A  |



| Activity | Impacts                                                                                                                                                                                                                                         | Mitigation Measures                                                                                                                          | Implementation Responsibility | Monitoring Indicators                       | Monitoring Frequency | Monitoring Responsibility | Cost                      |
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|          | depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. In certain climatic condition such as hot summer, airborne dust can become a major nuisance if control techniques are not properly employed | and maintained in order to minimize the exhaust emissions;                                                                                   |                               |                                             |                      |                           |                           |
|          |                                                                                                                                                                                                                                                 | Open burning of solid waste from the contractor's camps will be strictly banned;                                                             | CC, SC, PRMSC                 | Monitoring compliance to disposal of waste; | Weekly               | SC and PIMU               | N/A                       |
|          |                                                                                                                                                                                                                                                 | Fuel with substantially lower sulphur content will be preferred;                                                                             | CC, SC, PRMSC                 |                                             |                      | SC and PIMU               | N/A                       |
|          |                                                                                                                                                                                                                                                 | Personal Protective Equipment (PPEs) like masks, goggles and gloves etc. will be provided to workers;                                        | CC, SC, PRMSC                 | Implementation of HSE; Visual Inspection    | Daily                | SC and PIMU               | Cost given in ESMP Budget |
|          |                                                                                                                                                                                                                                                 | PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery will be enforced during construction works. | CC, SC, PRMSC                 | Monitoring of machinery and equipment;      | Daily                | SC and PIMU               | N/A                       |
|          |                                                                                                                                                                                                                                                 | Regular water sprinkling on the site and access roads will be carried out to suppress excessive dust emission(s)                             | CC, SC, PRMSC                 | Visual Monitoring                           | Daily                | SC and PIMU               | N/A                       |
|          |                                                                                                                                                                                                                                                 | Excavated trenches will be restored immediately to original level and paved after laying of sewer pipes;                                     | CC, SC, PRMSC                 | Visual Inspection                           | Daily                | SC and PIMU               | N/A                       |
|          |                                                                                                                                                                                                                                                 | Vehicle speed in the project area will be prescribed not more than 20 km/hr and controlled accordingly;                                      | CC, SC, PRMSC                 | Visual Inspection                           | Daily                | SC and PIMU               | N/A                       |
|          |                                                                                                                                                                                                                                                 | Diversion will be provided for local traffic movement;                                                                                       | CC, SC, PRMSC                 | Visual Inspection                           | Daily                | SC and PIMU               | N/A                       |



| Activity | Impacts                                                                                                                                                                                                                                                                                                                                                                                          | Mitigation Measures                                                                                                                                                                                                           | Implementation Responsibility | Monitoring Indicators                         | Monitoring Frequency | Monitoring Responsibility | Cost                                |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------|----------------------|---------------------------|-------------------------------------|
|          |                                                                                                                                                                                                                                                                                                                                                                                                  | The vehicles carrying construction materials and the construction material storage areas will be covered with tarpaulin.                                                                                                      | CC, SC, PRMSC                 | Use of tarpaulin for protection               | Daily                | SC and PIMU               | N/A                                 |
|          |                                                                                                                                                                                                                                                                                                                                                                                                  | Air quality monitoring should be done by the 3 <sup>rd</sup> party.                                                                                                                                                           | CC, SC, PRMSC                 | Air Quality                                   | Monthly              | SC and PIMU               | Cost is provided in ESMP Budget     |
| Dust     | During construction stage, the dust level may increase considerably. Earthworks, site clearing, stockpiling and hauling of materials will generate dust and affect the local air shed. Local people and the workers may be exposed to high dust levels during landscaping, access road and site preparation. This impact is site-specific, temporary, reversible, likely and medium significant. | Blowing of dust from potential sources at the worksite will be avoided by shielding them from the exterior, for example using polythene curtains or raising a fence of corrugated sheets around areas of active constructions | CC, SC, PRMSC                 | Visual Inspection<br>Air levels measured.     | Daily                | SC and PIMU               | N/A                                 |
|          |                                                                                                                                                                                                                                                                                                                                                                                                  | All excavation work will be sprinkled with water to control dust;                                                                                                                                                             | CC, SC, PRMSC                 | Visual Inspection                             | Daily                | SC and PIMU               | N/A                                 |
|          |                                                                                                                                                                                                                                                                                                                                                                                                  | Tires of all the vehicles leaving the site will be washed. No earth, mud, dust and the like will be deposited on the public road;                                                                                             | CC, SC, PRMSC                 | Visual Inspection                             | Daily                | SC and PIMU               | N/A                                 |
| Noise    | Noise level is expected to increase during construction activities. Main sources of noise and vibration will be heavy machinery such as excavators and other equipment. Noise generated by construction machinery is likely to affect sensitive receptors located within AoI.                                                                                                                    | Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and training them in their use;                                                                                                   | CC, SC, PRMSC                 | Visual inspections;<br>Noise levels measured. | Daily                | SC and PIMU               | Cost is provided in the ESMP Budget |
|          |                                                                                                                                                                                                                                                                                                                                                                                                  | Selection of up-to-date and well-maintained equipment with reduced noise levels will be ensured by suitable in-built damping techniques or appropriate muffling devices                                                       | CC, SC, PRMSC                 | Visual inspections;<br>Noise levels measured. | Daily                | SC and PIMU               | N/A                                 |



| Activity                                     | Impacts                                                                                                                                                                                                                                          | Mitigation Measures                                                                                                                                                                                         | Implementation Responsibility | Monitoring Indicators  | Monitoring Frequency | Monitoring Responsibility | Cost                                |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------|----------------------|---------------------------|-------------------------------------|
|                                              | Health risks associated with exposure to continuous noise levels include high blood pressure, hypertension, annoyance and sleep disturbance, temporary threshold shift etc. The impacts of noise will be temporary and highly adverse in nature. | Residents will be notified earlier before commencement of excavation operations.                                                                                                                            | CC, SC, PRMSC                 | Visual inspections;    | Daily                | SC and PIMU               | N/A                                 |
|                                              |                                                                                                                                                                                                                                                  | Noise quality monitoring should be done by the 3 <sup>rd</sup> party.                                                                                                                                       | CC, SC, PRMSC                 | Noise levels measured  | Quarterly            | SC and PIMU               | Cost is provided in the ESMP Budget |
| Municipal and Construction Waste/ Wastewater | Due to construction activities municipal and construction waste will be generated from construction activities. The construction waste will include wastewater, oil spillage from machinery, domestic waste and construction waste etc.          | Solid waste generated during construction and camp sites will be safely disposed of in demarcated waste disposal sites and the contractor will provide and implement a comprehensive waste management plan; | CC, SC, PRMSC                 | Monitoring compliance; | Weekly               | SC and PIMU               | N/A                                 |
|                                              |                                                                                                                                                                                                                                                  | Burning of waste will be prohibited;                                                                                                                                                                        | CC, SC, PRMSC                 | Visual Inspection      | Daily                | SC and PIMU               | N/A                                 |
|                                              |                                                                                                                                                                                                                                                  | Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc;                                                                                  | CC, SC, PRMSC                 | Visual Inspection      | Weekly               | SC and PIMU               | N/A                                 |
|                                              |                                                                                                                                                                                                                                                  | Emergency Response plan will be prepared to address the accidental spillage of fuels and hazardous goods;                                                                                                   | CC, SC, PRMSC                 | Visual Inspection      | Weekly               | SC and PIMU               | N/A                                 |
|                                              |                                                                                                                                                                                                                                                  | Containers with covers will be provided on site to store waste                                                                                                                                              | CC, SC, PRMSC                 | Visual Inspection      | Daily                | SC and PIMU               | N/A                                 |
| Resource Conservation                        | The materials used in construction of proposed project would include                                                                                                                                                                             | Wastage of water will be reduced by training the workers involved in water use;                                                                                                                             | CC, SC, PRMSC                 | Visual Inspection      | Daily                | SC and PIMU               | N/A                                 |





| Activity | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mitigation Measures                                                                                                | Implementation Responsibility | Monitoring Indicators                                                                          | Monitoring Frequency | Monitoring Responsibility | Cost |
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|          | coarse aggregates (crush), fine aggregates (sand), brick ballast, water 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.<br>Excessive water consumption for drinking and washing purposes by the construction staff may undermine water resources in the project area and in certain cases may disturb the existing water supplies in the project area. | Wastage of water will be controlled through providing proper valves and through controlling pressure of the water; | CC, SC, PRMSC                 | Visual Inspection                                                                              | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Water jets and sprays will be used for watering surfaces rather than using overflow system;                        | CC, SC, PRMSC                 | Visual Inspection                                                                              | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Source of water will be carefully selected. Water use will not disturb the existing community water supplies       | CC, SC, PRMSC                 | Any conflict on the water availability.                                                        | Fortnightly          | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reuse of construction waste materials will be considered;                                                          | CC, SC, PRMSC                 | Visual Inspection                                                                              | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Unnecessary equipment washings will be avoided;                                                                    | CC, SC, PRMSC                 | Visual Inspection                                                                              | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The efficient and well-maintained equipment and machinery will be used;                                            | CC, SC, PRMSC                 | Noise levels within permissible limits<br>Gas emissions minimized;<br>Dust emission controlled | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The equipment and machinery will be turned off when not in use;                                                    | CC, SC, PRMSC                 | Visual Inspection                                                                              | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Regular maintenance of machinery to avoid fuel leakages;                                                           | CC, SC, PRMSC                 | Log of vehicle and equipment repairs;                                                          | Daily                | SC and PIMU               | N/A  |



| Activity                  | Impacts                                                                                                                                                                                                                                                                                                                                                                                | Mitigation Measures                                                                                                                                                                                                      | Implementation Responsibility | Monitoring Indicators                     | Monitoring Frequency | Monitoring Responsibility | Cost |
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| Biodiversity Conservation | <u>FLORA</u><br>On account of construction of the proposed water supply and sewerage system, no trees are envisaged to be cut/disturbed. Hence there will be no direct impact on the flora of project area. However, the dust emissions due to excavation operations will stick on the leaves of existing trees and may close their stomata thus hindering the photosynthesis process. | Campsites will be established on vacant land as far as possible, at least 500 m away from the residential areas;                                                                                                         | CC, SC, PRMSC                 | Visual Inspection                         | Daily                | SC and PIMU               | N/A  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                        | Construction vehicles, machinery and equipment will remain confined within their designated areas of movement;                                                                                                           | CC, SC, PRMSC                 | Log Book of vehicle inventory             | Daily                | SC and PIMU               | N/A  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                        | The Contractor's staff and labour will be strictly directed not to damage any vegetation such as trees or bushes. They will use the paths and tracks for movement and will not be allowed to trespass through farmlands; | CC, SC, PRMSC                 | Any conflict with locals.                 | Daily                | SC and PIMU               | N/A  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                        | Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/ bushes for fuel will not be allowed.                                                                                       | CC, SC, PRMSC                 | Visual Inspection                         | Daily                | SC and PIMU               | N/A  |
|                           | <u>FAUNA</u><br>The local animals mostly cats, dogs and jackals and specially the livestock i.e., goats and cows will get disturbed due to construction activities, especially the noisy activities. However, there will be no damage to their health and life. Some reptiles and insects may get killed/ injured during excavation operations.                                        | Excavations will be limited to the approved engineering drawings;                                                                                                                                                        | CC, SC, PRMSC                 | Visual inspections; Photographic records. | Daily                | SC and PIMU               | N/A  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                        | Harassing of animals will be prohibited                                                                                                                                                                                  | CC, SC, PRMSC                 | Visual Inspection                         | Daily                | SC and PIMU               | N/A  |



| Activity                       | Impacts                                                                                                                                                                                                                                                                                                                                                                      | Mitigation Measures                                                                                                                                                                                                           | Implementation Responsibility | Monitoring Indicators                          | Monitoring Frequency | Monitoring Responsibility | Cost                            |
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| Occupational Health and Safety | Health risks and worker's safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment. The health and safety issues are also associated with the operation of construction machinery and equipment, which may cause minor and severe injuries to workers. It will be a long term and severe negative impact. | Obligatory insurance against accidents for labourers/workers;                                                                                                                                                                 | CC, SC, PRMSC                 | Accident/ Incident reported.                   | If happened          | SC and PIMU               | N/A                             |
|                                |                                                                                                                                                                                                                                                                                                                                                                              | Providing basic medical training to specified work staff and basic medical service and supplies to workers;                                                                                                                   | CC, SC, PRMSC                 | Maintained Training Record; Pictorial evidence | Weekly               | SC and PIMU               | N/A                             |
|                                |                                                                                                                                                                                                                                                                                                                                                                              | Layout plan for camp site, indicating safety measures taken by the contractor, e.g., firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents; | CC, SC, PRMSC                 | Visual inspection                              | Daily                | SC and PIMU               | N/A                             |
|                                |                                                                                                                                                                                                                                                                                                                                                                              | Work safety measures and good workmanship practices will be followed by the contractor to ensure no health risks for labourers, including use of Personal Protective Equipment (PPE) i.e., oxygen masks/ kits etc.;           | CC, SC, PRMSC                 | Visual inspection                              | Daily                | SC and PIMU               | Cost is provided in ESMP Budget |
|                                |                                                                                                                                                                                                                                                                                                                                                                              | Protection devices (ear muffs) will be provided to the workers doing job in the vicinity of high noise generating machines i.e., excavators;                                                                                  | CC, SC, PRMSC                 | Visual inspection                              | Daily                | SC and PIMU               | Cost is provided in ESMP Budget |
|                                |                                                                                                                                                                                                                                                                                                                                                                              | Use of safety signs at the construction site will be ensured.                                                                                                                                                                 | CC, SC, PRMSC                 | Visual inspection                              | Daily                | SC and PIMU               | N/A                             |
|                                |                                                                                                                                                                                                                                                                                                                                                                              | Contractor will immediately inform the consultant about the project related incident. The consultant will then                                                                                                                | CC, SC, PRMSC                 | Accident/ Incident reported.                   | If happened          | SC and PIMU               | N/A                             |



| Activity                    | Impacts                                                                                                                                                                                                                                                                                            | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                        | Implementation Responsibility | Monitoring Indicators   | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                             |                                                                                                                                                                                                                                                                                                    | submit a preliminary report to the PRMSC within 24 hours. Resultantly, PRMSC will promptly notify the World Bank for project-related incident within a maximum timeframe of 48 hours.                                                                                                                                                                                                                      |                               |                         |                      |                           |      |
| Community Health and Safety | The construction activities and vehicular movement at construction sites may result in roadside accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. Open trenches and deep manhole may cause trip & fall accidents for the local residents. | Medical screening of the laborers for communicable diseases will be conducted before hiring. Medical screenings are a basic requirement before the hiring of labour to prevent the spread of communicable diseases. However, on the basis of these screenings, diseased potential workers will not be barred from work; instead, necessary measures will be taken to prevent the spread of these diseases. | CC, SC, PRMSC                 | Medical Reports Record; | Quarterly            | Bi-Annual                 |      |
|                             |                                                                                                                                                                                                                                                                                                    | Provision of proper safety and diversion signage, particularly at sensitive/accident-prone spots;                                                                                                                                                                                                                                                                                                          | CC, SC, PRMSC                 | Visual inspection       | Daily                | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                                                                                                    | The site will be restricted for the entry of irrelevant people particularly children.                                                                                                                                                                                                                                                                                                                      | CC, SC, PRMSC                 | Visual inspection       | Daily                | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                                                                                                    | Open trenches and deep excavated manholes will be protected by fence/barricade to avoid any accident.                                                                                                                                                                                                                                                                                                      | CC, SC, PRMSC                 | Visual inspection       | Daily                | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                                                                                                    | Night time lighting will also be provided.                                                                                                                                                                                                                                                                                                                                                                 | CC, SC, PRMSC                 | Visual inspection       | Daily                | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                                                                                                    | Awareness campaign regarding HSE will also be provided to local                                                                                                                                                                                                                                                                                                                                            | CC, SC, PRMSC                 | Visual inspection       | Daily                | SC and PIMU               | N/A  |



| Activity           | Impacts                                                                                                                                                                                                                                                                                                                                                                                                       | Mitigation Measures                                                                                                                                                                                                                                                                                  | Implementation Responsibility | Monitoring Indicators        | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                    |                                                                                                                                                                                                                                                                                                                                                                                                               | Setting up speed limits within the village.                                                                                                                                                                                                                                                          | CC, SC, PRMSC                 | Visual inspection            | Daily                | SC and PIMU               | N/A  |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                               | Special consultation session will be held with the nearby medical facility to ensure that it is well informed and well equipped to handle any dust allergy cases if required.                                                                                                                        | CC, SC, PRMSC                 | Consultation Meeting Record  | Bi-annually          | SC and PIMU               | N/A  |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                               | Contractor will immediately inform the consultant about the project related incident. The consultant will then submit a preliminary report to the PRMSC within 24 hours. Resultantly, PRMSC will promptly notify the World Bank for project-related incident within a maximum timeframe of 48 hours. | CC, SC, PRMSC                 | Accident/ Incident reported. | If happened          | SC and PIMU               | N/A  |
| Traffic Management | The traffic influx within the villages is very low. Most of the traffic within the villages include motorbikes and few cars. The project interventions will not create traffic congestion issues in the project area. However, their movement will be disturbed due to the excavation and construction works and people may face accessibility issues. This impact is temporary and major negative in nature. | The construction activities will be carried out in pockets/reaches, once a patch has been completed (i.e., pipes are laid and covered) then excavation on new patch shall be started;                                                                                                                | CC, SC, PRMSC                 | Visual inspection            | Daily                | SC and PIMU               | N/A  |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                               | Local community will be taken on board to plan alternate access routes in connecting streets to ensure mobility of local traffic;                                                                                                                                                                    | CC, SC, PRMSC                 | Alternate route maps         | Daily                | SC and PIMU               | N/A  |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                               | Plan work in a minimum possible time.                                                                                                                                                                                                                                                                | CC, SC, PRMSC                 | Check targeted timeline      | Daily                | SC and PIMU               | N/A  |



| Activity                                                    | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Mitigation Measures                                                                                                                                                                                                                                               | Implementation Responsibility | Monitoring Indicators                                                             | Monitoring Frequency | Monitoring Responsibility | Cost |
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| Nuisance/<br>Disturbance to<br>Social<br>Sensitive<br>Areas | Since the proposed interventions will be carried out within the villages boundaries, therefore, the socially sensitive sites/places including schools, hospitals and religious centers will be temporarily affected due to dust, noise and the community will face accessibility issues due to open trenches. Dust due to earthworks will create health hazard to children and people with ailments. This impact is temporary and major negative in nature. | No work will be conducted near the religious places during religious congregations;                                                                                                                                                                               | CC, SC, PRMSC                 | Visual Inspection                                                                 | Daily                | SC and PIMU               | N/A  |
|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Material transport to the site will be scheduled considering school timings;                                                                                                                                                                                      | CC, SC, PRMSC                 | Visual inspection                                                                 | Daily                | SC and PIMU               | N/A  |
|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Notify concerned schools, hospitals/dispensary etc. 2 weeks prior to the work; conduct a 30 minutes awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts | CC, SC, PRMSC                 | Visual inspection                                                                 | Daily                | SC and PIMU               | N/A  |
|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.                                                                                                                     | CC, SC, PRMSC                 | Visual inspection                                                                 | Daily                | SC and PIMU               | N/A  |
| Accessibility                                               | Excavation of trenches and pipe/sewer laying work in the project area will obstruct access to residences, commercial buildings and businesses adjacent to the proposed project alignment. Disruption of access to commercial establishments may affect livelihood. The potential impacts are negative and moderate but short-term and temporary.                                                                                                            | Leave space for access between mounds of excavated soil;                                                                                                                                                                                                          | CC, SC, PRMSC                 | Visual inspection                                                                 | Daily                | SC and PIMU               | N/A  |
|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Consult affected business people to inform them in advance about the work schedule;                                                                                                                                                                               | CC, SC, PRMSC                 | Consultation meeting;<br>Pictorial evidence                                       | Weekly               | SC and PIMU               | N/A  |
|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             | If there are any holidays (i.e., Eid or Muharram etc.), the Contractor will complete the backfilling work of the trenches and will not leave any trench open before holidays;                                                                                     | CC, SC, PRMSC                 | Visual inspection<br>Designated borrow and quarry areas used for access material; | Daily                | SC and PIMU               | N/A  |





| Activity                                       | Impacts                                                                                                                                                                                                                                                                                             | Mitigation Measures                                                                                                                                                                                                                                         | Implementation Responsibility | Monitoring Indicators                              | Monitoring Frequency                       | Monitoring Responsibility | Cost |
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|                                                |                                                                                                                                                                                                                                                                                                     | Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints;                                                                                                                        | CC, SC, PRMSC                 | Visual inspection                                  | Weekly                                     | SC and PIMU               | N/A  |
| Resilience to Climate Change                   | There are chances that the open trenches may get flooded during rainy season. Flooding can hamper the construction of overhead storage tanks, pumping station and STP. This impact can be categorized as direct, local, medium term, temporary and reversible.                                      | Project components have been designed to withstand flooding;                                                                                                                                                                                                | CC, SC, PRMSC                 | Design provisions                                  | Once (after completion of Detailed Design) | SC and PIMU               | N/A  |
|                                                |                                                                                                                                                                                                                                                                                                     | The capacity of the sewerage/ drainage system have been designed and constructed based on extreme weather conditions predicted under international climate change models for Bhawana region to cater for extreme storm water runoff.                        | CC, SC, PRMSC                 | Check Meteorological department prediction of rain | Before construction                        | SC and PIMU               | N/A  |
| Liquid and Solid Waste from Construction Camps | Development of construction camps will generate significant quantities of liquid and solid waste. A total of five (05) nos. construction camps will be established in all five villages accommodating approximately 30 skilled and unskilled staff each (i.e., total 150 workers for all villages). | The waste generated from the camp site will be disposed of at existing dumping site of the Tehsil Bhawana by the Contractor;                                                                                                                                | CC, SC, PRMSC                 | Visual inspection                                  | Daily                                      | SC and PIMU               | N/A  |
|                                                |                                                                                                                                                                                                                                                                                                     | Construction workers and supervisory staff will be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste;                                                                                             | CC, SC, PRMSC                 | Through Trainings<br>Photographic record;          | Monthly                                    | SC and PIMU               | N/A  |
|                                                |                                                                                                                                                                                                                                                                                                     | Domestic and chemical effluents from the construction camp will be disposed of by the development of on-site sanitation systems i.e., septic tank prior to discharge to nearby drain. Septic tank will be located adjacent to the construction camp. Proper | CC, SC, PRMSC                 | Visual inspection                                  | Daily                                      | SC and PIMU               | N/A  |



| Activity                          | Impacts                                                                                                                                                                                                                                                                                                       | Mitigation Measures                                                                                                                                                                                                | Implementation Responsibility | Monitoring Indicators                                                               | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                                   |                                                                                                                                                                                                                                                                                                               | monitoring to check the compliance of PEQS will be carried out;                                                                                                                                                    |                               |                                                                                     |                      |                           |      |
|                                   |                                                                                                                                                                                                                                                                                                               | All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper SWM system. Toxic waste will be handled, stored, transported and disposed separately; | CC, SC, PRMSC                 | Monitoring compliance to Regular disposal of waste;<br>Photographic record;         | Weekly               | SC and PIMU               | N/A  |
|                                   |                                                                                                                                                                                                                                                                                                               | The waste will be properly sealed in containers with proper labels indicating the nature of the waste;                                                                                                             | CC, SC, PRMSC                 | Covered disposal containers placed at camp;                                         | Weekly               | SC and PIMU               | N/A  |
|                                   |                                                                                                                                                                                                                                                                                                               | Solid waste will be segregated at source so that it can be re-used or recycled                                                                                                                                     | CC, SC, PRMSC                 | Covered disposal containers placed at camp;                                         | Weekly               | SC and PIMU               | N/A  |
| Flammable and Hazardous Materials | Flammable materials to be used during the construction activities include diesel, furnace oil, petrol, Liquefied Petroleum Gas (LPG), kerosene oil and machinery fuels. These materials present little risk to the environment, if properly transported stored and used; otherwise, they are potentially very | Safety procedures will be followed by the contractor and labors strictly while using, handling and storage of these materials;                                                                                     | CC, SC, PRMSC                 | Visual inspection                                                                   | Daily                | SC and PIMU               | N/A  |
|                                   |                                                                                                                                                                                                                                                                                                               | Trainings will be provided to the contractor's staff for handling and using of flammable materials and explosives;                                                                                                 | CC, SC, PRMSC                 | Monitoring compliance to handling of flammable material through inventory register; | Daily                | SC and PIMU               | N/A  |



| Activity                    | Impacts                                                                                                                                                                                                                     | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                             | dangerous. Improper storage and handling practices for these flammable and explosive materials can pose dangers of fire and blasts in the area.                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                               | Photographic record;  |                      |                           |      |
|                             |                                                                                                                                                                                                                             | For safety of construction labors and immediate communities, it is suggested that contractor's staff will be trained about the procedures of safe use, handling and storage of materials;                                                                                                                                                                                                                                                                                                                | CC, SC, PRMSC                 | Visual observation    | Twice a week         | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                             | Emphasis will be to decrease the volume of mucking material by reusing and then the disposal at the marked area in environment friendly way. In order to reduce the volume of disposal material, maximum part of the excavated material can be used in other activities filling of borrow areas and natural depressions in the project area. In order to increase the aesthetics of the area, native grass can be planted by dumping the surplus material in the proposed area with suitable soil cover. | CC, SC, PRMSC                 | Visual inspection     | Weekly               | SC and PIMU               | N/A  |
| Gender Based Violence (GBV) | During construction phase, gender-based violence might arise due to discrimination made against women by unequal work distribution and unequal pay structure among others. Sexual harassment against women might occur as a | Awareness will be created among the females at individual and community levels about the construction sites;                                                                                                                                                                                                                                                                                                                                                                                             | CC, SC, PRMSC                 |                       |                      | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                             | Workers will not be allowed to crowd in the residential communities within the site;                                                                                                                                                                                                                                                                                                                                                                                                                     | CC, SC, PRMSC                 | Visual observation    | Twice a week         | SC and PIMU               | N/A  |
|                             |                                                                                                                                                                                                                             | Alternative routes for pedestrian will be provided to avoid mixing of women with workers;                                                                                                                                                                                                                                                                                                                                                                                                                | CC, SC, PRMSC                 | Visual Inspection     | Daily                | SC and PIMU               | N/A  |



| Activity        | Impacts                                                                                                                                                            | Mitigation Measures                                                                                                                                                                                                         | Implementation Responsibility | Monitoring Indicators                     | Monitoring Frequency                             | Monitoring Responsibility | Cost |
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|                 | consequence of mixing of men and women at the construction site, and moving on the roads and markets. This impact is negative in nature during construction stage. | Raise awareness among the communities of the potential risks of GBV, and establish response services in the nearby communities that can respond to instances of GBV (particularly those related to issues of labor influx); | CC, SC, PRMSC                 | Reported issues;<br>Awareness campaigns   | Daily                                            | SC and PIMU               | N/A  |
|                 |                                                                                                                                                                    | The Contractor will make sure that no discrimination is made on the basis of gender while hiring of workers;                                                                                                                | CC, SC, PRMSC                 | Hiring Criteria                           | Before Hiring                                    | SC and PIMU               | N/A  |
|                 |                                                                                                                                                                    | Provisions of gender disaggregate bathing, changing, and sanitation facilities;                                                                                                                                             | CC, SC, PRMSC                 | Design provisions                         | Once (before construction of construction camps) | SC and PIMU               | N/A  |
|                 |                                                                                                                                                                    | Contractor will take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially in relation to women.                                                                 | CC, SC, PRMSC                 | Visual inspection;<br>Complaints reported | Daily                                            | SC and PIMU               | N/A  |
|                 |                                                                                                                                                                    | The Contractor will prepare the Codes of Conduct and get it signed by all workers, and effectively communicate to all workers and project beneficiaries.                                                                    | CC, SC, PRMSC                 | Hiring Criteria                           | Before Hiring                                    | SC and PIMU               | N/A  |
| Influx of Labor | Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious,                          | Labour camp(s) will be established away from residential population;                                                                                                                                                        | CC, SC, PRMSC                 | As per approved site                      | Once                                             | SC and PIMU               | N/A  |
|                 |                                                                                                                                                                    | Preference will be given to the local people to work with contractor, and contractor should hire maximum labour force from the project area                                                                                 | CC, SC, PRMSC                 | Hiring Criteria                           | Once before hiring                               | SC and PIMU               | N/A  |



| Activity | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                     | Mitigation Measures                                                                                                                                                                                            | Implementation Responsibility | Monitoring Indicators                    | Monitoring Frequency | Monitoring Responsibility | Cost |
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|          | cultural or ethnic differences, or based on competition for local resources;<br>Increased risk of illegitimate behaviour and crime: The influx of workers and service providers into communities may increase the rate of crimes and a perception of insecurity by the local community. Such illegitimate behaviour and crimes can include theft, physical assaults, substance abuse, sexual assault and human trafficking; | because this will reduce the labour influx                                                                                                                                                                     |                               |                                          |                      |                           |      |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Awareness will be created among the work force to ensure respect for local customs;                                                                                                                            | CC, SC, PRMSC                 | Monitor training record                  | Monthly              | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Construction work will be completed within the stipulated time to move workers to next location;                                                                                                               | CC, SC, PRMSC                 | Visual inspection                        | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Labor force will be shuffled with the time;                                                                                                                                                                    | CC, SC, PRMSC                 | Visual inspection                        | Weekly               | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Create awareness among workers on proper sanitation and hygiene practices to endorse proper health and maintain good housekeeping practices at all project sites;                                              | CC, SC, PRMSC                 | Visual inspection                        | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Provide adequate personal hygiene facilities in good condition with adequate supply of clean water;                                                                                                            | CC, SC, PRMSC                 | Visual inspection                        | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Make arrangements to treat the affected workers on time to control the movement of vectors disease                                                                                                             | CC, SC, PRMSC                 | Visual inspection;<br>Complaint reported | Daily                | SC and PIMU               | N/A  |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                             | Sensitize workers and surrounding communities on awareness and prevention of HIV/AIDS and sexually transmitted infections (STI) through training, awareness campaigns and workshops during community meetings; | CC, SC, PRMSC                 | Complaint reported                       | Weekly               | SC and PIMU               | N/A  |



| Activity                         | Impacts                                                                                                                                                                                                                                                                                                          | Mitigation Measures                                                                                                                                        | Implementation Responsibility | Monitoring Indicators                     | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                                  |                                                                                                                                                                                                                                                                                                                  | Provide proper and free HIV/AIDS and STI health screening and counselling for site workers and community members;                                          | CC, SC, PRMSC                 | Hiring protocols                          | Before hiring        | SC and PIMU               | N/A  |
|                                  |                                                                                                                                                                                                                                                                                                                  | Develop and enforce a strict code of conduct for workers to regulate behaviour in the local communities;                                                   | CC, SC, PRMSC                 | Visual inspection;<br>Complaint reported  | Weekly               | SC and PIMU               | N/A  |
|                                  |                                                                                                                                                                                                                                                                                                                  | Prohibiting drugs, alcohol, weapons, and ammunition on the worksite among personnel;                                                                       | CC, SC, PRMSC                 | Visual inspection;<br>Complaints reported | Daily                | SC and PIMU               | N/A  |
|                                  |                                                                                                                                                                                                                                                                                                                  | The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft.  | CC, SC, PRMSC                 | Visual inspection                         | Daily                | SC and PIMU               | N/A  |
| Social/<br>Cultural<br>Conflicts | During the construction phase of the project, conflicts may arise between labor force and local community. Use of local resources and products by the construction workers can generate stress on the local biophysical resources. Furthermore, difference in cultural values may also cause discomfort to local | Public notification through announcements in local mosques during the entire construction phase to avoid any inconvenience in accessibility to the locals; | CC, SC, PRMSC                 | Visual inspection                         | Daily                | SC and PIMU               | N/A  |
|                                  |                                                                                                                                                                                                                                                                                                                  | Establishment of formal links with affected communities;                                                                                                   | CC, SC, PRMSC                 | Visual inspection                         | Weekly               | SC and PIMU               | N/A  |
|                                  |                                                                                                                                                                                                                                                                                                                  | Plan for social grievance redress mechanisms including the local leaders and community representatives;                                                    | CC, SC, PRMSC                 | During construction of the work           | Weekly               | SC and PIMU               | N/A  |





| Activity                                     | Impacts                                                                                                                                                                                                                                                                                                                            | Mitigation Measures                                                                                                                                                                                                                            | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                                              | residents. This impact is temporary and minor negative in nature.                                                                                                                                                                                                                                                                  | Local labor will preferably be employed for construction works;                                                                                                                                                                                | CC, SC, PRMSC                 | Hiring Policies       | Once (Before Hiring) | SC and PIMU               | N/A  |
|                                              |                                                                                                                                                                                                                                                                                                                                    | Careful planning and training of workforce to minimize disturbance to the local people;                                                                                                                                                        | CC, SC, PRMSC                 | Visual inspection     | Daily                | SC and PIMU               | N/A  |
|                                              |                                                                                                                                                                                                                                                                                                                                    | Contractor will preferably arrange their own sources of water.                                                                                                                                                                                 | CC, SC, PRMSC                 | Visual observations   | Daily                | SC and PIMU               | N/A  |
| Child Labor                                  | Due to poverty and feeble financial situation of the area, the underaged children might get involved with the contractor various construction works. This will be the violation of the Child Labor Act. Furthermore, SEA/SH issues might arise which will create social conflicts. This impact is adverse and temporary in nature. | Standard clause in the contracts related to child labor explicit prohibitions, etc.) and contractor will ensure compliance to the contractual provisions on bonded and child labor, equal wages for similar work explicit prohibitions, etc.). | CC, SC, PRMSC                 | Visual Observation    | Daily                | SC and PIMU               | N/A  |
| Anticipated Impacts during Operational Phase |                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                |                               |                       |                      |                           |      |
| Soil                                         | The soil quality may be affected due to leakage/ infiltration from sewer lines and STP bed. The sludge generated from cleaning/ maintenance of pumping stations, manholes, sewers and STP may contaminate the soil. The liner of the STP, while desludging may                                                                     | Sludge shall be treated prior to ultimate use/disposal. Various options for sludge treatment include Digestion, Drying/ Dewatering, Composting, Lime Stabilization, Heat Treatment must be considered;                                         | PRMSC                         | Visual inspection     | Weekly               | PIMU-PRMSC                | N/A  |



| Activity    | Impacts                                                                                                                                                                                                                                                                                                           | Mitigation Measures                                                                                                | Implementation Responsibility | Monitoring Indicators             | Monitoring Frequency | Monitoring Responsibility | Cost                      |
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|             | get dried and cracks may lead to the seepage of wastewater and thus contaminate the soil. Improper disposal of scum and sludge is another concern. This is a moderate negative impact.                                                                                                                            |                                                                                                                    |                               |                                   |                      |                           |                           |
| Air Quality | The operation of sewerage scheme will result in generation of gases including H <sub>2</sub> S and CH <sub>4</sub> . H <sub>2</sub> S is a foul-smelling poisonous gas which might be harmful for the sewer-men and could be fatal sometimes. CH <sub>4</sub> is natural gas also referred to as a greenhouse gas | Provision of exhaust gas vents at appropriate locations in the design                                              | PRMSC                         | Visual inspection                 | Monthly              | PIMU-PRMSC                | N/A                       |
|             |                                                                                                                                                                                                                                                                                                                   | Sewer-men will cover their faces with gas mask while entering the sewer for cleaning or maintenance purposes;      | PRMSC                         | Visual inspection;<br>Use of PPEs | Weekly               | PIMU-PRMSC                | Cost given in ESMP Budget |
|             |                                                                                                                                                                                                                                                                                                                   | It's better to use sucking machinery for cleaning of sewers;                                                       | PRMSC                         | Availability                      | Once                 | PIMU-PRMSC                | N/A                       |
|             |                                                                                                                                                                                                                                                                                                                   | Use gas detector before inspection;                                                                                | PRMSC                         | Visual inspection                 | Daily                | PIMU-PRMSC                | N/A                       |
|             |                                                                                                                                                                                                                                                                                                                   | Adequate tree plantation must be done around the STP to control the spread of odour;                               | PRMSC                         | Visual inspection                 | Weekly (maintenance) | PIMU-PRMSC                | N/A                       |
| Odour       | STP are designed on adequate waste loading and function well if they are not overloaded. The overloading will result in malfunctioning of STP and it will result in significant odour generation in the vicinity. This impact is temporary and high adverse in nature.                                            | The STP should not be overloaded and personnel dealing in operation should be trained to avoid operational issues; | PRMSC                         | Visual inspection                 | Daily                | PIMU-PRMSC                | N/A                       |



| Activity    | Impacts                                                                                                                                                                                                                                                                                                                        | Mitigation Measures                                                                                                     | Implementation Responsibility | Monitoring Indicators         | Monitoring Frequency | Monitoring Responsibility | Cost |
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| Solid Waste | Domestic and hazardous wastes would be generated during cleaning and maintenance activities. The solid waste during operational phase will consist of plastics, metal and organic wastes present in sewer lines which can cause blockage in sewerage system.                                                                   | Waste shall be collected, stored and disposed of according to relevant standards in approved facilities;                | PRMSC                         | Visual inspection             | Weekly               | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | An organized collection system and its implementation through a licensed contractor;                                    | PRMSC                         | Hiring of licensed contractor | Once                 | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | The containers will be timely removed and the fine will be imposed on contractor in case of violations;                 | PRMSC                         | Visual inspection             | Daily                | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | Closed containers will be used for transportation of waste to the dumping site;                                         | PRMSC                         | Visual inspection             | Weekly               | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | Schedule inspection of the sewer lines and STP to keep it clean and to identify any hazardous material;                 | PRMSC                         | Visual inspection             | Daily                | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | Solid waste bins shall be placed at appropriate locations to avoid its mixing in wastewater.                            | PRMSC                         | Visual inspection             | Weekly               | PIMU-PRMSC                | N/A  |
| Sludge      | Sludge is semi solid material which will be settled at the bottom of the STP due to anaerobic decomposition of biomass. Significant amount of sludge will not be produced in ABR; however, periodic desludging will be done to achieve good removal efficiency. The removed sludge in wet form, if left unattended will create | Appropriate sludge treatment must be undertaken before disposal of sludge;                                              | PRMSC                         | Visual inspection             | Monthly              | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | The sludge must never be left unattended and should be transferred to designated dumping site after adequate treatment; | PRMSC                         | Visual inspection             | Monthly              | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | Dried sludge can be used as a land conditioner in the fields.                                                           | PRMSC                         | Visual inspection             | Monthly              | PIMU-PRMSC                | N/A  |
|             |                                                                                                                                                                                                                                                                                                                                | In case of maintenance/sludge removal, alternative ponds shall remain functional;                                       | PRMSC                         | Visual inspection             | Monthly              | PIMU-PRMSC                | N/A  |



| Activity       | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency | Monitoring Responsibility | Cost |
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|                | nuisance i.e., odor, soil contamination, groundwater contamination (through percolation/seepage) and will serve as breeding ground for disease vector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Inlet and outlet pipework access/maintenance pits should be inspected regularly for blockages. These pits should be covered at other times.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PRMSC                         | Visual inspection     | Daily                | PIMU-PRMSC                | N/A  |
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | The water must be bypassed during rain and flooding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRMSC                         | Visual inspection     | During rain          | PIMU-PRMSC                | N/A  |
| Brine Disposal | In case of operation of RO filtration Plants, around 75% of water is rejected and 25% is consumed as treated product water. It means that for every 2000 lph capacity RO plant; we require 6000 lph of raw water to be treated from which 4000 lph will be the RO reject or brine. So, per day 32000 litres of wastewater will be generated from a single RO. The rejected water is free from bacteria, viruses and other pathogens but has only dissolved particles in it. RO concentrate disposal issues present significant design and operational challenges that must be addressed. Conventional disposal techniques mostly suffer from direct or indirect contamination of water/soil. | This water should not be thrown into municipal sewer, rather it should be reused. The reject water will be discharge into irrigation channels where flow will be controlled to ensure proper dilution and water will be used for irrigation.<br>Brine can be managed through controlled dilution with freshwater or treated effluent to reduce salinity before reuse for irrigation of non-food vegetation e.g, in Barley, sugar beet, and date palms (southern Punjab).<br>Reuse of brine for dust suppression on unpaved roads can be considered where environmentally acceptable.<br>Planting halophytic grasses and shrubs in designated areas can help utilize saline water while stabilizing soil.<br>Small-scale ponds with brine-tolerant fish or shrimp species can be developed in suitable areas. | PRMSC                         | Visual inspection     | Monthly              | PIMU-PRMSC                |      |



| Activity                                                                            | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                                               | Mitigation Measures                                                                                                                | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency | Monitoring Responsibility | Cost                            |
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| Community Health Hazards                                                            | During desludging and cleaning operations the sludge will be piled up temporarily along the manholes and will be a hazard for passers-by and local community. This impact is temporary and moderate negative in nature.<br>The treated wastewater from STP will be used in agricultures in nearby areas. The community using the part will be exposed to the effects of treated wastewater. This impact is permanent and moderate negative in nature. | The treated wastewater shall be routed to the agricultural area in a way that there must not be physical contact of the community; | PRMSC                         | Visual inspection     | Daily                | PIMU-PRMSC                | N/A                             |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The community must be educated on the effects of treated wastewater to avoid health issues;                                        | PRMSC                         | Through Seminars      | Yearly               | PIMU-PRMSC                | N/A                             |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The sludge must be timely removed from the site and the area must be barricaded during desludging and cleaning periods.            | PRMSC                         | Visual inspection     | Monthly              | PIMU-PRMSC                | N/A                             |
| Cumulative Impact of Several Water extraction Points and Sewerage Treatment Systems | Cumulative impact may occur as a result of development of several treatment plants or several water extraction points.                                                                                                                                                                                                                                                                                                                                | Water quality monitoring should be done by the third party on quarterly basis to ensure the supply of safe drinking water.         | PRMSC                         | WHO Guideline /PEQS   | Quarterly            | PIMU-PRMSC                | PCRWR through Separate contract |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Groundwater table will be monitored periodically.                                                                                  | PRMSC                         | Depth in meter/feet   | Quarterly            | PIMU-PRMSC                | N/A                             |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Maintenance of ABR should be done annually for its smooth operations.                                                              | PRMSC                         | Visual inspection     | Annually             | PIMU-PRMSC                | N/A                             |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Ensure the treated effluent follows the National Environmental Quality Standards                                                   | PRMSC                         | PEQS                  | Monthly              | PIMU-PRMSC                | PCRWR through                   |



| Activity         | Impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Mitigation Measures                                                                                                                                                      | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency           | Monitoring Responsibility | Cost              |
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|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                          |                               |                       |                                |                           | Separate contract |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Water metering system should be installed to know the total consumption of water.                                                                                        | PRMSC                         | Water Meters          | Once at the time of connection | PIMU-PRMSC                | N/A               |
| Social Inclusion | It is crucial to ensure that every stakeholder of the community have equal access on the provision of clean drinking water and sanitation facilities, improved healthcare facilities, educational facilities and on economic excess and job opportunities. In this proposed project efforts will be made to promote the participation of marginalized groups, such as women and minorities, elderly person in decision-making processes and community activities | Providing awareness campaigns to increase knowledge and understanding of the project and challenges faced by marginalized groups.                                        | PRMSC                         | Visual inspection     | Weekly                         | PIMU-PRMSC                | N/A               |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Providing awareness on the importance of clean drinking water & sanitation, education, job training, and community services to underserved and marginalized populations. | PRMSC                         | Visual inspection     | Weekly                         | PIMU-PRMSC                | N/A               |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Fostering partnerships between PRMSC-TO and VOs/VCs to promote social inclusion to address the root causes of social exclusion.                                          | PRMSC                         | Visual inspection     | Monthly                        | PIMU-PRMSC                | N/A               |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Regular monitoring and evaluation of project policies and programs to ensure they are effective and inclusive                                                            | PRMSC                         | Visual inspection     | Weekly                         | PIMU-PRMSC                | N/A               |
| Elite Capture    | Elite capture is often facilitated by corruption, nepotism, and patronage networks, which enable the elites to manipulate the system in their favor. The consequences of elite                                                                                                                                                                                                                                                                                   | To avoid elite capture the VLD will not be accepted from the person having more than 25 acres land                                                                       | PRMSC                         | Visual inspection     | Monthly in meeting of VO       | PIMU-PRMSC                | N/A               |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Involving multiple stakeholders, including community members, in decision-making processes related to project activities.                                                | PRMSC                         | Visual inspection     | Monthly in meeting of VO       | PIMU-PRMSC                | N/A               |





| Activity                        | Impacts                                                                                                                                         | Mitigation Measures                                                                                                       | Implementation Responsibility | Monitoring Indicators | Monitoring Frequency                                 | Monitoring Responsibility | Cost |
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|                                 | capture are far-reaching, with the general public often left without access to basic amenities such as health, education, water and sanitation. | Robust and transparent GRM will be implemented                                                                            | PRMSC                         | Visual inspection     | Daily                                                | PIMU-PRMSC                | N/A  |
|                                 |                                                                                                                                                 | To promote the participation of marginalized groups, such as women and minorities, in decision-making processes           | PRMSC                         |                       |                                                      |                           |      |
|                                 |                                                                                                                                                 | Strengthening institutions such as VO's/VC's and regulatory agencies without undue influence from elites                  | PRMSC                         | Visual inspection     | Once at the time of VO's formation or Change in VO's | PIMU-PRMSC                | N/A  |
|                                 |                                                                                                                                                 | Due diligence will be held during VLD process to absolve the doner from all the associated land rights.                   | PRMSC                         | Visual inspection     | Once at the time of VLD                              | PIMU-PRMSC                | N/A  |
| End users of Treated wastewater | The VO of the village will decide the distribution rights of treated wastewater according to the needs of community.                            | End water users will adopt water conservation measures such as reducing water wastage, using efficient irrigation methods | PRMSC                         | Awareness campaigns   | Weekly                                               | PIMU-PRMSC                | N/A  |
|                                 |                                                                                                                                                 | Equal rights of the community on the usage of treated water will be ensure by the VO's.                                   | PRMSC                         | Visual inspection     | Need Basis                                           | PIMU-PRMSC                | N/A  |
|                                 |                                                                                                                                                 | Distribution of treated wastewater will be decided by VO's/VCS in village                                                 | PRMSC                         | VO's Meeting          | Need Basis                                           | PIMU-PRMSC                | N/A  |
|                                 |                                                                                                                                                 | VO will ensure monitoring and evaluation on regular basis regarding the usage and conservation of treated water           | PRMSC                         | Visual inspection     | Need Basis                                           | PIMU-PRMSC                | N/A  |
|                                 |                                                                                                                                                 | Awareness campaigns will be conducted on the understanding and                                                            | PRMSC                         | Awareness campaigns   | Once at the time of VLD                              | PIMU-PRMSC                | N/A  |



| Activity                               | Impacts                                                                                                                                                                 | Mitigation Measures                                                                                                                            | Implementation Responsibility | Monitoring Indicators        | Monitoring Frequency | Monitoring Responsibility | Cost                            |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------|----------------------|---------------------------|---------------------------------|
|                                        |                                                                                                                                                                         | importance of water conservation and its impacts.                                                                                              |                               |                              |                      |                           |                                 |
| Occupational Health and Safety Hazards | Infections resulting from direct contact with treated wastewater, and from infected wounds; and Intestinal infections that are transmitted by flies feeding on the STP. | The Contractor should prepare OHS and ERPs during operation phase;                                                                             | PRMSC                         | Implementation of OHS & ERPs | Daily                | PIMU-PRMSC                | N/A                             |
|                                        |                                                                                                                                                                         | Instructing the workforce on handling of treated wastewater;                                                                                   | PRMSC                         | Visual inspection            | Daily                | PIMU-PRMSC                | N/A                             |
|                                        |                                                                                                                                                                         | Provide basic medical training to the specified work staff and basic medical service and supplies to workers;                                  | PRMSC                         | Visual inspection;           | Daily                | PIMU-PRMSC                | N/A                             |
|                                        |                                                                                                                                                                         | Obligatory insurance of work laborers against accidents;                                                                                       | PRMSC                         | Visual inspection            | Fortnightly          | PIMU-PRMSC                | N/A                             |
|                                        |                                                                                                                                                                         | Provision of safety measures such as emergency sirens, firefighting equipment, first aid, and contingency measures in case of accidents;       | PRMSC                         | Visual inspection            | Monthly              | PIMU-PRMSC                | Cost is provided in ESMP budget |
|                                        |                                                                                                                                                                         | PRMSC-Tehsil Office, within 24 hours, will promptly notify the World Bank for project-related incident within a maximum timeframe of 24 hours. | PRMSC- Tehsil Office          | Accident/ Incident reported. | If happened          | PRMSC                     | N/A                             |

#### KEY

CC Construction Contractor

DC Design Consultant

EPA Environment Protection Agency

SC Supervision Consultant

PIMU-PRMSC Project Implementation Unit – Punjab Rural Municipal Services Company



## **SECTION -10 Grievance Redressal Mechanism (GRM)**

The Grievance Redress Mechanism (GRM), outlines the policy and procedure for documenting, addressing, responding, and employing methods to resolve project grievances and complaints that may emerge during and after PRSWSSP sub-projects implementation. It will also cater to managing any disconnects that emerge from the field level and that have significant implications for the effective implementation of the sub-project interventions.

In an effort to deter fraud and corruption, the use of a dedicated mobile application has been proposed for reporting grievances from the field level to district and provincial headquarters. This will not only provide a coherent system of checks and balances but will also enable swift redressal and effective monitoring of complaints.

The PIMU at the Local Government & Community Development Department (LG&CDD) level will serve as the Secretariat for the Grievance Redressal Committee (GRC Directorate) that will be responsible for providing oversight on the entire GRM process at a strategic level and monitoring complaints management.

Water supply & sanitation are imperative daily basis facilities. Due to, continuous use and all-time requirement, there is a tendency for routine O&M requirements of the facilities. O&M will be needed as soon as project interventions are completed in the village. Due to the huge number of beneficiaries spread, a comprehensive complaint redressal model is indispensable for Service Delivery Unit (SDU). The Grievance Redress Mechanism (GRM) will be consistent with the Component 4 Project Management and Monitoring sub-component 4.2 Grievance Redressal Model is part of the Project of PRSWSSP. Project activities may cause social friction if Projects do not have an effective GRM.

### **10.1 Objectives**

The Grievance Redressal Mechanism (GRM) will be consistent with the requirements of the World Bank safeguard policies to ensure the mitigation of community concerns, risk management, and maximization of environmental and social benefits. The overall objective of the GRM is therefore to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the village level.

The GRM will be accessible to diverse members of the community, including women, senior citizens, and other vulnerable groups. Culturally, appropriate communication mechanisms will be used at all sub-project sites both to spread awareness regarding the GRM process as well as complaints management. This GRM will be integrated with the PRSWSSP overall project GRM hotline

### **10.2 Disclosure of GRM**

The final processes and procedures for the GRM will be translated into local languages and disseminated at all sub-project locations. These shall be made available (in both leaflet and poster format) to all subproject locations through the offices of each SDU. Dedicated male and female Grievance Focal Persons for each sub-project location will play an instrumental role in spreading awareness regarding the GRM, including the use of information technology for reporting and monitoring complaints. It will be ensured that the GRM will be easily accessible for all beneficiaries and workers to raise workplace concerns.



### 10.3 Records and Monitoring

The Project Director's Office will maintain an electronic database at the PIMU that will provide a summary of complaints received and mitigations. The PD office will also provide an analysis of the grievances at each sub-project location using a pre-designed Monitoring and Evaluation (M&E) template that will give insight into the type of complaints received and a qualitative and quantitative review of grievance redressal. The PD's office will also be responsible for uploading the actions and results for each grievance for each sub-project location on a periodic basis to the Project website. The dedicated mobile application that will be used to communicate grievances will provide the basis for recording complaints both at the provincial and district levels.

Apart from the electronic database that will be maintained at the PIMU level, a manual register of all complaints and actions taken will be maintained by the Environmental and Social Focal Persons at the Office of the SDU-TOs and a manual register of all day-to-day complaints and their grievance redressal details will be maintained by VOs their office.

GBV-related issues will be recorded through GRM, two separate focal persons for males and females are part of Village Organization VO – which will also work as tier-1 of the Grievance Redressal Committee (GRC). The female focal person – trained on the referral directory – will be responsible for further referral of GBV-related complaints to the forums concerned. A multi-sectoral referral system is proposed, which will include referral to The Punjab Women's Toll-Free Helpline 1043 available 24/7. It is managed and supervised by Punjab Commission on the Status of Women (PCSW). Their helpline team comprises all-women call agents, three legal advisors, a psychosocial counselor, supervisors, and management staff. Moreover, awareness and advocacy training at schools and community level would be conducted on social protection mechanisms/ referral mechanisms vis-à-vis Gender-Based Violence (physical, sexual, verbal, psychological, etc.), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH). The Punjab Commission on the Status of Women (PCSW) has been identified as a key stakeholder. PCSW will be informed of the project activities and an institutional link will be established. Furthermore, at the PRMSC Tehsil Office, the Behavior Change and Communication (BCC) Officer – in addition to being member of GRC Tier-I&II – will initially deal with gender related issues/ complaints and further refer the same to the Gender Specialist at Head Office, PRMSC.

### 10.4 Proposed Institutional Mechanisms

It is proposed to establish the following prior to commencing project implementation activities including pre-construction activities:

Tehsil Level-Public Complaints Center (PCC) in SDU-TO will be responsible to receive, log, and resolve complaints at the site and in Village-level. The complainant would be able to launch a complaint on a toll-free number, mobile application, message, or telephone.





**Tier I:** Village level –Panchayat/Village Councils (VC) made under Punjab Local Government (Amendment) Ordinance 2021 will act as the 1st Tier of GRM at the village/community level. Since VCs are not functional, the Project Appraisal Document (PAD) recommends establishment of informal Village Organizations (VOs) in lieu of VCs until formal VCs are elected. This informal VO will comprise of nine (09) members including a chairperson. All the members of the VO will be elected by the village community except a line department's representative and a BCC Officer of the PRMSC. These non-elected members are part of the VOs to give credence/ recognition to the VO. Moreover, the BCC Officer will forward the unaddressed complaints to the Tier-II of the GRC.

**Tier II:** Grievance Redress Committee (GRC-Tehsil Level) in SDU-TO will be established for each tehsil that will manage GRM aspects for all sub-project locations in each tehsil including decisions to be taken, actions and monitoring of complaints resolution at the sub-project level. GRC-II, Tier-II comprises of nine (09) members. Respective Tehsil Manager will spearhead the Tier-II. Moreover, to ensure community participation in the Tier-II, the chairperson of the concerned village – from where the complaint is lodged – will also be a member.

**Tier III:** PIMU Level-GRC at PMIU (LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly review. GRC Tier-III will comprise of nine (09) members. The Project Director / Chief Executive Officer, PRMSC, will spearhead the Tier-III. Moreover, to ensure community participation in the Tier-III, the chairperson of the concerned village – from where the complaint is lodged – will also be a member.

The composition of GRCs of all tiers has been attached as Annexure-6.

## 10.5 GRM Process Implementation

The grievance redress process is described hereunder:

Through the envisaged system, the complainant would be able to launch a complaint on a toll-free number, mobile application, message, or telephone (GRM can accept anonymous grievances).

Details of the complaints and the complainants will be entered into the system and a complaint number will be provided to the complainant through SMS.

In SDU a specific person will be designated to monitor the system and issue necessary instruction to relevant quarter for necessary action.

The GRM will provide an interface to complainants to check the status of their complaint and a dashboard for SDU & PIMU to monitor the progress on the complaints.

The system will bridge the gap between the masses and the service provider.

Monitoring officers will precisely know the details of pending complaints in every SDU. The performance of the SDU could also be easily monitored through it.

The GRM will have a built-in escalation system for moving unresolved complaints to higher levels.

## 10.6 Mode of Complaint

The complainant can lodge their complaints by opting the following modes:





|                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |
| <b>Written Application</b>                                                        | <b>Telephonically</b>                                                             | <b>Verbally</b>                                                                   | <b>Android Application</b>                                                         | <b>Website</b>                                                                      |

### 10.7 GRM Procedures and Timelines

The tracking and documenting of grievance resolutions will include the following elements:

- Tracking complainant(s) from subprojects sites (field and community level) to PIMU;
- Dedicated staff to update the database routinely;
- Promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism;
- Processes for informing stakeholders about the status of a case; and
- Procedures to retrieve data for reporting purposes, including the periodic reports, from Village and Tehsil and document them into the monthly progress reports at PIMU.

GR (Village level) will be responsible to receive, log, and resolve complaints at the village level. The Grievance Redress Committee at the village Panchayats will review and identify actions to be taken to address the complaints at its weekly meeting. If not resolved timely then complaint would be referred to GRC-Tehsil Level (SDU-TO) within 3 days after receiving.

GRC-SDU-TO will try to resolve the complaints in a satisfactory manner anyhow, if not satisfactorily resolved by the village panchayats/councils and Tehsil level, then the grievance will be referred for consideration by GRC at the PIMU/LG&CDD level within one week.

Every effort will be made to address or resolve grievances within the following fixed timelines, which will be an indicator of the performance of the handling system. Acknowledgment of a written submission will be issued to the complainant within three working days.

If the complainant is not satisfied, the complaint will have the option to seek redress through the court of law.

### 10.8 GRM Procedures for Contractor:

The contractor will add a detailed description of GRM, uptake channels, handling process, and confidential reporting system in C-ESMP.





## SECTION -11 ENVIRONMENTAL BUDGET

### 11.1 ESMP Cost

As per letter Ref. No. PRMSC/PRSWSSP/EDCS/ESS/19 dated 10-01-2025, the Environmental and Social Management Plan (ESMP) cost has been finalized at PKR 1,520,575 per village, as agreed by PRMSC in consultation with the World Bank representative. Accordingly, for the total one hundred ninety-three (193) villages, the ESMP cost amounts to PKR-293,470,975. The implementation and expenditure of ESMP measures during the construction phase shall be the responsibility of the Contractor. Breakup cost is given below:

| Sr No.                              | Description                | Amount PKR     |
|-------------------------------------|----------------------------|----------------|
| 1                                   | ESMP cost for one Village  | 1,520,575      |
| 2                                   | ESMP cost for 193 Villages | 293,470,975    |
| <b>Grand Total in Million (RS.)</b> |                            | <b>293.470</b> |

The ESMP budget consists of six main components:

- Personal Protective Equipment (PPE)
- Health Safety Environment and Trainings,
- Environmental testing and monitoring,
- CESMP formulation Cost,
- HSE Supervision Cost (staffing),
- Waste Management and Housekeeping

**Table 11.1: Village-wise ESMP Cost**

| Village-wise ESMP Cost     |                                   |                  |
|----------------------------|-----------------------------------|------------------|
| Sr.                        | ESMP Component                    | Cost (PKR)       |
| 1                          | PPE                               | 581,950          |
| 2                          | HSE & Training                    | 416,500          |
| 3                          | Env. Monitoring                   | 286,125          |
| 4.                         | CESMP formulation Cost            | 50,000           |
| 5                          | HSE Supervision Cost              | 120,000          |
| 6.                         | Waste Management and Housekeeping | 66,000           |
| <b>Total (One Village)</b> |                                   | <b>1,520,575</b> |

Breakup of each component of the ESMP cost is provided below:

### 11.2 Budget Estimate for PPE During the Construction Phases

Personal Protective Equipment cost is including in the ESMP Cost significantly for Health, Safety and Environment and divided into two categories according to the size of villages small & Large. Breakup of the estimate of the HSE cost for villages is provided in Table 11.2. Which includes safety items ear plugs, helmets, safety shoes, protective goggles, Gloves, Masks and first aid kits.



**Table 11.2: Budget Estimate for HSE During the Construction Phase**

| Sr. No.                               | Item Description            | ISO / Standard Code / Description                                                                                                                                                                                                                                                                               | Unit | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|---------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------|------------------------|-------------|
| <b>Personal Protective Equipments</b> |                             |                                                                                                                                                                                                                                                                                                                 |      |                |                        |             |
| 1                                     | Safety Jackets              | EN ISO 20471: 360 degree visibility<br>Fluorescent yellow/orange; retro-reflective strips; breathable mesh fabric; secure Velcro or zipper closure, provided in appropriate sizes are required by Staff, PRMSC name and logo printed                                                                            | Each | 654            | 30                     | 19620       |
| 2                                     | Safety Helmets              | EN-397<br>High-density polyethylene (HDPE) or ABS plastic; adjustable screw harness; Adjustable headbands, chin straps, and non-allergic sweatbands. color-coded (white for engineers, yellow for workers)<br>PRMSC Brading and LOGO PRINTED with sr number mentioned on each helmet for ease of record keeping | Each | 5668           | 30                     | 170040      |
| 3                                     | Safety Gloves               | EN 388 :<br>Nitrile-coated or leather palm; abrasion and cut-resistant; breathable back; conforms to EN388 safety ratings                                                                                                                                                                                       | Each | 650            | 50                     | 32500       |
| 4                                     | Dust Mask (Dust proof mask) | ISO 16975:<br>Disposable N95 or FFP2 class mask; elastic bands; nose clip for sealing; replace after use                                                                                                                                                                                                        | Each | 500            | 100                    | 50000       |
| 5                                     | Safety Shoes & Toes         | EN ISO 20345, requiring a toe cap to withstand a minimum 200-joule impact and 15 kilonewtons (kN) of compression<br>Steel toe cap; anti-slip, oil-resistant sole; leather upper; ankle support for shoes only                                                                                                   | Each | 8175           | 35                     | 286125      |
| 6                                     | Safety Harness Belt         | ISO 10333:<br>High-tenacity polyester webbing, minimum width 45mm; adjustable shoulder and thigh straps with metal buckles; dorsal D-ring for fall arrest, side D-rings for positioning; and chest strap with quick-connect buckle; Renowned Brand                                                              | Each | 4905           | 3                      | 14715       |



| Sr. No. | Item Description   | ISO / Standard Code / Description                                                                      | Unit | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|---------|--------------------|--------------------------------------------------------------------------------------------------------|------|----------------|------------------------|-------------|
| 7       | Protective Goggles | ISO 16321:<br>Anti-fog, scratch-resistant; side shielding for wrap-around protection; adjustable strap | Each | 545            | 10                     | 5450        |
| 8       | Ear Plugs          | ISO 4869-1:<br>Soft polyurethane foam; noise reduction rating (NRR) of 30 dB or more                   | Each | 175            | 20                     | 3500        |

### 11.3 Break Up of Health Safety & Environment

Budget estimate for HSE composed of cost of medical screening of communicable diseases of the labors, cost of tarpaulins to cover the construction material while transporting or storage, cost of handling and disposal of hazardous materials and solid waste, provision of fire alarms and fire extinguishers for fire fighting in case of fire emergency. A special provision for the COVID-19 measure is also part of HSE budget estimate, which will not be utilized if corona situation aggravates and government announce special measures are required to be taken to contain spread of virus. Breakup of the estimate of the HSE cost for village is provided in Table 11.3.

**Table 11.3: Break Up of Personal Protective Equipment**

| Health Safety Environment Materials / Testing |                        |                                                                                                                                                                                                                                                                                                                                                                                    | Unit | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|-----------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------|------------------------|-------------|
| 9                                             | First Aid Kit          | ISO 7010-E003:<br>Painkiller, eyewash solution, antibiotic ointment, thermometer, plasters, sterile gauze, dressings, sterile eye dressings, triangular bandages, crepe rolled bandages, safety pins, disposable sterile gloves and tweezers), pain killers, burn creams, pyodine solution (big bottle), other medication as required by tehsil team is adequate size and quantity | Each | 27250          | 1                      | 27250       |
| 10                                            | Warning / Safety Signs | ISO 7010:<br>Weatherproof PVC or Plastic or aluminum signs; reflective print; standardized colors and pictograms (danger, caution, mandatory)                                                                                                                                                                                                                                      | Each | 500            | 25                     | 12500       |
| 11                                            | Green Mesh             | Green safety netting for site periphery; 50% shading; UV-stabilized HDPE material.                                                                                                                                                                                                                                                                                                 | S.ft | 40             | 200                    | 8000        |



| Health Safety Environment Materials / Testing |                                                                     |                                                                                                                                                                                                                     | Unit      | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|-----------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|------------------------|-------------|
| 12                                            | DCP Fire Extinguisher (Dry Chemical Powder)                         | ISO 7165:<br>6-kg; ABC type; The extinguishing agent is mono ammonium phosphate and ammonium sulphate powder and the discharge time of the agent is 13 second                                                       | No.       | 11990          | 1                      | 11990       |
| 13                                            | CO <sub>2</sub> Fire Extinguisher                                   | ISO 7165:<br>5 kg; frost-free horn; suitable for electrical and liquid fires; discharge time of the agent in 13 second)                                                                                             | No.       | 14170          | 1                      | 14170       |
| 14                                            | Fire Alarm                                                          | ICS 13.030.10:<br>Proper segregation, PPE for handlers, timely removal, recordkeeping per solid waste rules                                                                                                         | No.       | 10900          | 2                      | 21800       |
| 15                                            | Trapuline                                                           | Waterproof tarpaulin sheet made from polyethylene or canva                                                                                                                                                          | Sq.ft     | 600            | 30                     | 18000       |
| 16                                            | Safety Cones                                                        | UV-resistant PVC or rubber material; at least 28 to 36 inches in height; high-visibility orange color with reflective collars (minimum 4-inch reflective band) for day and night visibility                         |           | 3270           | 12                     | 39240       |
| 17                                            | Tree Plantation                                                     | 5-6 feet height; Native species plantation; soil preparation and watering included                                                                                                                                  | No.       | 545            | 100                    | 54500       |
| 18                                            | Barricading / Fencing (Reflective tape, poles, safety mesh/netting) | ISO 13857:<br>Includes poles, reflective tape, plastic mesh netting; minimum 3 feet height; durable and visible                                                                                                     | Rft       | 20             | 300                    | 6000        |
| 19                                            | Trainings                                                           | HSE Training, Rescue Training, Labour Code of Conduct, Environmental Code of Conduct, Defensive Driver Trainings, Labour Laws and Labour Rights, GAP Training, C-ESMP Training and anyother as required by E&S wing | Quarterly | 27250          | 4                      | 109000      |



| Health Safety Environment Materials / Testing |                               |                                                  | Unit     | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|-----------------------------------------------|-------------------------------|--------------------------------------------------|----------|----------------|------------------------|-------------|
| 20                                            | Water Sprinkling              | Water sprinkling through tank mounted on tractor | Per Trip | 1500           | 30                     | 45000       |
| 21                                            | Medical Screening for Workers | CBC, Anti HCV, HBsAG, HIV, RPR, LFTs, RFTs etc.  | Persons  | 1635           | 30                     | 49050       |

#### 11.4 Environmental Monitoring Cost

Provision for the environmental monitoring is part of the cost of ESMP. Environmental Monitoring will help the client to assess the negative impacts on air and water quality of the concerned villages. Table 11.4 provide the cost of Environmental Monitoring in village.

**Table 11.4: Environmental Monitoring Cost**

| Environmental Testing and Monitoring |                                |                                                                                    | Unit | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|--------------------------------------|--------------------------------|------------------------------------------------------------------------------------|------|----------------|------------------------|-------------|
| 22                                   | Ambient Air Quality Monitoring | As per the parameters and methodology defined by EPA (Quarterly in every village)  | Each | 27250          | 3                      | 81750       |
| 23                                   | Groundwater Quality Test       | As per the parameters and methodology defined by EPA (Quarterly in every village)  | Each | 21800          | 3                      | 65400       |
| 24                                   | Surface Water Quality Test     | (As per the parameters and methodology defined by EPA (Quarterly in every village) | Each | 21800          | 3                      | 65400       |
| 25                                   | waste Water Quality Test       | (As per the parameters and methodology defined by EPA (Quarterly in every village) | Each | 21800          | 3                      | 65400       |
| 26                                   | Noise Level Monitoring         | (As per the parameters and methodology defined by EPA (Quarterly in every village) | Each | 2725           | 3                      | 8175        |



## 11.5 Training Program

The environmental and social training will help to ensure that the requirements of the ESMP are clearly understood and followed by all project personnel. The primary responsibility of providing this training to all project personnel will be that of the contractor and ESC. The training will be provided to different professional groups separately such as managers, skilled personnel, unskilled labors, and camp staff. Table 11.5 provides detail of the training required for the implementation of ESMP during the construction phase.

**Table 11.5: Training For Contractors by PRMSC and EDCS consultants**

| Training Activity                                                     | Participants                                    | Type of Training   | Content                                                                  | Scheduling |
|-----------------------------------------------------------------------|-------------------------------------------------|--------------------|--------------------------------------------------------------------------|------------|
| <b>Construction Phase (10 months)</b>                                 |                                                 |                    |                                                                          |            |
| Environment code of practices                                         | Contractor Staff                                | Presentation       | Awareness & applicability of environmental code of practices             | Once       |
| Revision of Environment code of practice                              | Contractor Staff                                | Presentation       | Revision on Awareness & applicability of environmental code of practices | Once       |
| Waste Management                                                      | Contractor Staff                                | Lecture            | Awareness associated with waste Storage, collection and safe disposal    | Once       |
| Workers Code of Conduct                                               | Contractor Staff                                | Presentation & FGD | Do's and don't's of community interaction                                | twice      |
| Grievance Redress Mechanism                                           | All relevant project staff including contractor | Presentation & FGD | roles and procedures of GRM                                              |            |
| Awareness workshop regarding Covid 19 and other vector borne diseases | Contractor Staff                                | Presentation       | Risk, Prevention and available treatment                                 | Once       |
| 2Community/ occupational health and safety                            | Contractor Staff                                | Lecture            | Awareness on EHS Guidelines                                              | Once       |





| Training Activity           | Participants                     | Type of Training | Content                                                                                                   | Scheduling |
|-----------------------------|----------------------------------|------------------|-----------------------------------------------------------------------------------------------------------|------------|
| Emergency Response          | Contractor Staff                 | Workshop         | Potential natural and other hazard/emergencies and dealing with emergency to minimize damage              | Once       |
| WB OPs & PEPA Regulations   | Managerial Staff of Contractor   | Lecture          | Awareness on World Bank OPs, PEPA rules, guidelines, regulation and standards for satisfactory compliance | Once       |
| Resettlement Related Issues | Contractor and ESC Staff of PIMU | Lecture          | Awareness on OP 4.12 (Involuntary Resettlement)                                                           | Once       |
| Labour Code of Practise     | Contractor Staff                 | Lecture          | Awareness & applicability of Laboral code of practices                                                    | Once       |
| Gender Aspects              | Contractor Staff                 | Lecture          | Awareness on gender inequalities/GBV OP 4.20                                                              | Once       |

### 11.6 Institutional Capacity & Strengthening

In order to ensure that the ESMP provisions are implemented efficiently and effectively, capacity building/ strengthening of the implementing parties are required. Therefore, based on the assessment of the institutional capacities of the parties involved in the implementation of the ESMP, the following broad areas of capacity building/strengthening have been identified and recommended for effective implementation of the ESMP.

Table 11.6 shows the positions proposed for institutional strengthening for effective implementation of environmental and social mitigation measures and a cost of PKR 120,000 is dedicated to each village and it is anticipated that each procurement package will consist of 8 to 12, villages providing sufficient financial compensation for the HSE supervision staff to be hired on contractor payroll.



**Table 11.6: HSE Supervision**

| Institutional Strengthening | Position                 | Scheduling (Months) | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------|--------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contractor                  | Environmental/HSE Expert | 10                  | <ul style="list-style-type: none"> <li>Responsible for the overall implementation of ESMF processes and procedures in the light of WB policies and Guidelines and local policies and procedures;</li> <li>Closely follow up the integration of safeguard assessment information and inclusion of safeguards self-screening process at the project development and design stage;</li> <li>Provide technical support during proposal development, project design, appraisal process, and resource mobilization plan for the sub-projects in all locations;</li> <li>Undertake follow-up monitoring to ensure that proposed mitigation measures are implemented according to an agreed-upon environmental and social mitigation implementation plan;</li> <li>Closely provide assistance and design capacity building/training program for the overall implementation of ESMF from PIMU to village level and deliver capacity building training to the field teams to close knowledge/skill gaps and minimize the likelihood of risks happening to sub-projects;</li> <li>Ensure that appropriate environmental and social mitigation measures are proposed and met;</li> <li>Undertake to follow-up monitoring to ensure that proposed mitigation measures are implemented according to an agreed-upon environmental and social mitigation and implementation plan;</li> <li>At the PIMU level, maintain the record of all information, documents evidence, and reports including progress reports, TPV Reports, training reports, ESMPs, Screening Checklists, etc.;</li> <li>Closely work with SSS and Gender Specialists at the PIMU level and provide technical assistance and advice to the Environment/ Water Quality Officers based at SDU-TO</li> </ul> |

### 11.7 ESMP Cost of Village

Table 11.7 provides the calculated cost of the Environmental and Social Management Plan (ESMP) The total estimated cost of ESMP is **293.470 PKR million** for 193 Revenue villages in the tehsil Liaqatpur.



**Table 11.7: ESMP Implementation Cost - Village Wise**

| ESMP IMPLEMENTATION COST - Village Wise |                             |                                                                                                                                                                                                                                                                                                                 |                            |                |                        |             |
|-----------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|------------------------|-------------|
| Sr. No.                                 | Item Description            | ISO / Standard Code / Description                                                                                                                                                                                                                                                                               | PROPOSED FOR 1800 villages |                |                        |             |
|                                         |                             |                                                                                                                                                                                                                                                                                                                 | Unit                       | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
| Personal Protective Equipments          |                             |                                                                                                                                                                                                                                                                                                                 |                            |                |                        |             |
| 1                                       | Safety Jackets              | EN ISO 20471: 360 degree visibility<br>Fluorescent yellow/orange; retro-reflective strips; breathable mesh fabric; secure Velcro or zipper closure, provided in appropriate sizes are required by Staff, PRMSC name and logo printed                                                                            | Each                       | 654            | 30                     | 19620       |
| 2                                       | Safety Helmets              | EN-397<br>High-density polyethylene (HDPE) or ABS plastic; adjustable screw harness; Adjustable headbands, chin straps, and non-allergic sweatbands. color-coded (white for engineers, yellow for workers)<br>PRMSC Brading and LOGO PRINTED with sr number mentioned on each helmet for ease of record keeping | Each                       | 5668           | 30                     | 170040      |
| 3                                       | Safety Gloves               | EN 388 :<br>Nitrile-coated or leather palm; abrasion and cut-resistant; breathable back; conforms to EN388 safety ratings                                                                                                                                                                                       | Each                       | 650            | 50                     | 32500       |
| 4                                       | Dust Mask (Dust proof mask) | ISO 16975:<br>Disposable N95 or FFP2 class mask; elastic bands; nose clip for sealing; replace after use                                                                                                                                                                                                        | Each                       | 500            | 100                    | 50000       |
| 5                                       | Safety Shoes & Toes         | EN ISO 20345, requiring a toe cap to withstand a minimum 200-joule impact and 15 kilonewtons (kN) of compression<br>Steel toe cap; anti-slip, oil-resistant sole; leather upper; ankle support for shoes only                                                                                                   | Each                       | 8175           | 35                     | 286125      |
| 6                                       | Safety Harness Belt         | ISO 10333:<br>High-tenacity polyester webbing, minimum width 45mm; adjustable                                                                                                                                                                                                                                   | Each                       | 4905           | 3                      | 14715       |



| ESMP IMPLEMENTATION COST - Village Wise              |                        |                                                                                                                                                                                                                                                                                                                                                                                    |                            |                |                        |             |
|------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|------------------------|-------------|
| Sr. No.                                              | Item Description       | ISO / Standard Code / Description                                                                                                                                                                                                                                                                                                                                                  | PROPOSED FOR 1800 villages |                |                        |             |
|                                                      |                        |                                                                                                                                                                                                                                                                                                                                                                                    | Unit                       | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|                                                      |                        | shoulder and thigh straps with metal buckles; dorsal D-ring for fall arrest, side D-rings for positioning; and chest strap with quick-connect buckle; Renowned Brand                                                                                                                                                                                                               |                            |                |                        |             |
| 7                                                    | Protective Goggles     | ISO 16321:<br>Anti-fog, scratch-resistant; side shielding for wrap-around protection; adjustable strap                                                                                                                                                                                                                                                                             | Each                       | 545            | 10                     | 5450        |
| 8                                                    | Ear Plugs              | ISO 4869-1:<br>Soft polyurethane foam; noise reduction rating (NRR) of 30 dB or more                                                                                                                                                                                                                                                                                               | Each                       | 175            | 20                     | 3500        |
| <b>Health Safety Environment Materials / Testing</b> |                        |                                                                                                                                                                                                                                                                                                                                                                                    |                            |                |                        |             |
| 9                                                    | First Aid Kit          | ISO 7010-E003:<br>Painkiller, eyewash solution, antibiotic ointment, thermometer, plasters, sterile gauze, dressings, sterile eye dressings, triangular bandages, crepe rolled bandages, safety pins, disposable sterile gloves and tweezers), pain killers, burn creams, pyodine solution (big bottle), other medication as required by tehsil team is adequate size and quantity | Each                       | 27250          | 1                      | 27250       |
| 10                                                   | Warning / Safety Signs | ISO 7010:<br>Weatherproof PVC or Plastic or aluminum signs; reflective print; standardized colors and pictograms (danger, caution, mandatory)                                                                                                                                                                                                                                      | Each                       | 500            | 25                     | 12500       |
| 11                                                   | Green Mesh             | Green safety netting for site periphery; 50% shading; UV-stabilized HDPE material.                                                                                                                                                                                                                                                                                                 | S.ft                       | 40             | 200                    | 8000        |



### ESMP IMPLEMENTATION COST - Village Wise

| Sr. No. | Item Description                                                    | ISO / Standard Code / Description                                                                                                                                                           | PROPOSED FOR 1800 villages |                |                        |             |
|---------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|------------------------|-------------|
|         |                                                                     |                                                                                                                                                                                             | Unit                       | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
| 12      | DCP Fire Extinguisher (Dry Chemical Powder)                         | ISO 7165:<br>6-kg; ABC type; The extinguishing agent is mono ammonium phosphate and ammonium sulphate powder and the discharge time of the agent is 13 second                               | No.                        | 11990          | 1                      | 11990       |
| 13      | CO <sub>2</sub> Fire Extinguisher                                   | ISO 7165:<br>5 kg; frost-free horn; suitable for electrical and liquid fires; discharge time of the agent in 13 second)                                                                     | No.                        | 14170          | 1                      | 14170       |
| 14      | Fire Alarm                                                          | ICS 13.030.10:<br>Proper segregation, PPE for handlers, timely removal, recordkeeping per solid waste rules                                                                                 | No.                        | 10900          | 2                      | 21800       |
| 15      | Trapuline                                                           | Waterproof tarpaulin sheet made from polyethylene or canva                                                                                                                                  | Sq.ft                      | 600            | 30                     | 18000       |
| 16      | Safety Cones                                                        | UV-resistant PVC or rubber material; at least 28 to 36 inches in height; high-visibility orange color with reflective collars (minimum 4-inch reflective band) for day and night visibility |                            | 3270           | 12                     | 39240       |
| 17      | Tree Plantation                                                     | 5-6 feet height; Native species plantation; soil preparation and watering included                                                                                                          | No.                        | 545            | 100                    | 54500       |
| 18      | Barricading / Fencing (Reflective tape, poles, safety mesh/netting) | ISO 13857:<br>Includes poles, reflective tape, plastic mesh netting; minimum 3 feet height; durable and visible                                                                             | Rft                        | 20             | 300                    | 6000        |
| 19      | Trainings                                                           | HSE Training, Rescue Training, Labour Code of Conduct, Environmental Code of Conduct, Defensive Driver Trainings,                                                                           | Quarterly                  | 27250          | 4                      | 109000      |



| ESMP IMPLEMENTATION COST - Village Wise                                    |                                |                                                                                                                                |                            |                |                        |             |
|----------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|------------------------|-------------|
| Sr. No.                                                                    | Item Description               | ISO / Standard Code / Description                                                                                              | PROPOSED FOR 1800 villages |                |                        |             |
|                                                                            |                                |                                                                                                                                | Unit                       | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs) |
|                                                                            |                                | Labour Laws and Labour Rights, GAP Training, C-ESMP Training and anyother as required by E&S wing                              |                            |                |                        |             |
| 20                                                                         | Water Sprinkling               | Water sprinkling through tank mounted on tractor                                                                               | Per Trip                   | 1500           | 30                     | 45000       |
| 21                                                                         | Medical Screening for Workers  | CBC, Anti HCV, HBsAG, HIV, RPR, LFTs, RFTs etc.                                                                                | Persons                    | 1635           | 30                     | 49050       |
| <b>Environmental Testing and Monitoring</b>                                |                                |                                                                                                                                |                            |                |                        |             |
| 22                                                                         | Ambient Air Quality Monitoring | As per the parameters and methodology defined by EPA (Quarterly in every village                                               | Each                       | 27250          | 3                      | 81750       |
| 23                                                                         | Groundwater Quality Test       | As per the parameters and methodology defined by EPA (Quarterly in every village                                               | Each                       | 21800          | 3                      | 65400       |
| 24                                                                         | Surface Water Quality Test     | (As per the parameters and methodology defined by EPA (Quarterly in every village                                              | Each                       | 21800          | 3                      | 65400       |
| 25                                                                         | waste Water Quality Test       | (As per the parameters and methodology defined by EPA (Quarterly in every village                                              | Each                       | 21800          | 3                      | 65400       |
| 26                                                                         | Noise Level Monitoring         | (As per the parameters and methodology defined by EPA (Quarterly in every village)                                             | Each                       | 2725           | 3                      | 8175        |
| <b>Site Specific / Contractors Environmntal and Social Management Plan</b> |                                |                                                                                                                                |                            |                |                        |             |
| 27                                                                         | CESMP Formulation              | By an individual or firm as approved by PRMSC Environment Wing                                                                 | per village                | 50000          | 1                      | 50000       |
| <b>HSE Staff</b>                                                           |                                |                                                                                                                                |                            |                |                        |             |
| 28                                                                         | HSE Supervisor                 | Bachelor's degree in Environmental Sciences / Engineering , NEBOSH or IOSH certification will be preffered, with over one year | Per month                  | 10000          | 12                     | 120000      |





| ESMP IMPLEMENTATION COST - Village Wise                                                                                                                                     |                                               |                                                                                                                                                          |                                              |                |                        |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|------------------------|------------------|
| Sr. No.                                                                                                                                                                     | Item Description                              | ISO / Standard Code / Description                                                                                                                        | PROPOSED FOR 1800 villages                   |                |                        |                  |
|                                                                                                                                                                             |                                               |                                                                                                                                                          | Unit                                         | Unit Rate (Rs) | Quantity (Per Village) | Amount (Rs)      |
|                                                                                                                                                                             |                                               | of experience in Occupational Health and Safety, one HSE person for 10-15 village, hiring of HSE staff will be approved by E&S prior to contract signing | per village                                  |                |                        |                  |
| <b>Waste Management and House Keeping</b>                                                                                                                                   |                                               |                                                                                                                                                          |                                              |                |                        |                  |
| 29                                                                                                                                                                          | Handling and disposal of Hazardous Material   | ICS 13.030.30:<br>Safe storage, labeling, and transportation; spill kits and secondary containment as per MSDS                                           | 3 times per village for duration of contract | 11000          | 3                      | 33000            |
| 30                                                                                                                                                                          | Handling and disposal of Solid Waste Material | ICS 13.030.10:<br>Proper segregation, PPE for handlers, timely removal, recordkeeping per solid waste rules                                              | 3 times per village for duration of contract | 11000          | 3                      | 33000            |
| Note : Cost of ESMP implementation is village wise, PKR 1520575 will be multiplied with the number of villages in the civil work contract package to obtain total ESMP cost |                                               |                                                                                                                                                          |                                              |                |                        |                  |
| <b>Total ESMP Implementation Cost per year (PKR)</b>                                                                                                                        |                                               |                                                                                                                                                          |                                              |                |                        | <b>1,520,575</b> |



## **SECTION -12 CONCLUSION AND RECOMMENDATIONS**

### **12.1 Conclusion**

The proposed water supply scheme, sewerage network, and sewage treatment plant are expected to provide significant environmental, social, and public health benefits to the project area through improved access to safe drinking water, proper wastewater collection, and environmentally sound sewage treatment and disposal. The project will contribute to improved sanitation conditions, reduction in waterborne diseases, enhancement of living standards, and overall environmental improvement.

The Environmental Impact Assessment (EIA) indicates that most of the anticipated adverse environmental and social impacts are temporary, localized, and manageable in nature, primarily associated with construction activities such as excavation, dust generation, traffic disruption, noise, waste generation, and temporary access limitations. During the operational phase, potential impacts related to wastewater leakage, sludge handling, odor emissions, and occupational health and safety may occur if not properly managed.

However, with the effective implementation of the proposed mitigation measures and the Environmental and Social Management Plan (ESMP), these impacts can be minimized to acceptable levels in compliance with applicable environmental regulations and safeguard requirements. Therefore, the project is considered environmentally and socially feasible subject to the implementation of the recommended mitigation and monitoring measures.

### **12.2 Recommendations**

The following recommendations are proposed for environmentally sustainable implementation of the project:

1. All mitigation measures identified in the ESMP shall be strictly implemented during construction and operation phases.
2. Contractors shall prepare and implement site-specific environmental, health, and safety management plans prior to commencement of construction activities.
3. Adequate measures shall be adopted to control dust, noise, wastewater, and solid waste during pipeline laying and construction works.
4. Proper traffic management and public safety arrangements shall be ensured in densely populated and sensitive areas.
5. Sewage treatment plant operations shall comply with the applicable National Environmental Quality Standards (NEQS) for treated effluent discharge.
6. Sludge generated from the sewage treatment plant shall be handled, transported, and disposed of through environmentally acceptable methods.
7. Regular environmental monitoring shall be conducted to ensure compliance with environmental standards and safeguard requirements.
8. Occupational health and safety measures, including provision of personal protective equipment (PPE), emergency response procedures, and worker training, shall be ensured throughout project implementation.



9. Public consultations and community engagement activities shall continue throughout the project lifecycle to address stakeholder concerns and maintain transparency.
10. Institutional capacity strengthening and environmental awareness training shall be conducted for project staff, contractors, and relevant stakeholders to ensure effective environmental management and long-term sustainability of the project.



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### **Annexure-1: Structural Drawings**



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# TUBE WELL DRAWING



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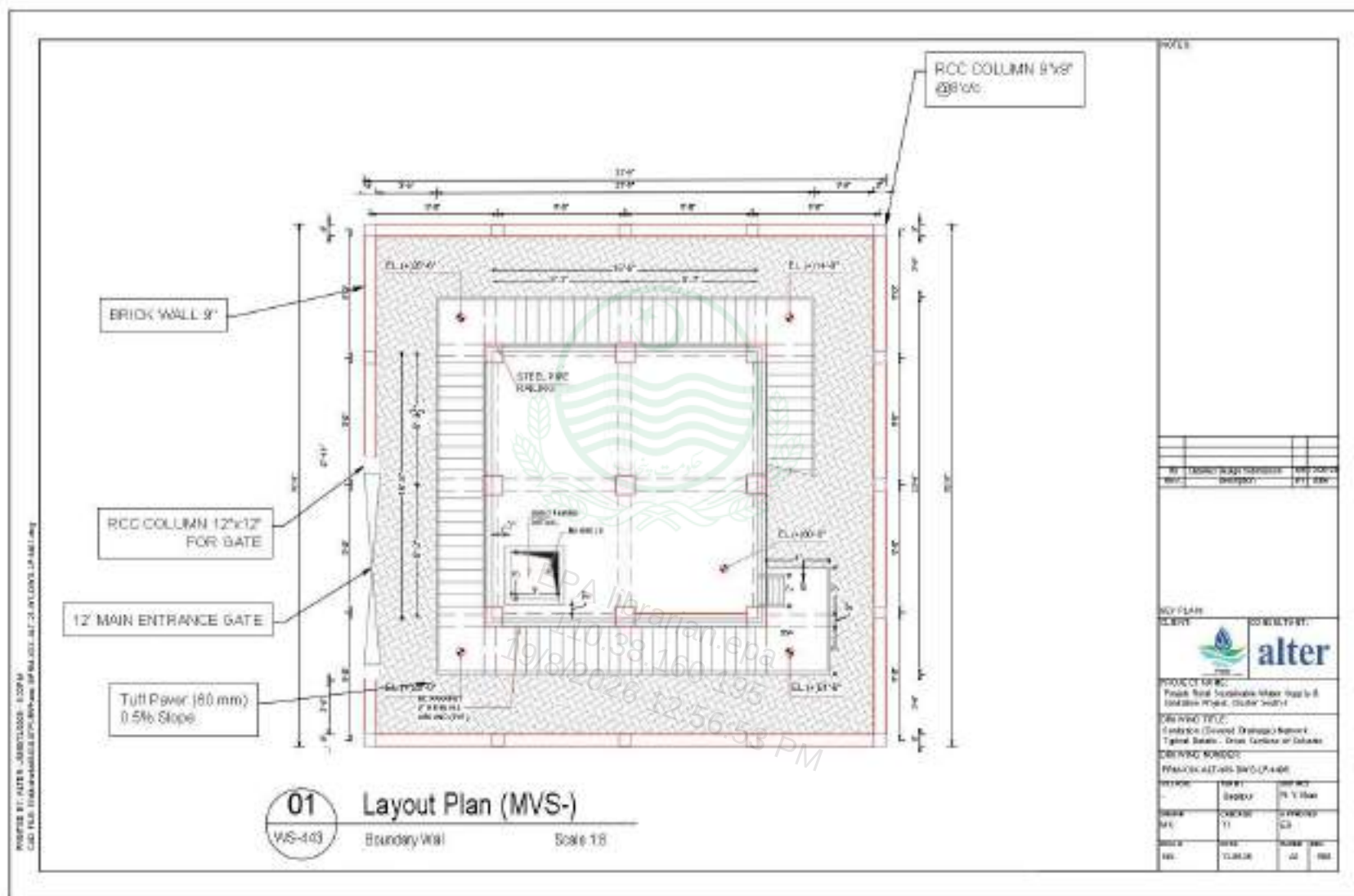




O.H.R 10,000 GLAN



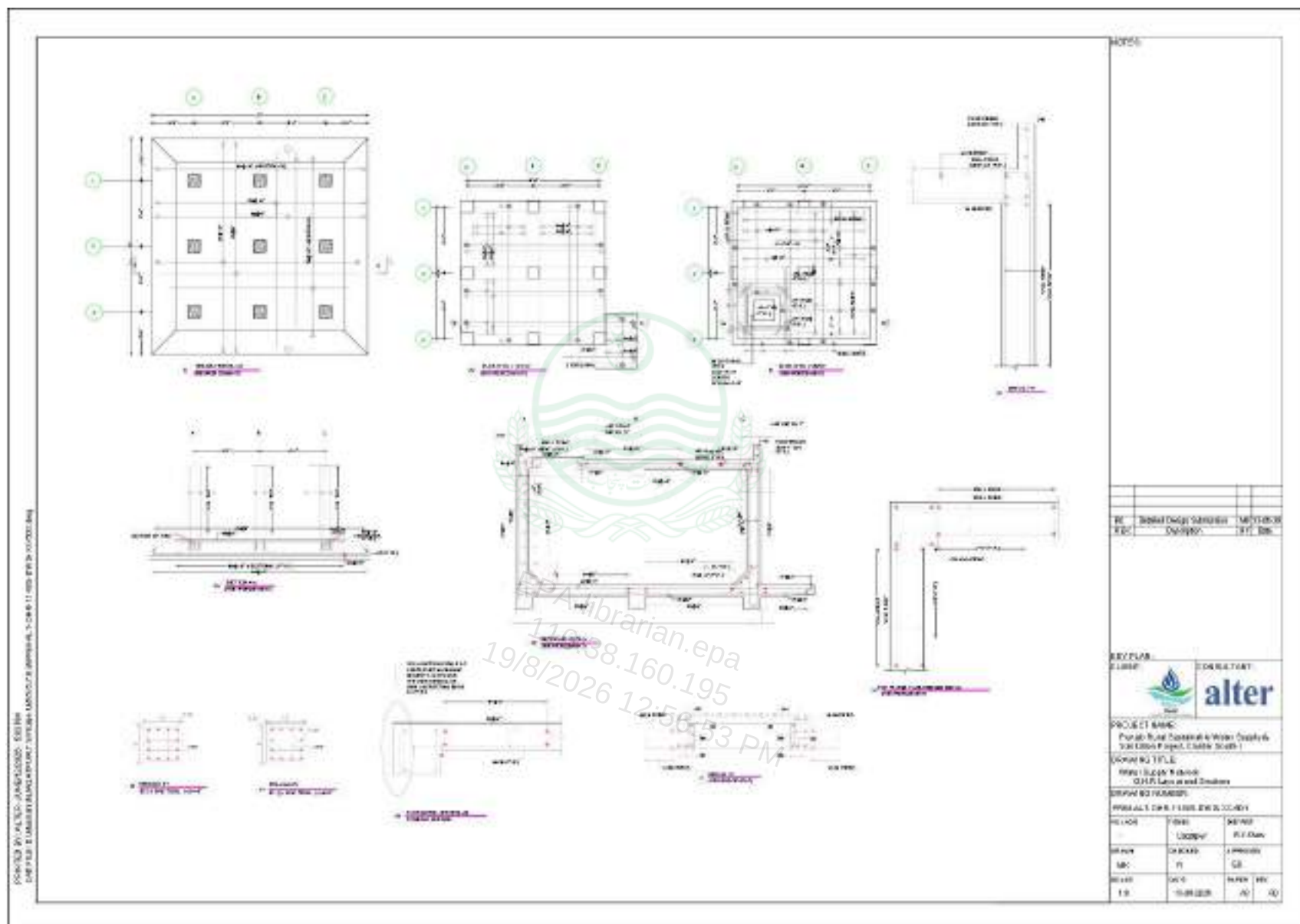
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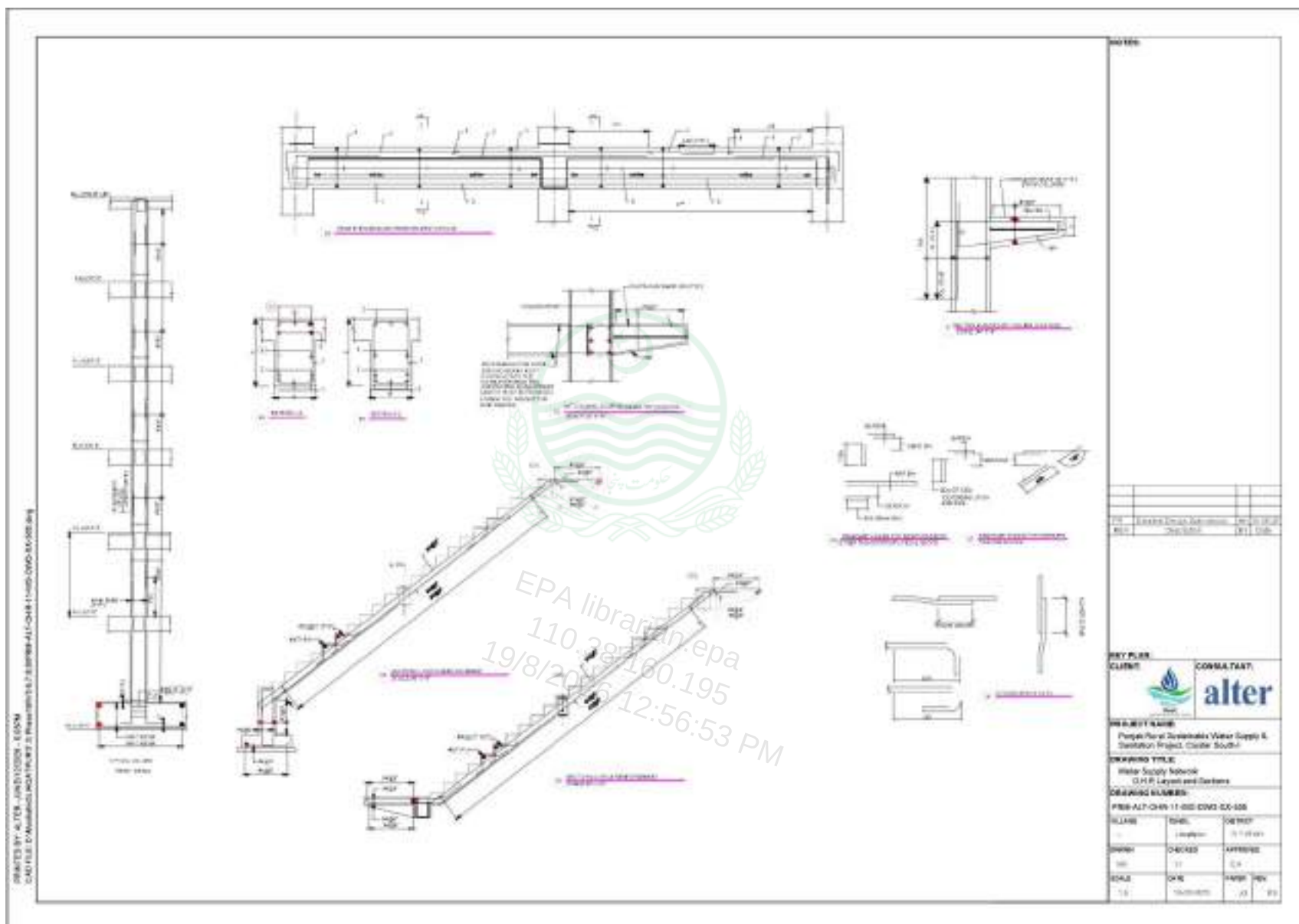










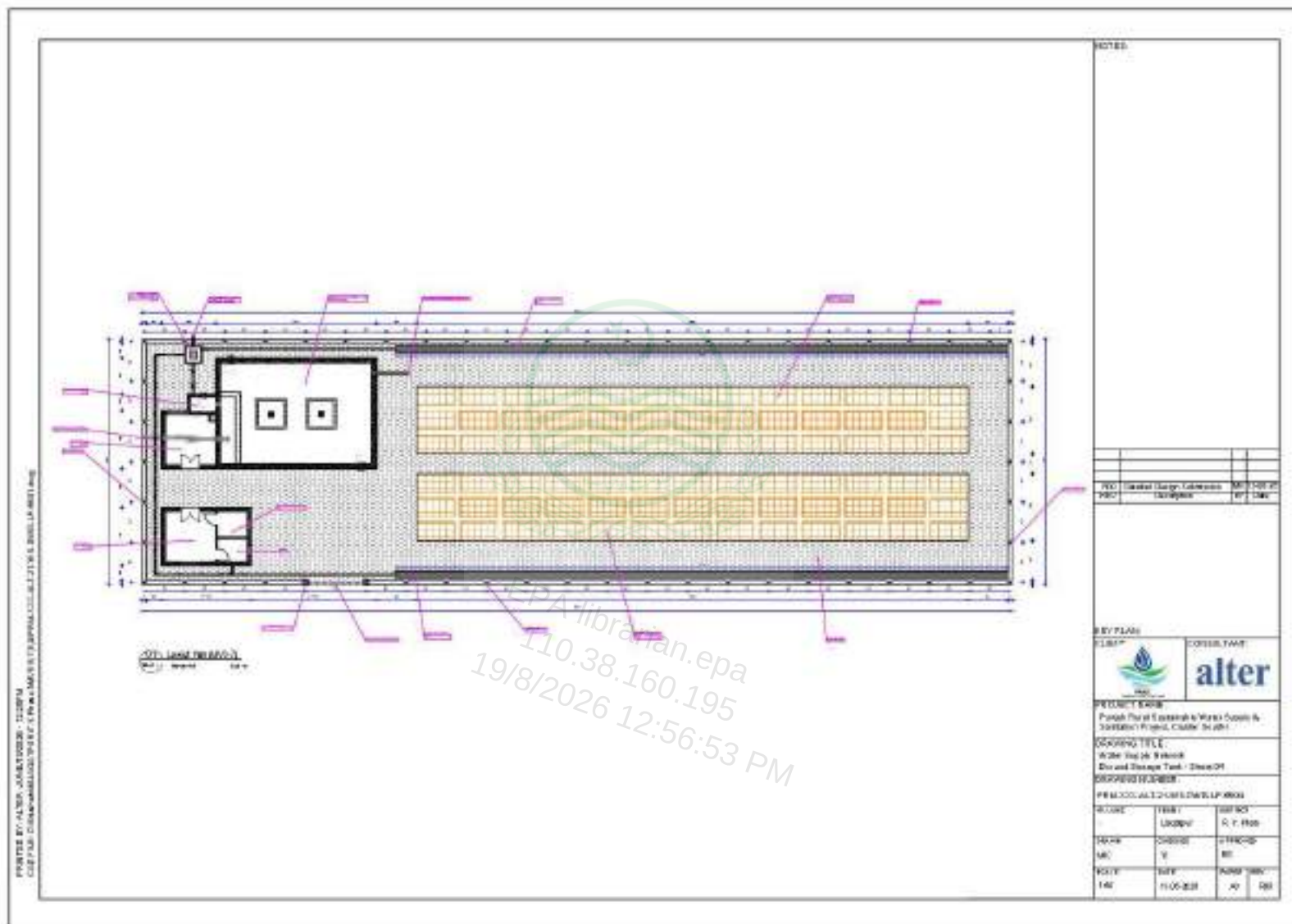




# GST AND PUMP ROOM

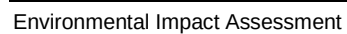


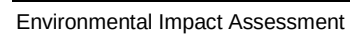
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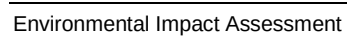
STAND POST

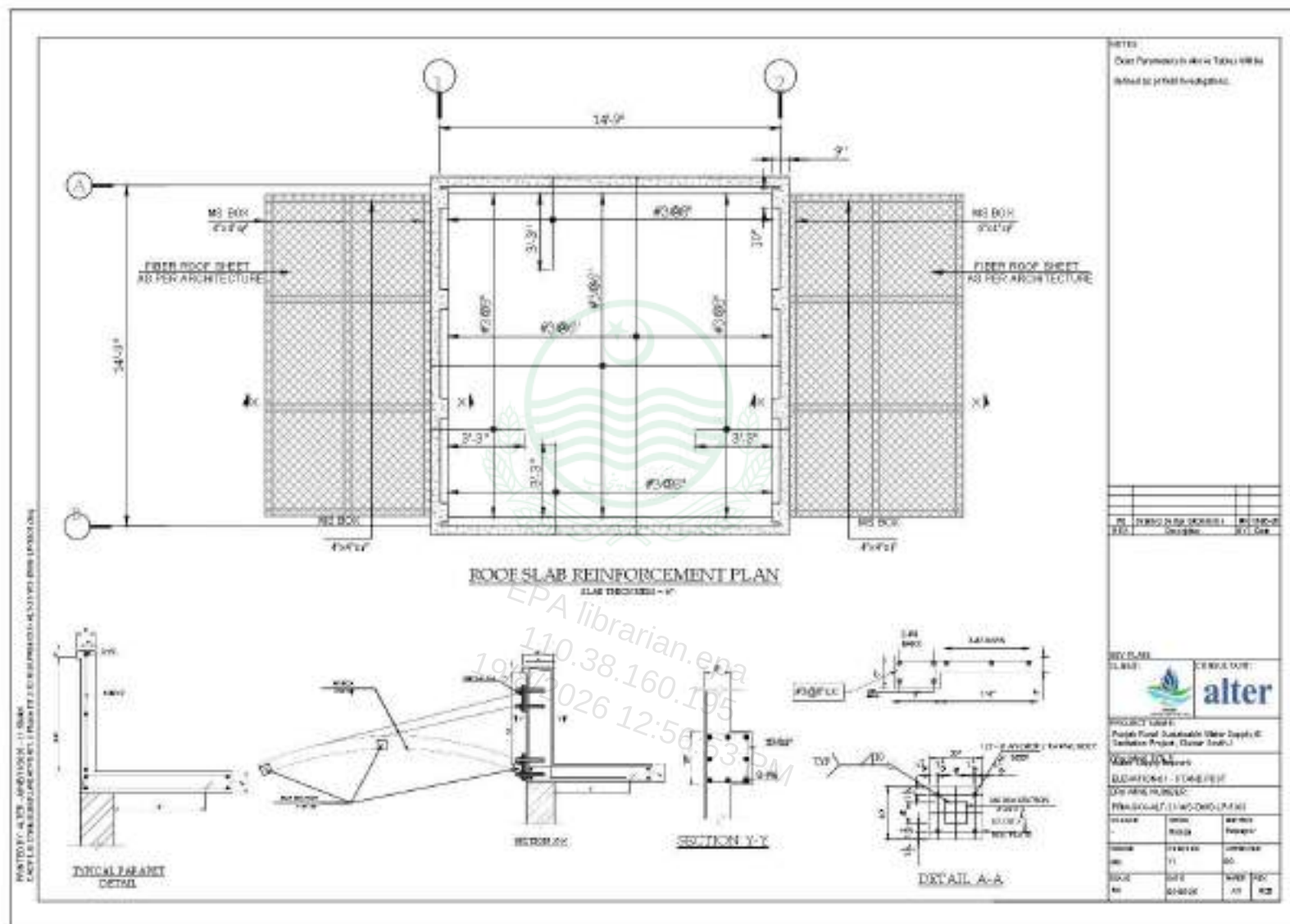


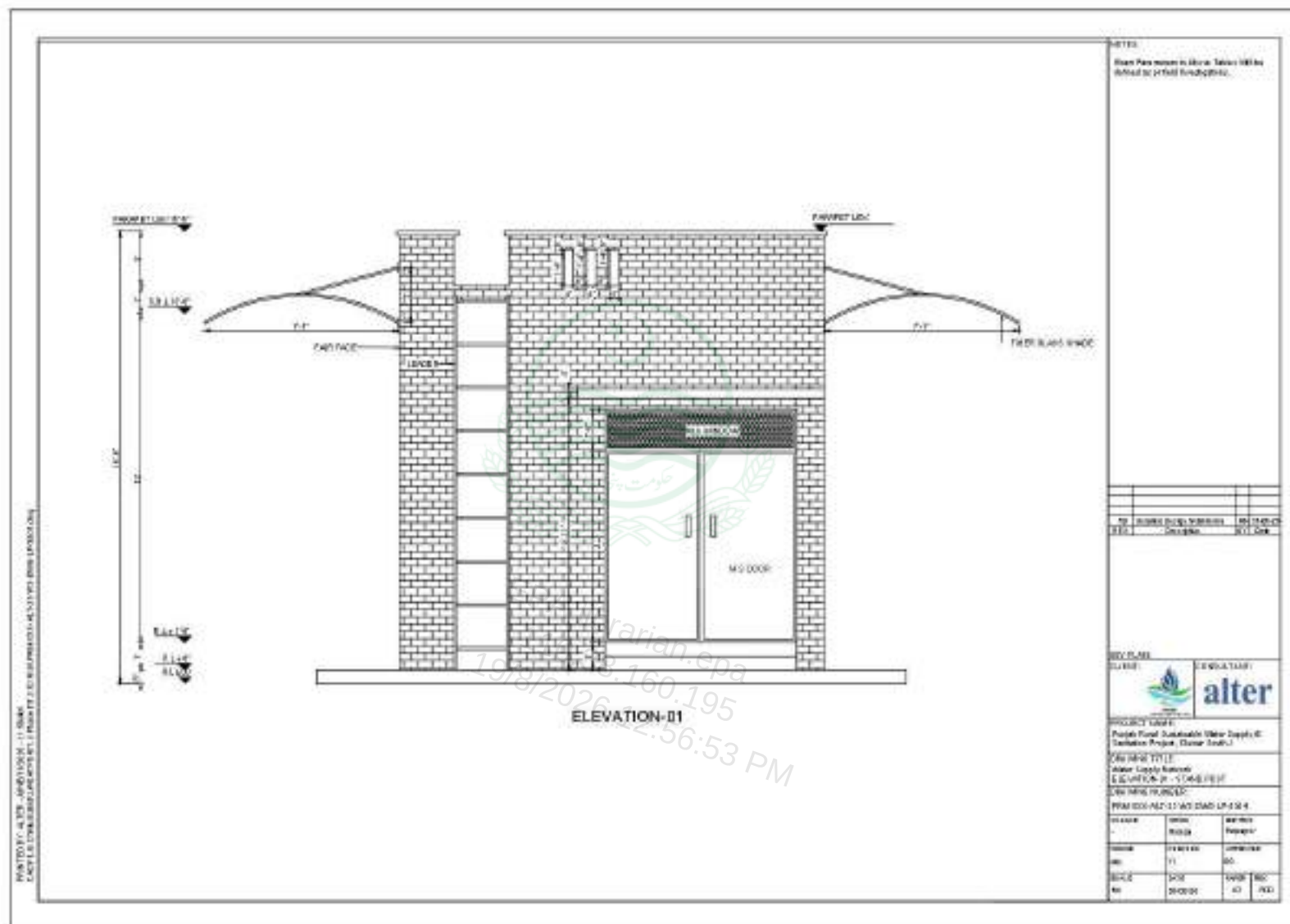
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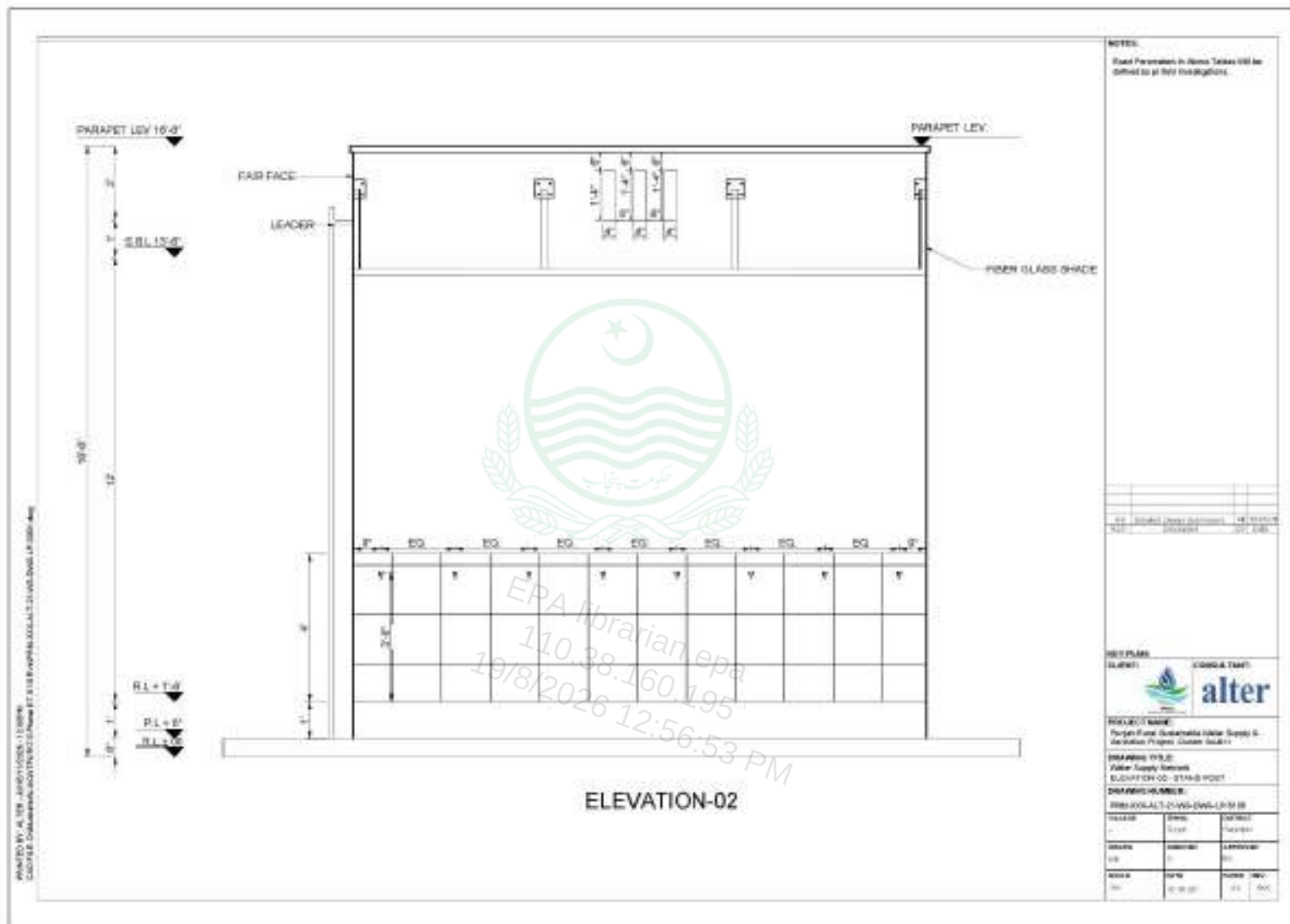








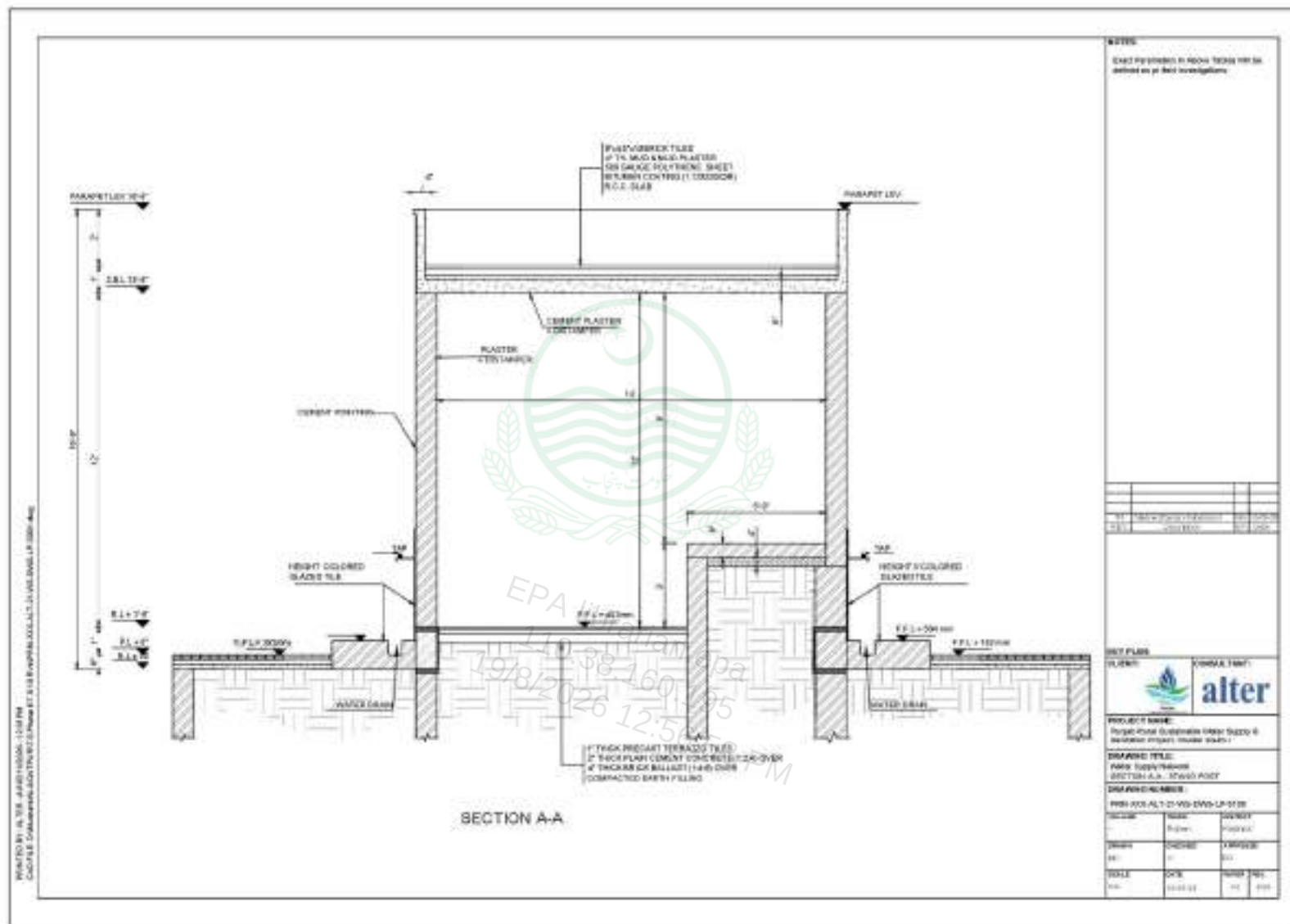


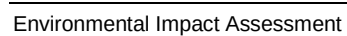


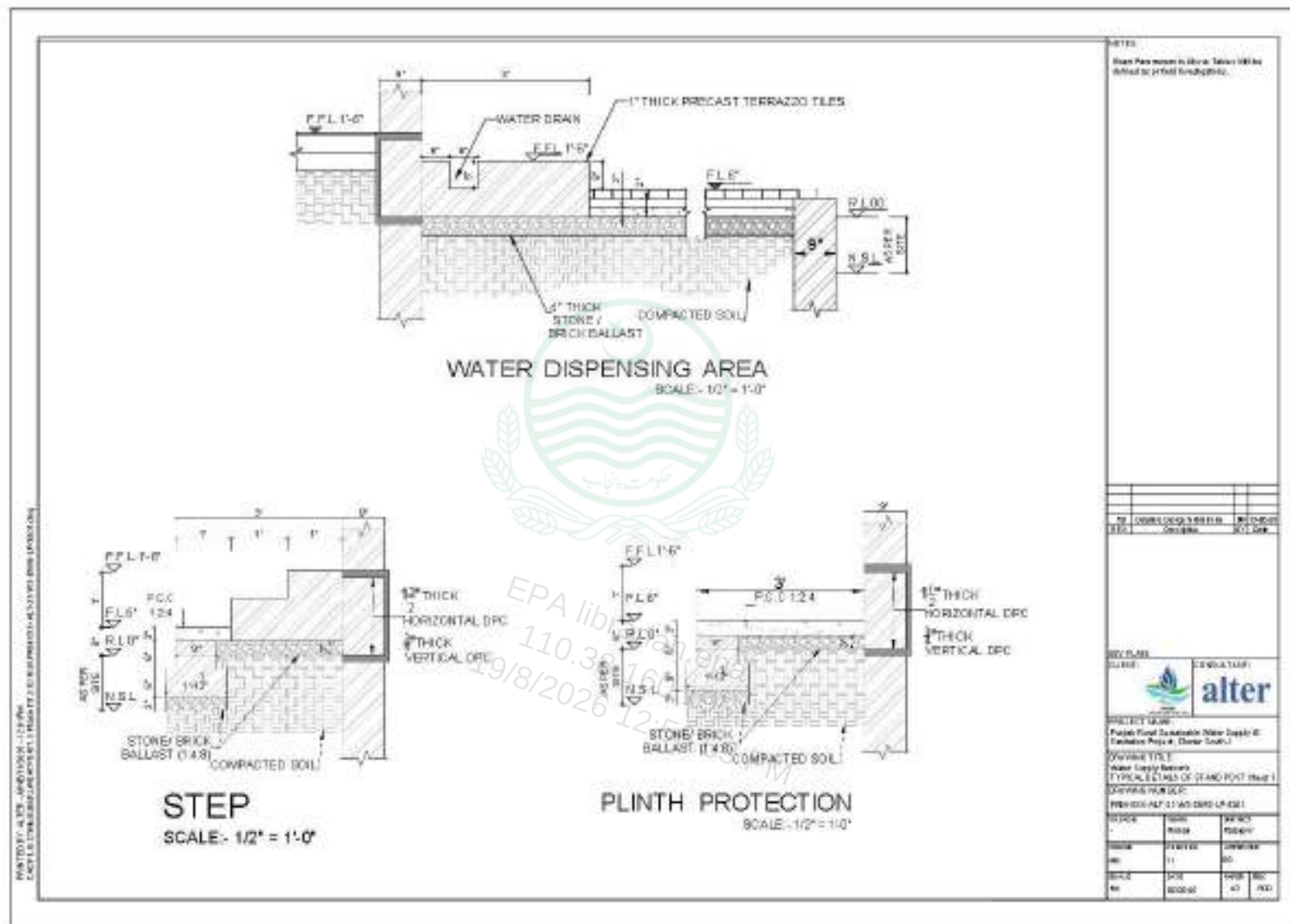
















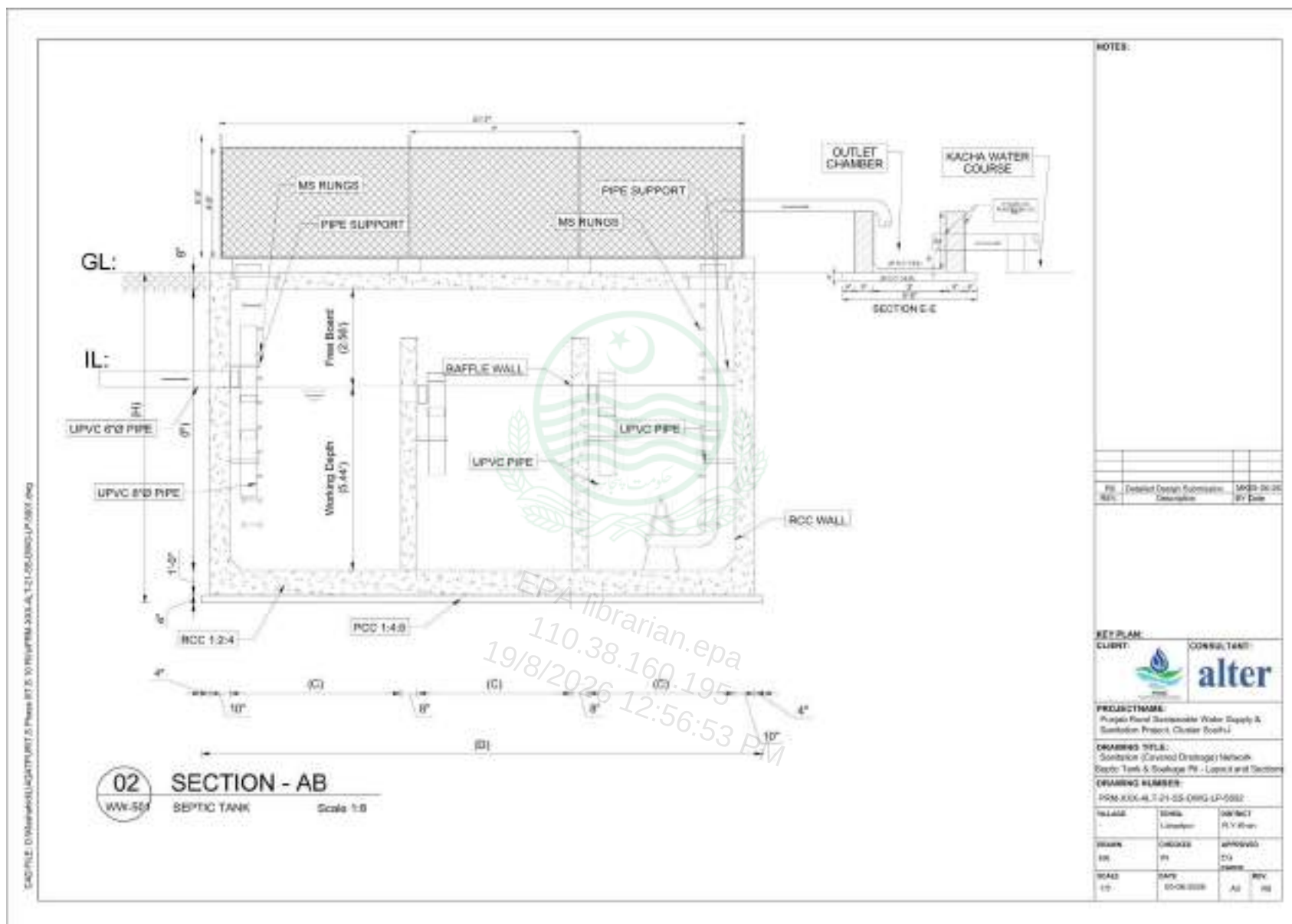
# SANITATION (COVERED DRAINAGE) NETWORK SEPTIC TANK AND SOAKAGE PIT LAYOUT AND SECTIONS

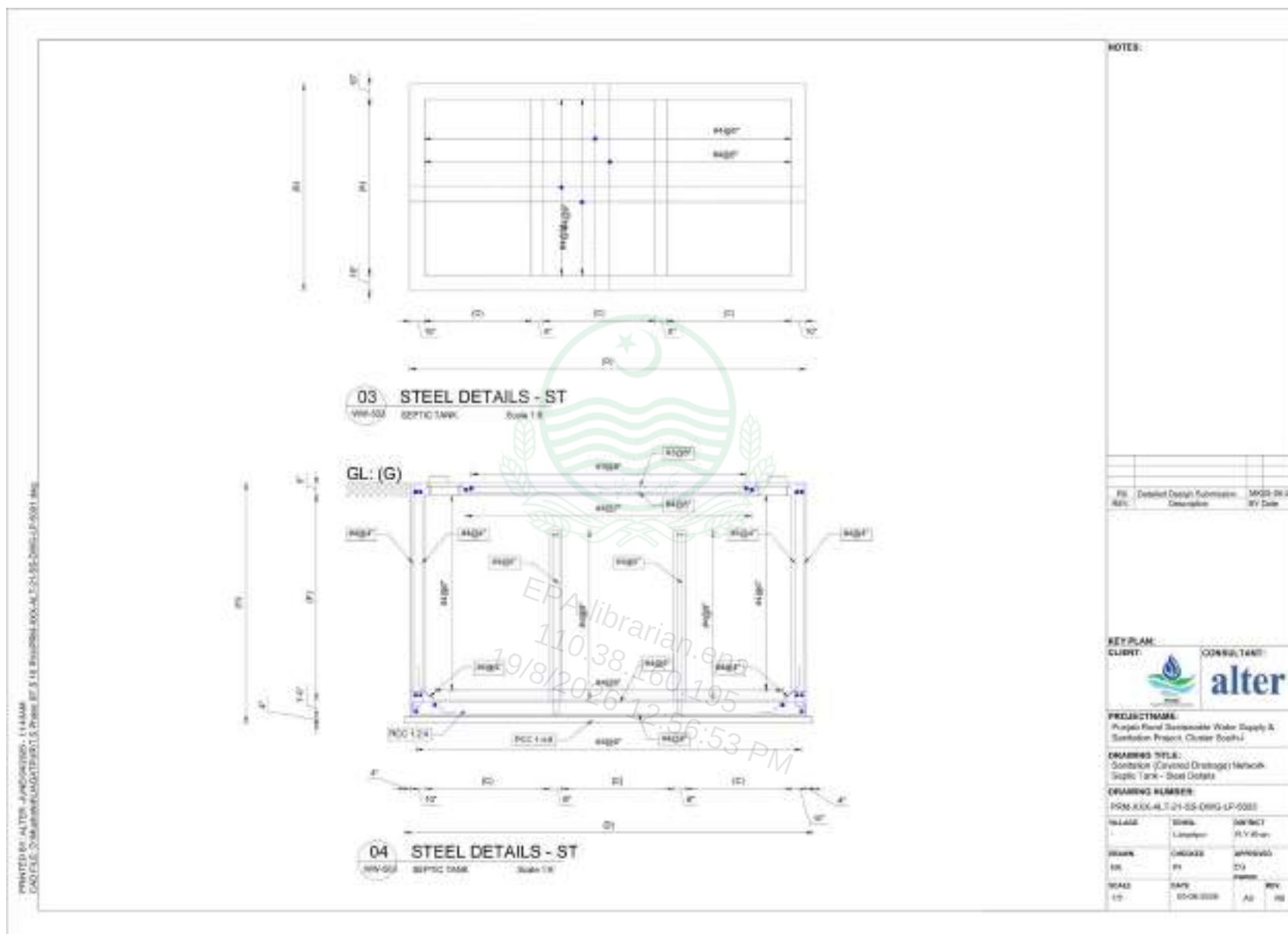


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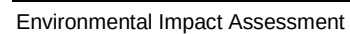


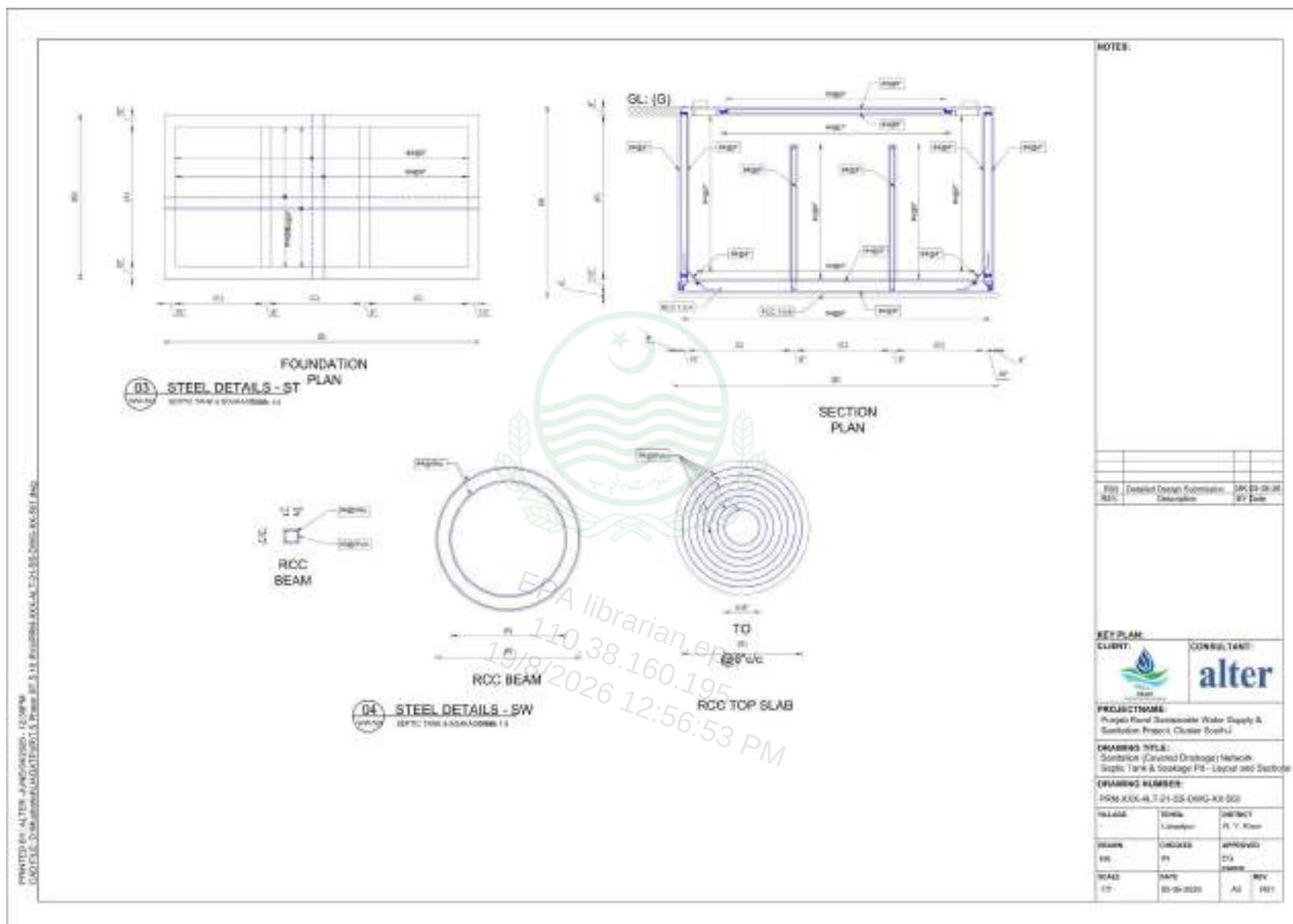






|                                                                                                    |                                                                                       |                       |                                                                                       |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------|
| NOTES:                                                                                             |                                                                                       |                       |                                                                                       |
|                                                                                                    |                                                                                       |                       |                                                                                       |
|                                                                                                    |                                                                                       |                       |                                                                                       |
|                                                                                                    |                                                                                       |                       |                                                                                       |
| FILE<br>REF:                                                                                       | Detailed Design Submission<br>Description                                             | MOCD-2024-<br>BY Date |                                                                                       |
| <b>KEY PLAN:</b>                                                                                   |                                                                                       |                       |                                                                                       |
| CLIENT:                                                                                            |  | CONSULTANT:           |  |
| PROJECT NAME:<br>Punjab Rural Sustainable Water Supply &<br>Sanitation Project, Cluster 3(a)(ii)   |                                                                                       |                       |                                                                                       |
| DRAWING TITLE:<br>Sanitation (Septic Tank) Network<br>(Septic Tank & Soakage Pit - Details Toilet) |                                                                                       |                       |                                                                                       |
| DRAWING NUMBER:<br>PSM-RSC-AE.7.21-S5-DWG-LP-0082                                                  |                                                                                       |                       |                                                                                       |
| VILLAGE                                                                                            | Block                                                                                 | DISTRICT              | STATE                                                                                 |
|                                                                                                    | Rajauri                                                                               | Papapun               |                                                                                       |
| TOWN                                                                                               | COUNCIL                                                                               | APPROVED              |                                                                                       |
| LOC.                                                                                               | PI                                                                                    | D/C                   | DATE                                                                                  |
| SCALE                                                                                              | MATCH                                                                                 | AUT                   | REV.                                                                                  |
| 1:1                                                                                                | E7-09-20                                                                              | All                   |                                                                                       |



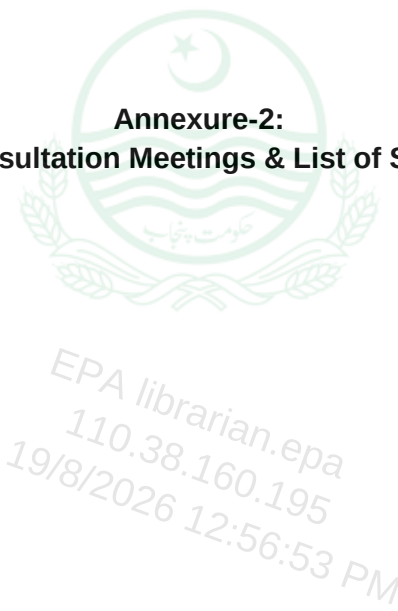








**Annexure-2:**  
**Glimpse of Villages, Consultation Meetings & List of Selected 100 Participants**





Stakeholder Consultation at Chak 7 Abbasia, Tehsil Liaquatpur.



Stakeholder Consultation at Chak 16 Abbasia, Tehsil Liaquatpur.



Stakeholder Consultation at Chak 52 Jinnah Abbadi, Tehsil Liaquatpur.



Stakeholder Consultation at Chak 84 Abbasia, Tehsil Liaquatpur.



Stakeholder Consultation with Women at Chak No. 64 Abbasia, Tehsil Liaquatpur



Stakeholder Consultation with Women at Chak No. 15 Abbasia, Tehsil Liaquatpur



Stakeholder Consultation at Chak No. 06 Channa, Tehsil Liaquatpur



Stakeholder Consultation at Chak 07 Abbasia, Tehsil Liaquatpur.



Stakeholder Consultation with the Tehsil Manager, PRMSC Liaquatpur



Stakeholder Consultation with an Official of the Environmental Protection Department (EPD), Rahim Yar Khan



Stakeholder Consultation with Official of Wildlife Department, Rahimyar Khan.



Stakeholder Consultation with DFO Forest, Rahimyar Khan.





Stakeholder Consultation with Official of Social Welfare Department, Rahimyar Khan.



Stakeholder Consultation with Official of Agriculture Department, Rahimyar Khan.



Stakeholder Consultation at Basti Jatoli Sial, Tehsil Liaquatpur.



Glimps of Basti Abdullah Sial, Tehsil Liaquatpur.



Glimps of Moza Pararan Sharif, Tehsil Liaquatpur.



Stakeholder Consultation at Moza Chimi, Tehsil Liaquatpur.



A Street View of Village Nala Musani, Tehsil Liaqatpur.



Stakeholder Consultation at Village Goath Ameen, Tehsil Liaqatpur.



Stakeholder Consultation with Women at Village Chak-10 Abbasia Chota, Tehsil Liaqatpur.



Stakeholder Consultation with Women at Village Chak-55 Abbasia, Tehsil Liaqatpur.



Stakeholder Consultation with Women at Village Chak-52 Abbasia, Tehsil Liaqatpur.



Stakeholder Consultation with Women at Village Chak 06 Channa, Tehsil Liaqatpur.



|                                                                                |                                                                                  |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|                                                                                |                                                                                  |
| <p>Air Quality Monitoring at Chak No. 88 Abbasia, Tehsil Liaquatpur</p>        | <p>Noise Quality Monitoring at Chak No. 88 Abbasia, Tehsil Liaquatpur</p>        |
|                                                                                |                                                                                  |
| <p>Groundwater Quality Monitoring at Chak No. 9 Abbasia, Tehsil Liaquatpur</p> | <p>Surface Water Quality Monitoring at Chak No. 1 Doshaka, Tehsil Liaquatpur</p> |

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### Consultation Meetings Tehsil-Wise

| Sr. No | Tehsil     | Community Consultation Meeting | Number of Participants |
|--------|------------|--------------------------------|------------------------|
| 1      | Liaquatpur | 245                            | 3906                   |

### List of 100 Selected Participants

| Sr.No. | Name                 | Fathers name       | Age | Contact Number |
|--------|----------------------|--------------------|-----|----------------|
| 1      | Usman Gani           | Shafiqullah        | 40  | 0301-7630161   |
| 2      | Abdul Rehman         | Muhammad Arshad    | 33  | 0300-6772884   |
| 3      | Hagi Muhammad Iqbal  | Muhammad Hafeez    | 58  | 0304-1808976   |
| 4      | Arslan               | Muhmood Ali        | 30  | 0313-6646562   |
| 5      | Khalid Muhmood       | Muhammad Latif     | 42  | 0300-6869126   |
| 6      | Muhammad Idress      | Muhammad Hanif     | 35  | 3983233        |
| 7      | Abbas Farooq         | Shahid Farooq      | 35  | 0303-6123905   |
| 8      | Muhammad Ameen       | Muhammad Hanif     | 40  | 0302-8018903   |
| 9      | Muhammad Javaid      | Khoshi Muhammad    | 45  | 0345-9886124   |
| 10     | Muhammad Rafiq       | Abdul Sattar       | 60  | 0345-8025208   |
| 11     | Abdul Majeed         | Abdul Sattar       | 75  | 0301-5832280   |
| 12     | Ghulam Fareed        | Umerdin            | 100 | 0341-5052188   |
| 13     | Abdul Razzq          | Nazir Ahmed        | 30  | 0344-8857176   |
| 14     | Hagi Liaqat Ali      | Muhammad Sharif    | 65  | 0342-4777926   |
| 15     | Hagi Rafaqat Ali     | Muhammad Sharif    | 60  | 0345-2515000   |
| 16     | Muhammad Hammad      | Liaqat Ali         | 28  | 0347-7751306   |
| 17     | Usam Tariq           | Tariq Masoad       | 35  | 0345-7141988   |
| 18     | Abdul Rehman         | Muhammad Buxsh     | 60  | 0301-9418494   |
| 19     | Jam Ayaz             | Hagi Ahmed         | 40  | 0307-8566884   |
| 20     | Jam Abid             | Hagi Muhammad      | 56  | 0300-1853081   |
| 21     | Allah Bachaya Abbasi | Allah Diwaya       | 60  | 0306-7413007   |
| 22     | Haq Nawaz            | Allah Diwaya       | 47  | 0304-5919550   |
| 23     | Muhammad Akram       | Allah Dita         | 45  | 0304-2416335   |
| 24     | Muammad Arshad       | Qasim Khan         | 30  | 0308-2526080   |
| 25     | Nazir Ahmed          | Allah Buxsh        | 40  | 0303-2269131   |
| 26     | Nabi Buxsh           | Malik Abdul Kareem | 60  | 03015124019    |
| 27     | Rasool Buxsh         | Muhammad Nawaz     | 40  | 0308-7612711   |
| 28     | Rasool Buxsh Sial    | Atta Muhammad Sial | 45  | 0302-7808655   |
| 29     | Mahboob Ahmed        | Muhammed Sher      | 40  | 0300-6874015   |



| Sr.No. | Name                   | Fathers name            | Age | Contact Number |
|--------|------------------------|-------------------------|-----|----------------|
| 30     | Farman Azeem           | Muhammad Buxsh          | 50  | 0320-8763836   |
| 31     | Muhammad Zafar Abbasi  | Sardar Ahmed            | 45  | 0308-2847386   |
| 32     | Muhammad Arslan Abbasi | Muhammad Nawaz Abbasi   | 35  | 0304-7344831   |
| 33     | Muhammad Saleem        | Nazir Ahmed             | 30  | 0305-7052336   |
| 34     | Muhammad Kashif        | Muhammad Perwaiz Abbasi | 40  | 0308-3701470   |
| 35     | Bashir Ahmed           | Nazir Ahmed             | 32  | 0301-0247636   |
| 36     | Muhammad Yaqoob        | Shabbir Ahmed           | 43  | 0300-5715167   |
| 37     | Salahuddin             | Sadardeen               | 32  | 0305-7018660   |
| 38     | Muhammad Jamil         | Malik Pathan            | 57  | 0306-7664560   |
| 39     | Allah Dita             | Ghulam Qadir            | 35  | 0307-2992104   |
| 40     | Saeed Ahmed            | Muhammad Ismail         | 40  | 0309-7489853   |
| 41     | Muhammad Javaid Jatial | Bashir Ahmed            | 60  | 0313-8674552   |
| 42     | Salman Dilshad         | Muhammad Dilshad        | 35  | 0312-4486511   |
| 43     | Muhammad Rajab         | Allah Dita              | 55  | 0324-1038754   |
| 44     | Jam Saifullah          | Jam Gaman               | 50  | 0316-6574398   |
| 45     | Jamshed Ahmed          | Umerwada                | 40  | 03008982355    |
| 46     | Qari Muhammad Shoukat  | Shumlay Khan            | 45  | 0303-7649396   |
| 47     | Muhammad Riaz          | Abdul Wahid Khan        | 40  | 0303-7665433   |
| 48     | Hagi Khan              | Abdul Gani              | 35  | 0301-2627953   |
| 49     | Amar Saif              | Saifullah               | 32  | 0327-7716655   |
| 50     | Imdad Rasool           | Abdul Rehman            | 33  | 0300-6743822   |
| 51     | Zaffar Iqbal           | Muhammad Hussain        | 45  | 0300-8778403   |
| 52     | Malik Ubaid            | Malik Kamal             | 40  | 0328-3357522   |
| 53     | Shoukat Ali            | Ghulam Sarwar           | 30  | 0307-1537946   |
| 54     | Jam Fayaz Ahmed        | Jam Muhammad Pannah     | 48  | 0305-7014513   |
| 55     | Jam Riaz Ahmed         | Jam Muhammad Panah      | 43  | 0307-9191697   |
| 56     | Rai Akmal              | Rai Abdul Hameed        | 55  | 0300-5023914   |
| 57     | Rai Muhammad Afzal     | Rai Jaan Muhammad       | 45  | 0308-8324455   |
| 58     | Muhammad Kashif        | Muhammad Sadiq          | 34  | 0370-9509062   |
| 59     | Muhammad Saleem        | Allah Bachaya           | 28  | 0343-6690991   |
| 60     | Waheed Jameel          | Jameel                  | 34  | 0300-7854955   |
| 61     | Muhammad Ramzan        | Alam Sher               | 53  | 0300-3962712   |
| 62     | Mumtaz Ahmed           | Muhammad Bota           | 38  | 0301- 4238003  |
| 63     | Ali Hussain            | Abdullah                | 46  | 0301-7667211   |
| 64     | Shamsul haq            | Anwarul haq             | 62  | 0300-9682120   |
| 65     | Muhammad Younis        | Muhammad Yousif         | 70  | 0301-3990299   |



| Sr.No. | Name                     | Fathers name      | Age | Contact Number |
|--------|--------------------------|-------------------|-----|----------------|
| 66     | Muhammad Shakeel         | Nazir Ahmed       | 50  | 0302-7634535   |
| 67     | Ali Akbar                | Muhammad Latif    | 40  | 0300-7815278   |
| 68     | Shahid Mehmood           | Abdul Khaliq      | 50  | 0302-7412693   |
| 69     | Ahtar Ali                | Muhammad Latif    | 26  | 0302-7614711   |
| 70     | Muhammd Arif             | Lal din           | 60  | 0308-3729247   |
| 71     | Muhammad Tanvir          | Bashir Ahmed      | 45  | 0302-7662241   |
| 72     | Muhammad Akram           | Muhammad Aslam    | 40  | 0300-6725037   |
| 73     | Muhammad Tariq           | Hagi Ahmed        | 41  | 0333-7474589   |
| 74     | Ghulam Haider            | Muhammad Abdullah | 55  | 0301-0318913   |
| 75     | Muhammad Nazir           | Muhammad Yousif   | 75  | 0300-6715065   |
| 76     | Muhammad Saleem          | Muhammad Khoshi   | 65  | 0306-5468238   |
| 77     | Abdul Malik              | Muhammad Sharif   | 66  | 0306-2329105   |
| 78     | Muhammad Javaid          | Muhammad Aslam    | 60  | 0301-1787213   |
| 79     | Abdul Rehman             | Bakhtzar          | 50  | 03327398367    |
| 80     | Taswar khan              | Munir khan        | 52  | 03431612220    |
| 81     | Ali Raza                 | Nawab jaan        | 57  | 0308-7676039   |
| 82     | Habibullah               | Laldin            | 70  | 03447115138    |
| 83     | Allah Rakha              | Muhammad Bota     | 40  | 0302-7656939   |
| 84     | Mubarak Bhuta            | Ghulam Hussain    | 60  | 0300-8779957   |
| 85     | Muhammad Ihsan           | Wahid Buxsh       | 51  | 0300-7827041   |
| 86     | Mukhtar Hussain          | Wahid Buxsh       | 35  | 0304-2517344   |
| 87     | Garib Nawaz              | Hagi Hussain      | 65  | 0301-8677666   |
| 88     | Syed Khursheed Ahmed     | Syed Azizullah    | 75  | 0304-7551170   |
| 89     | Syed Safdar Hussain Shah | Syed Alamdar Shah | 50  | 0303-8740874   |
| 90     | Syed Azhar Abbas         | Syed Alamdar Shah | 45  | 0307-8880786   |
| 91     | Mehboob Ali              | Ahmed Ali         | 40  | 0301-2675028   |
| 92     | Arshad Ali               | Muhammad Yousif   | 55  | 0306-9522516   |
| 93     | Ali Ahmed                | Muhammad Yousif   | 50  | 0302-7912783   |
| 94     | Hagi Ahmed               | Ghulam Rasool     | 40  | 0307-4656355   |
| 95     | Ahmeddin                 | Ghulam Hussain    | 55  | 0341-7239824   |
| 96     | Abdul Samad              | Bashir Ahmed      | 50  | 0345-8142784   |
| 97     | Muhammad Nabeel          | Maqbool Ahmed     | 48  | 0345-8020535   |
| 98     | Mian Muhammad Usman      | Manzoor Ahmed     | 42  | 0300-6753557   |
| 99     | Sajad Ahmed              | Ghulam Siraj      | 37  | 0300-6875689   |
| 100    | Rana Shafiq Ahmed        | Muhammad Shafi    | 57  | 0300-8038101   |



### **Annexure-3: Environmental Testing Results**



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### Environmental Monitoring

Environmental quality testing results including groundwater, surface water, wastewater and air quality monitoring results can be accessed through the following link:

[https://drive.google.com/drive/folders/12u05QVRX6isIVBQBnwc99S5aSwcs9Cc1?usp=drive\\_link](https://drive.google.com/drive/folders/12u05QVRX6isIVBQBnwc99S5aSwcs9Cc1?usp=drive_link)



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## ENVIRONMENTAL MONITORING & ANALYSIS REPORT

Engineering Design and  
Construction Supervision of  
Punjab Rural Sustainable Water  
Supply & Sanitation Project-  
Cluster South-1  
(Liaquatpur-Rojhan)

- > Ambient Air Monitoring
- > Groundwater Analysis
- > Surface Water Analysis
- > Wastewater Analysis

Report Reference No. AES-ENV-AL-197/2025

Dated: 16<sup>th</sup> October, 2025

Asian Environmental Services (Pvt.) Ltd.

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## AMBIENT AIR MONITORING LOCATION 01 CHAK 09 ABBASIA Liaquatpur



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## AMBIENT AIR MONITORING REPORT

| Monitoring Details    |       |                           |                                      |                         |                                      |                                      |                                      |
|-----------------------|-------|---------------------------|--------------------------------------|-------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Report Reference No   |       | AES-ENV-AL-197-2025-AA-01 |                                      | Monitoring Point        |                                      | Chak DP Abbasia                      |                                      |
| Date of Monitoring    |       | 01-10-2025 to 02-10-2025  |                                      | Monitoring Coordinates  |                                      | 29°0'26" N 71°0'17" E                |                                      |
| Sr. No.               | Time  | CO (mg/m <sup>3</sup> )   | CO <sub>2</sub> (mg/m <sup>3</sup> ) | NO (µg/m <sup>3</sup> ) | NO <sub>2</sub> (µg/m <sup>3</sup> ) | NO <sub>x</sub> (µg/m <sup>3</sup> ) | SO <sub>2</sub> (µg/m <sup>3</sup> ) |
| 1                     | 12:00 | 2.26                      | 936                                  | 3.81                    | 3.72                                 | 7.53                                 | 70.82                                |
| 2                     | 13:00 | 2.13                      | 950                                  | 3.72                    | 3.74                                 | 7.46                                 | 75.70                                |
| 3                     | 14:00 | 1.97                      | 1055                                 | 3.58                    | 3.66                                 | 7.24                                 | 76.22                                |
| 4                     | 15:00 | 1.78                      | 1098                                 | 3.44                    | 3.62                                 | 7.06                                 | 78.76                                |
| 5                     | 16:00 | 1.53                      | 1168                                 | 3.38                    | 3.59                                 | 6.97                                 | 81.21                                |
| 6                     | 17:00 | 1.39                      | 1255                                 | 3.16                    | 3.59                                 | 6.75                                 | 85.92                                |
| 7                     | 18:00 | 1.29                      | 1282                                 | 2.83                    | 3.51                                 | 6.34                                 | 88.76                                |
| 8                     | 19:00 | 1.25                      | 1411                                 | 2.67                    | 3.44                                 | 6.11                                 | 91.32                                |
| 9                     | 20:00 | 1.11                      | 1480                                 | 2.56                    | 3.38                                 | 5.94                                 | 88.11                                |
| 10                    | 21:00 | 0.98                      | 1566                                 | 2.55                    | 3.27                                 | 5.81                                 | 85.97                                |
| 11                    | 22:00 | 1.01                      | 1577                                 | 2.77                    | 3.17                                 | 5.94                                 | 81.94                                |
| 12                    | 23:00 | 1.02                      | 1651                                 | 2.91                    | 3.08                                 | 5.99                                 | 78.84                                |
| 13                    | 00:00 | 1.11                      | 1692                                 | 2.83                    | 3.02                                 | 5.85                                 | 76.20                                |
| 14                    | 01:00 | 1.12                      | 1760                                 | 2.77                    | 2.97                                 | 5.73                                 | 73.56                                |
| 15                    | 02:00 | 1.21                      | 1787                                 | 2.69                    | 2.85                                 | 5.55                                 | 72.88                                |
| 16                    | 03:00 | 1.25                      | 1757                                 | 2.63                    | 2.80                                 | 5.43                                 | 69.14                                |
| 17                    | 04:00 | 1.29                      | 1730                                 | 2.57                    | 2.74                                 | 5.31                                 | 67.34                                |
| 18                    | 05:00 | 1.42                      | 1640                                 | 2.85                    | 2.61                                 | 5.46                                 | 63.50                                |
| 19                    | 06:00 | 1.91                      | 1541                                 | 3.24                    | 2.48                                 | 5.72                                 | 62.43                                |
| 20                    | 07:00 | 2.14                      | 1445                                 | 3.47                    | 2.78                                 | 6.24                                 | 64.44                                |
| 21                    | 08:00 | 2.19                      | 1397                                 | 3.61                    | 2.99                                 | 6.60                                 | 67.86                                |
| 22                    | 09:00 | 2.27                      | 1292                                 | 3.65                    | 3.08                                 | 6.73                                 | 69.04                                |
| 23                    | 10:00 | 2.30                      | 1188                                 | 3.64                    | 3.25                                 | 6.89                                 | 72.85                                |
| 24                    | 11:00 | 2.25                      | 1130                                 | 3.69                    | 3.55                                 | 7.23                                 | 73.48                                |
| Average Concentration |       | 1.69                      | 1408                                 | 3.13                    | 3.20                                 | 6.33                                 | 75.48                                |

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LAB 208  
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## AMBIENT AIR MONITORING REPORT

|                     |                           |                        |                       |
|---------------------|---------------------------|------------------------|-----------------------|
| Monitoring Details  |                           |                        |                       |
| Report Reference No | AES-ENV-AL-197-2025-AA-01 | Monitoring Point       | Chak 09 Abbasi        |
| Date of Monitoring  | 01-10-2025 to 02-10-2025  | Monitoring Coordinates | 29°0'26" N 71°0'17" E |

| Parameters                                | Method of Measurement                         | Monitoring Duration | LDL  | Average Obtained Concentration | PEQS                    | Remarks |
|-------------------------------------------|-----------------------------------------------|---------------------|------|--------------------------------|-------------------------|---------|
| Nitrogen Dioxide (NO <sub>2</sub> ) *     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 3.20                           | 80.0 µg/m <sup>3</sup>  | Optimal |
| Nitrogen Oxide (NO)*                      | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 3.13                           | 40.0 µg/m <sup>3</sup>  | Optimal |
| NO <sub>x</sub> *                         | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 6.33                           | NGVS µg/m <sup>3</sup>  | -       |
| Sulphur Dioxide (SO <sub>2</sub> ) *      | Fluorescence method                           | 24 Hours            | 1.00 | 75.68                          | 120.0 µg/m <sup>3</sup> | Optimal |
| Carbon Monoxide (CO)*                     | Non-Dispersive Infra-Red (NDIR)               | 24 Hours            | 0.01 | 1.59                           | 05.0 mg/m <sup>3</sup>  | Optimal |
| Carbon Dioxide (CO <sub>2</sub> )         | -                                             | 24 Hours            | -    | 1408                           | NGVS mg/m <sup>3</sup>  | -       |
| Ozone (O <sub>3</sub> ) *                 | Non-Dispersive Ultra-Violet Absorption Method | 01 Hour             | 1.00 | 0.04                           | 130 µg/m <sup>3</sup>   | Optimal |
| Particulate Matter (PM <sub>10</sub> ) *  | β Ray absorption method                       | 24 Hours            | 1.00 | 78                             | 150.0 µg/m <sup>3</sup> | Optimal |
| Particulate Matter (PM <sub>2.5</sub> ) * | β Ray absorption method                       | 24 Hours            | 1.00 | 24                             | 35.0 µg/m <sup>3</sup>  | Optimal |
| Total Particulate Matter (TSP)            | Gravimetric Sampling                          | 24 Hours            | 1.00 | 112                            | 500.0 µg/m <sup>3</sup> | Optimal |

\*Parameters are approved from Punjab Environmental Protection Agency.

Note: The standards for CO monitoring is for 08 hours, however the Average Obtained Concentration is at 24 hours.

### Abbreviations:

LDL: Lower Detection Limit

mg/m<sup>3</sup> = Milligram per Meter Cube

### Remarks:

Optimal = Compliance with Permissible Range

Low = Less than Permissible Range

PEQS: Punjab Environmental Quality Standards

NGVS = National Guidelines Value Set

µg/m<sup>3</sup>: Micro Gram per Meter Cube

High = Exceeds from Permissible Range

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## AMBIENT AIR MONITORING REPORT

|                     |                           |                        |                       |
|---------------------|---------------------------|------------------------|-----------------------|
| Monitoring Details  |                           |                        |                       |
| Report Reference No | AES-ENV-AL-197-2025-AA-01 | Monitoring Point       | Chak 09 Abbasia       |
| Date of Monitoring  | 01-10-2025 to 02-10-2025  | Monitoring Coordinates | 29°0'26" N 71°0'17" E |

| Sr. No. | Time  | Ambient Temperature °C | Wind Direction | Wind Velocity m/s | Humidity % | Pressure (mm of Hg) |
|---------|-------|------------------------|----------------|-------------------|------------|---------------------|
| 1       | 12:00 | 36                     | SW             | 3.03              | 44         | 752.31              |
| 2       | 13:00 | 37                     | SW             | 3.05              | 39         | 751.56              |
| 3       | 14:00 | 37                     | S              | 2.96              | 39         | 750.81              |
| 4       | 15:00 | 37                     | SW             | 2.73              | 39         | 750.79              |
| 5       | 16:00 | 37                     | SW             | 2.56              | 39         | 750.06              |
| 6       | 17:00 | 37                     | W              | 1.98              | 39         | 749.79              |
| 7       | 18:00 | 36                     | SW             | 1.34              | 42         | 750.34              |
| 8       | 19:00 | 34                     | SW             | 1.11              | 47         | 750.44              |
| 9       | 20:00 | 33                     | SW             | 0.98              | 49         | 750.69              |
| 10      | 21:00 | 33                     | S              | 1.11              | 52         | 751.11              |
| 11      | 22:00 | 33                     | SW             | 2.89              | 56         | 751.35              |
| 12      | 23:00 | 31                     | SW             | 3.05              | 62         | 751.79              |
| 13      | 00:00 | 31                     | S              | 2.67              | 62         | 751.98              |
| 14      | 01:00 | 30                     | S              | 2.65              | 62         | 752.79              |
| 15      | 02:00 | 30                     | S              | 2.84              | 62         | 752.99              |
| 16      | 03:00 | 30                     | S              | 2.15              | 62         | 752.68              |
| 17      | 04:00 | 29                     | S              | 3.05              | 66         | 752.33              |
| 18      | 05:00 | 29                     | S              | 3.28              | 66         | 752.1               |
| 19      | 06:00 | 28                     | S              | 2.44              | 70         | 751.78              |
| 20      | 07:00 | 28                     | S              | 2.95              | 66         | 751.23              |
| 21      | 08:00 | 29                     | S              | 2.61              | 66         | 750.89              |
| 22      | 09:00 | 31                     | S              | 2.33              | 59         | 750.65              |
| 23      | 10:00 | 33                     | SW             | 2.76              | 52         | 750.32              |
| 24      | 11:00 | 34                     | SW             | 2.67              | 53         | 749.16              |

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## NOISE MONITORING REPORT

| Monitoring Details  |                           |                        |                       |
|---------------------|---------------------------|------------------------|-----------------------|
| Report Reference No | AES-ENV-AL-197-2025-AA-01 | Monitoring Point       | Chak 09 Abbasia       |
| Date of Monitoring  | 01-10-2025 to 02-10-2025  | Monitoring Coordinates | 29°02'0" N 71°0'17" E |

| Sr. No. | Time  | Noise dB (A) |            |
|---------|-------|--------------|------------|
| 1       | 12:00 | 48           |            |
| 2       | 13:00 | 49           |            |
| 3       | 14:00 | 46           |            |
| 4       | 15:00 | 47           |            |
| 5       | 16:00 | 47           |            |
| 6       | 17:00 | 48           | Day Time   |
| 7       | 18:00 | 45           |            |
| 8       | 19:00 | 44           |            |
| 9       | 20:00 | 44           |            |
| 10      | 21:00 | 42           |            |
| 11      | 22:00 | 43           | Night Time |
| 12      | 23:00 | 42           |            |
| 13      | 00:00 | 40           |            |
| 14      | 01:00 | 41           |            |
| 15      | 02:00 | 41           |            |
| 16      | 03:00 | 42           |            |
| 17      | 04:00 | 42           |            |
| 18      | 05:00 | 43           |            |
| 19      | 06:00 | 44           | Day Time   |
| 20      | 07:00 | 45           |            |
| 21      | 08:00 | 47           |            |
| 22      | 09:00 | 46           |            |
| 23      | 10:00 | 49           |            |
| 24      | 11:00 | 50           |            |

| Time       | PEQS | Average Values | Remarks |
|------------|------|----------------|---------|
| Day Time   | 55   | 47             | Optimal |
| Night Time | 45   | 42             | Optimal |

### Abbreviations:

#### Remarks:

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

dB (A) = Decibel (Standard for human hearing)

Marginal = Close to Permissible Range

High = Exceeds from Permissible Range

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## AMBIENT AIR MONITORING LOCATION 02

### CHAK 51 ABBASIA

Liaquatpur



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## AMBIENT AIR MONITORING REPORT

| Monitoring Details    |                           |                         |                                      |                         |                                      |                                      |                                      |
|-----------------------|---------------------------|-------------------------|--------------------------------------|-------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Report Reference No.  | AES-ENV-KL-197-2025-AA-02 |                         |                                      | Monitoring Point        | Chak 51 Abbasia                      |                                      |                                      |
| Date of Monitoring    | 02-10-2025 to 03-10-2025  |                         |                                      | Monitoring Coordinates  | 29°33' N 71°22' E                    |                                      |                                      |
| Sr. No.               | Time                      | CO (mg/m <sup>3</sup> ) | CO <sub>2</sub> (mg/m <sup>3</sup> ) | NO (µg/m <sup>3</sup> ) | NO <sub>2</sub> (µg/m <sup>3</sup> ) | NO <sub>x</sub> (µg/m <sup>3</sup> ) | SO <sub>2</sub> (µg/m <sup>3</sup> ) |
| 1                     | 12:00                     | 2.23                    | 1098                                 | 3.76                    | 3.77                                 | 7.56                                 | 101.82                               |
| 2                     | 13:00                     | 2.26                    | 1148                                 | 3.72                    | 3.72                                 | 7.44                                 | 96.99                                |
| 3                     | 14:00                     | 2.24                    | 1211                                 | 3.65                    | 3.64                                 | 7.29                                 | 96.23                                |
| 4                     | 15:00                     | 2.16                    | 1278                                 | 3.64                    | 3.44                                 | 7.07                                 | 93.46                                |
| 5                     | 16:00                     | 2.21                    | 1366                                 | 3.48                    | 3.29                                 | 6.76                                 | 90.67                                |
| 6                     | 17:00                     | 2.38                    | 1404                                 | 3.32                    | 3.17                                 | 6.48                                 | 86.70                                |
| 7                     | 18:00                     | 2.49                    | 1501                                 | 3.27                    | 2.72                                 | 5.99                                 | 85.97                                |
| 8                     | 19:00                     | 2.30                    | 1575                                 | 2.91                    | 2.48                                 | 5.39                                 | 78.84                                |
| 9                     | 20:00                     | 2.14                    | 1640                                 | 2.58                    | 2.40                                 | 4.99                                 | 76.04                                |
| 10                    | 21:00                     | 1.86                    | 1701                                 | 2.41                    | 2.20                                 | 4.61                                 | 71.03                                |
| 11                    | 22:00                     | 1.53                    | 1769                                 | 2.44                    | 2.05                                 | 4.48                                 | 67.21                                |
| 12                    | 23:00                     | 1.38                    | 1784                                 | 2.46                    | 1.84                                 | 4.30                                 | 62.41                                |
| 13                    | 00:00                     | 1.29                    | 1773                                 | 2.55                    | 1.56                                 | 4.11                                 | 57.21                                |
| 14                    | 01:00                     | 1.11                    | 1751                                 | 2.58                    | 1.86                                 | 4.44                                 | 59.74                                |
| 15                    | 02:00                     | 0.97                    | 1730                                 | 2.67                    | 2.07                                 | 4.73                                 | 65.25                                |
| 16                    | 03:00                     | 1.06                    | 1665                                 | 2.87                    | 2.33                                 | 5.19                                 | 65.78                                |
| 17                    | 04:00                     | 1.23                    | 1571                                 | 3.04                    | 2.55                                 | 5.59                                 | 72.91                                |
| 18                    | 05:00                     | 1.42                    | 1507                                 | 3.24                    | 3.10                                 | 6.34                                 | 74.60                                |
| 19                    | 06:00                     | 1.58                    | 1343                                 | 3.42                    | 2.89                                 | 6.31                                 | 79.25                                |
| 20                    | 07:00                     | 1.82                    | 1274                                 | 3.66                    | 3.15                                 | 6.82                                 | 83.34                                |
| 21                    | 08:00                     | 1.92                    | 1228                                 | 3.60                    | 3.27                                 | 6.87                                 | 88.63                                |
| 22                    | 09:00                     | 2.05                    | 1168                                 | 3.69                    | 3.44                                 | 7.12                                 | 89.15                                |
| 23                    | 10:00                     | 2.15                    | 1148                                 | 3.75                    | 3.59                                 | 7.33                                 | 93.75                                |
| 24                    | 11:00                     | 2.18                    | 1120                                 | 3.83                    | 3.70                                 | 7.53                                 | 95.95                                |
| Average Concentration |                           | 1.83                    | 1448                                 | 3.19                    | 2.84                                 | 6.03                                 | 80.55                                |

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## AMBIENT AIR MONITORING REPORT

### Monitoring Details

Report Reference No: AES-ENV-AL-197-2025-AA-02  
Date of Monitoring: 02-10-2025 to 03-10-2025  
Monitoring Point: Chak 51 Abbasia  
Monitoring Coordinates: 29°33' N 71°22' E

| Parameters                                | Method of Measurement                         | Monitoring Duration | LDL  | Average Obtained Concentration | PEQS                    | Remarks |
|-------------------------------------------|-----------------------------------------------|---------------------|------|--------------------------------|-------------------------|---------|
| Nitrogen Dioxide (NO <sub>2</sub> ) *     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 3.19                           | 80.0 µg/m <sup>3</sup>  | Optimal |
| Nitrogen Oxide (NO) *                     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 2.84                           | 40.0 µg/m <sup>3</sup>  | Optimal |
| NO <sub>x</sub> *                         | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 6.03                           | NGVS                    | -       |
| Sulphur Dioxide (SO <sub>2</sub> ) *      | Ultraviolet Fluorescence method               | 24 Hours            | 1.00 | 80.55                          | 120.0 µg/m <sup>3</sup> | Optimal |
| Carbon Monoxide (CO) *                    | Non-Dispersive Infra-Red (NDIR)               | 24 Hours            | 0.01 | 1.83                           | 05.0 mg/m <sup>3</sup>  | Optimal |
| Carbon Dioxide (CO <sub>2</sub> )         | -                                             | 24 Hours            | -    | 1406                           | NGVS mg/m <sup>3</sup>  | -       |
| Ozone (O <sub>3</sub> ) *                 | Non-Dispersive Ultra-Violet Absorption Method | 01 Hour             | 1.00 | 0.05                           | 130 µg/m <sup>3</sup>   | Optimal |
| Particulate Matter (PM <sub>10</sub> ) *  | β Ray absorption method                       | 24 Hours            | 1.00 | 71                             | 150.0 µg/m <sup>3</sup> | Optimal |
| Particulate Matter (PM <sub>2.5</sub> ) * | β Ray absorption method                       | 24 Hours            | 1.00 | 24                             | 35.0 µg/m <sup>3</sup>  | Optimal |
| Total Particulate Matter (TSP)            | Gravimetric Sampling                          | 24 Hours            | 1.00 | 115                            | 500.0 µg/m <sup>3</sup> | Optimal |

\*Parameters are as per Punjab Environmental Protection Agency.  
Note: The standard for CO monitoring is for 24 hours, however the Average Ozone Concentration is of 24 hours.

### Abbreviations:

LDL = Lower Detection Limit

mg/m<sup>3</sup> = Milligram per Meter Cube

### Remarks:

Optimal = Compliance with Permissible Range

Low = Less than Permissible Range

NGVS = Punjab Environmental Quality Standards

NGVS = No Guideline Value Set

High = Close to Exceeding Range

µg/m<sup>3</sup> = Micro Gram per Meter Cube

High = Exceeds Permissible Range

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### AMBIENT AIR MONITORING REPORT

#### Monitoring Details

Report Reference No

AES-ENV-AL-197-2025-AA-02

Monitoring Point

Chak 51 Abbaila

Date of Monitoring

02-10-2025 to 03-10-2025

Monitoring Coordinates

29°33' N 71°22' E

| Sr. No. | Time  | Ambient Temperature °C | Wind Direction | Wind Velocity m/s | Humidity % | Pressure (mm of Hg) |
|---------|-------|------------------------|----------------|-------------------|------------|---------------------|
| 1       | 12:00 | 35                     | SW             | 3.05              | 50         | 755.31              |
| 2       | 13:00 | 36                     | SW             | 3.45              | 50         | 754.56              |
| 3       | 14:00 | 37                     | SW             | 3.15              | 39         | 753.81              |
| 4       | 15:00 | 37                     | SW             | 3.05              | 39         | 753.06              |
| 5       | 16:00 | 37                     | SW             | 2.76              | 39         | 752.31              |
| 6       | 17:00 | 37                     | SW             | 2.45              | 39         | 751.56              |
| 7       | 18:00 | 36                     | N              | 2.14              | 44         | 752.34              |
| 8       | 19:00 | 35                     | N              | 2.19              | 44         | 752.79              |
| 9       | 20:00 | 34                     | N              | 1.98              | 49         | 753.11              |
| 10      | 21:00 | 33                     | N              | 1.34              | 52         | 753.78              |
| 11      | 22:00 | 32                     | S              | 1.39              | 55         | 754.36              |
| 12      | 23:00 | 31                     | N              | 1.47              | 55         | 754.75              |
| 13      | 00:00 | 31                     | N              | 2.25              | 55         | 755.16              |
| 14      | 01:00 | 31                     | S              | 3.05              | 55         | 755.79              |
| 15      | 02:00 | 31                     | SW             | 3.54              | 55         | 756.06              |
| 16      | 03:00 | 30                     | S              | 3.11              | 59         | 756.89              |
| 17      | 04:00 | 30                     | N              | 2.56              | 59         | 756.97              |
| 18      | 05:00 | 30                     | SW             | 2.22              | 59         | 757.23              |
| 19      | 06:00 | 30                     | S              | 2.67              | 60         | 757.56              |
| 20      | 07:00 | 31                     | SW             | 3.05              | 60         | 757.89              |
| 21      | 08:00 | 31                     | S              | 2.51              | 62         | 758.13              |
| 22      | 09:00 | 32                     | S              | 1.11              | 59         | 758.31              |
| 23      | 10:00 | 34                     | S              | 1.78              | 56         | 758.48              |
| 24      | 11:00 | 35                     | S              | 2.67              | 50         | 758.97              |

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## NOISE MONITORING REPORT

| Monitoring Details  |                           |                        |                         |
|---------------------|---------------------------|------------------------|-------------------------|
| Report Reference No | AES-ENV-AI-197-2025-AA-02 | Monitoring Point       | Chak 51 Abbasia         |
| Date of Monitoring  | 02-10-2025 to 03-10-2025  | Monitoring Coordinates | 29°03'31" N 71°22'27" E |

| Sr. No. | Time  | Noise dB (A) |            |
|---------|-------|--------------|------------|
| 1       | 12:00 | 48           |            |
| 2       | 13:00 | 50           |            |
| 3       | 14:00 | 49           |            |
| 4       | 15:00 | 47           |            |
| 5       | 16:00 | 48           |            |
| 6       | 17:00 | 49           | Day Time   |
| 7       | 18:00 | 47           |            |
| 8       | 19:00 | 45           |            |
| 9       | 20:00 | 44           |            |
| 10      | 21:00 | 45           |            |
| 11      | 22:00 | 43           |            |
| 12      | 23:00 | 43           |            |
| 13      | 00:00 | 40           | Night Time |
| 14      | 01:00 | 41           |            |
| 15      | 02:00 | 40           |            |
| 16      | 03:00 | 40           |            |
| 17      | 04:00 | 42           |            |
| 18      | 05:00 | 41           |            |
| 19      | 06:00 | 43           |            |
| 20      | 07:00 | 45           |            |
| 21      | 08:00 | 47           | Day Time   |
| 22      | 09:00 | 47           |            |
| 23      | 10:00 | 48           |            |
| 24      | 11:00 | 49           |            |

| Time       | PEQS | Average Values | Remarks |
|------------|------|----------------|---------|
| Day Time   | 55   | 47             | Optimal |
| Night Time | 45   | 41             | Optimal |

Abbreviations:

Remarks:

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

dB (A) = Decibels (Adjustable to human hearing)

High = Close to Permissible Range

High = Exceeds Permissible Range

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## AMBIENT AIR MONITORING LOCATION 03 CHAK 46 ABBASIA Liaquatpur



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## AMBIENT AIR MONITORING REPORT

### Monitoring Details

Report Reference No. AES-ENV-AL-197-2025-AA-03 Monitoring Point Chak 46 Abbasia  
Date of Monitoring 03-10-2025 to 04-10-2025 Monitoring Coordinates 29°54'44" N 71°02'21" E

| Sr. No.               | Time  | CO (mg/m <sup>3</sup> ) | CO <sub>2</sub> (mg/m <sup>3</sup> ) | NO (µg/m <sup>3</sup> ) | NO <sub>2</sub> (µg/m <sup>3</sup> ) | NO <sub>x</sub> (µg/m <sup>3</sup> ) | SO <sub>2</sub> (µg/m <sup>3</sup> ) |
|-----------------------|-------|-------------------------|--------------------------------------|-------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1                     | 12:00 | 1.33                    | 1044                                 | 3.91                    | 2.03                                 | 5.93                                 | 23.98                                |
| 2                     | 13:00 | 1.39                    | 1075                                 | 4.49                    | 2.01                                 | 6.50                                 | 31.01                                |
| 3                     | 14:00 | 1.66                    | 1112                                 | 4.64                    | 2.05                                 | 6.69                                 | 37.46                                |
| 4                     | 15:00 | 2.16                    | 1201                                 | 4.87                    | 2.16                                 | 7.03                                 | 41.33                                |
| 5                     | 16:00 | 2.00                    | 1240                                 | 4.73                    | 2.12                                 | 6.85                                 | 42.81                                |
| 6                     | 17:00 | 1.63                    | 1262                                 | 4.54                    | 2.14                                 | 6.68                                 | 46.05                                |
| 7                     | 18:00 | 1.52                    | 1280                                 | 4.52                    | 2.10                                 | 6.62                                 | 44.25                                |
| 8                     | 19:00 | 1.47                    | 1336                                 | 4.22                    | 2.07                                 | 6.29                                 | 39.97                                |
| 9                     | 20:00 | 1.41                    | 1415                                 | 3.96                    | 2.01                                 | 5.96                                 | 41.98                                |
| 10                    | 21:00 | 1.47                    | 1426                                 | 3.66                    | 1.97                                 | 5.63                                 | 44.15                                |
| 11                    | 22:00 | 1.63                    | 1451                                 | 3.61                    | 2.07                                 | 5.68                                 | 40.70                                |
| 12                    | 23:00 | 1.47                    | 1462                                 | 3.66                    | 2.03                                 | 5.69                                 | 37.49                                |
| 13                    | 00:00 | 1.47                    | 1523                                 | 3.65                    | 2.08                                 | 5.73                                 | 35.60                                |
| 14                    | 01:00 | 1.43                    | 1562                                 | 3.66                    | 2.07                                 | 5.73                                 | 33.20                                |
| 15                    | 02:00 | 1.39                    | 1607                                 | 3.64                    | 2.08                                 | 5.72                                 | 34.48                                |
| 16                    | 03:00 | 1.37                    | 1634                                 | 3.62                    | 2.05                                 | 5.67                                 | 33.31                                |
| 17                    | 04:00 | 1.34                    | 1589                                 | 3.65                    | 2.03                                 | 5.68                                 | 31.24                                |
| 18                    | 05:00 | 1.33                    | 1534                                 | 3.67                    | 1.97                                 | 5.64                                 | 28.29                                |
| 19                    | 06:00 | 1.31                    | 1496                                 | 3.73                    | 2.01                                 | 5.74                                 | 23.82                                |
| 20                    | 07:00 | 1.30                    | 1464                                 | 3.71                    | 1.99                                 | 5.70                                 | 23.93                                |
| 21                    | 08:00 | 1.18                    | 1343                                 | 3.71                    | 2.01                                 | 5.72                                 | 18.68                                |
| 22                    | 09:00 | 1.18                    | 1283                                 | 3.71                    | 2.01                                 | 5.72                                 | 15.96                                |
| 23                    | 10:00 | 1.23                    | 1222                                 | 3.70                    | 1.99                                 | 5.69                                 | 13.40                                |
| 24                    | 11:00 | 1.27                    | 1098                                 | 3.67                    | 1.99                                 | 5.66                                 | 20.61                                |
| Average Concentration |       | 1.46                    | 1360                                 | 3.96                    | 2.04                                 | 6.00                                 | 32.65                                |

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## AMBIENT AIR MONITORING REPORT

|                     |                           |                        |                        |
|---------------------|---------------------------|------------------------|------------------------|
| Monitoring Details  |                           |                        |                        |
| Report Reference No | AES-ENV-AL-197-2025-AA-03 | Monitoring Point       | Chak 46 Abbasia        |
| Date of Monitoring  | 03-10-2025 to 04-10-2025  | Monitoring Coordinates | 28°54'44" N 71°02'1" E |

| Parameters                                | Method of Measurement                         | Monitoring Duration | LDL  | Average Obtained Concentration | PEQS                    | Remarks |
|-------------------------------------------|-----------------------------------------------|---------------------|------|--------------------------------|-------------------------|---------|
| Nitrogen Dioxide (NO <sub>2</sub> ) *     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 2.04                           | 80.0 µg/m <sup>3</sup>  | Optimal |
| Nitrogen Oxide (NO) *                     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 3.96                           | 40.0 µg/m <sup>3</sup>  | Optimal |
| NO <sub>x</sub> *                         | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 6.00                           | NGV5 µg/m <sup>3</sup>  | -       |
| Sulphur Dioxide (SO <sub>2</sub> ) *      | Ultraviolet Fluorescence method               | 24 Hours            | 1.00 | 32.65                          | 120.0 µg/m <sup>3</sup> | Optimal |
| Carbon Monoxide (CO) *                    | Non-Dispersive Infra-Red (NDIR)               | 24 Hours            | 0.01 | 1.46                           | 05.0 mg/m <sup>3</sup>  | Optimal |
| Carbon Dioxide (CO <sub>2</sub> )         | -                                             | 24 Hours            | -    | 1360                           | NGV5 mg/m <sup>3</sup>  | -       |
| Ozone (O <sub>3</sub> ) *                 | Non-Dispersive Ultra-Violet Absorption Method | 01 Hour             | 1.00 | 0.04                           | 130 µg/m <sup>3</sup>   | Optimal |
| Particulate Matter (PM <sub>10</sub> ) *  | β Ray absorption method                       | 24 Hours            | 1.00 | 78                             | 150.0 µg/m <sup>3</sup> | Optimal |
| Particulate Matter (PM <sub>2.5</sub> ) * | β Ray absorption method                       | 24 Hours            | 1.00 | 19                             | 35.0 µg/m <sup>3</sup>  | Optimal |
| Total Particulate Matter (TSP)            | Gravimetric Sampling                          | 24 Hours            | 1.00 | 119                            | 500.0 µg/m <sup>3</sup> | Optimal |

\*Parameters are approved by the Punjab Environmental Protection Agency.

Note: The standard for CO monitoring is for 05 Hours, however the Average Obtained Concentration is of 24-Hour.

### Abbreviations:

MDL=Lower Detection Limit

mg/m<sup>3</sup>= Milligram per Meter Cube

### Remarks:

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

PEQS= Punjab Environmental Quality Standards

NGVS= Ng Guideline Value Set

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

µg/m<sup>3</sup>= Micro Gram per Meter Cube

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

High = Exceeds from Permissible Range

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(TM)

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## AMBIENT AIR MONITORING REPORT

## Monitoring Details

Report Reference No

AES-ENV-AI-197-2025-AA-03

Monitoring Point

Chak 46 Abbasa

Date of Monitoring

03-10-2025 to 04-10-2025

Monitoring Coordinates

28°54'44" N 71°02'1" E

| Sr. No. | Time  | Ambient Temperature °C | Wind Direction | Wind Velocity m/s | Humidity % | Pressure (mm of Hg) |
|---------|-------|------------------------|----------------|-------------------|------------|---------------------|
| 1       | 12:00 | 36                     | S              | 3.05              | 44         | 757.56              |
| 2       | 13:00 | 36                     | N              | 1.96              | 44         | 757.21              |
| 3       | 14:00 | 37                     | S              | 2.67              | 39         | 756.81              |
| 4       | 15:00 | 37                     | SE             | 1.96              | 39         | 756.45              |
| 5       | 16:00 | 37                     | S              | 1.45              | 37         | 756.09              |
| 6       | 17:00 | 36                     | S              | 3.05              | 39         | 755.96              |
| 7       | 18:00 | 35                     | S              | 2.96              | 44         | 755.63              |
| 8       | 19:00 | 34                     | N              | 2.11              | 49         | 755.3               |
| 9       | 20:00 | 33                     | N              | 2.18              | 56         | 755.16              |
| 10      | 21:00 | 33                     | N              | 2.45              | 56         | 755.89              |
| 11      | 22:00 | 32                     | N              | 2.31              | 59         | 756.36              |
| 12      | 23:00 | 32                     | N              | 1.98              | 66         | 756.79              |
| 13      | 00:00 | 31                     | N              | 1.27              | 66         | 757.42              |
| 14      | 01:00 | 30                     | S              | 1.78              | 70         | 757.28              |
| 15      | 02:00 | 30                     | SW             | 2.75              | 70         | 757.12              |
| 16      | 03:00 | 30                     | SW             | 3.05              | 70         | 756.98              |
| 17      | 04:00 | 29                     | N              | 1.68              | 70         | 756.73              |
| 18      | 05:00 | 29                     | SE             | 2.18              | 74         | 756.37              |
| 19      | 06:00 | 29                     | SE             | 2.89              | 74         | 756.21              |
| 20      | 07:00 | 29                     | SE             | 3.05              | 74         | 756.79              |
| 21      | 08:00 | 29                     | S              | 2.67              | 74         | 757.45              |
| 22      | 09:00 | 30                     | SW             | 2.46              | 70         | 757.78              |
| 23      | 10:00 | 32                     | SW             | 2.19              | 69         | 757.87              |
| 24      | 11:00 | 34                     | NW             | 2.67              | 56         | 757.94              |

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## NOISE MONITORING REPORT

| Monitoring Details  |                           |                        |                       |
|---------------------|---------------------------|------------------------|-----------------------|
| Report Reference No | AEI-ENV-AL-197-2025-AA-03 | Monitoring Point       | Chak 46 Abbasia       |
| Date of Monitoring  | 03-10-2025 to 04-10-2025  | Monitoring Coordinates | 28°54'44"N 71°02'11"E |

| Sr. No. | Time  | Noise dB (A) |            |
|---------|-------|--------------|------------|
| 1       | 12:00 | 48           |            |
| 2       | 13:00 | 50           |            |
| 3       | 14:00 | 49           |            |
| 4       | 15:00 | 47           |            |
| 5       | 16:00 | 45           |            |
| 6       | 17:00 | 47           | Day Time   |
| 7       | 18:00 | 46           |            |
| 8       | 19:00 | 45           |            |
| 9       | 20:00 | 45           |            |
| 10      | 21:00 | 43           |            |
| 11      | 22:00 | 44           |            |
| 12      | 23:00 | 42           |            |
| 13      | 00:00 | 44           | Night Time |
| 14      | 01:00 | 42           |            |
| 15      | 02:00 | 40           |            |
| 16      | 03:00 | 40           |            |
| 17      | 04:00 | 41           |            |
| 18      | 05:00 | 43           |            |
| 19      | 06:00 | 45           |            |
| 20      | 07:00 | 46           |            |
| 21      | 08:00 | 46           | Day Time   |
| 22      | 09:00 | 48           |            |
| 23      | 10:00 | 49           |            |
| 24      | 11:00 | 47           |            |

| Time       | PEQS | Average Values | Remarks |
|------------|------|----------------|---------|
| Day Time   | 35   | 47             | Optimal |
| Night Time | 45   | 42             | Optimal |

### Abbreviations:

#### Remarks:

Optimal = Compliance with Permissible Range

Marginal = Close to Tolerance Edge

Low = Less than Permissible Range

High = Greater than Permissible Range

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## AMBIENT AIR MONITORING LOCATION 04 CHAK 88 ABBASIA CHOTTA Liaquatpur



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## AMBIENT AIR MONITORING REPORT

### Monitoring Details

Report Reference No. AES-BNV-AL-197-2025-AA-D4 Monitoring Point Chak 88 Abbasia Chak 84  
Date of Monitoring 04-10-2025 to 05-10-2025 Monitoring Coordinates 28°48'41" N 70°55'34" E

| Sr. No.               | Time  | CO (mg/m <sup>3</sup> ) | CO <sub>2</sub> (mg/m <sup>3</sup> ) | NO (µg/m <sup>3</sup> ) | NO <sub>2</sub> (µg/m <sup>3</sup> ) | NO <sub>x</sub> (µg/m <sup>3</sup> ) | SO <sub>2</sub> (µg/m <sup>3</sup> ) |
|-----------------------|-------|-------------------------|--------------------------------------|-------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1                     | 12:00 | 1.83                    | 1040                                 | 3.96                    | 2.08                                 | 6.04                                 | 49.45                                |
| 2                     | 13:00 | 2.26                    | 1073                                 | 4.24                    | 2.35                                 | 6.58                                 | 53.65                                |
| 3                     | 14:00 | 2.13                    | 1100                                 | 4.07                    | 2.61                                 | 6.68                                 | 83.43                                |
| 4                     | 15:00 | 1.97                    | 1114                                 | 3.89                    | 2.35                                 | 6.24                                 | 103.63                               |
| 5                     | 16:00 | 1.19                    | 1143                                 | 3.78                    | 2.31                                 | 6.09                                 | 121.89                               |
| 6                     | 17:00 | 1.43                    | 1181                                 | 3.69                    | 2.07                                 | 5.75                                 | 110.97                               |
| 7                     | 18:00 | 1.63                    | 1240                                 | 3.72                    | 2.14                                 | 5.86                                 | 96.36                                |
| 8                     | 19:00 | 1.45                    | 1264                                 | 3.77                    | 2.23                                 | 6.01                                 | 86.12                                |
| 9                     | 20:00 | 1.59                    | 1280                                 | 3.71                    | 2.10                                 | 5.81                                 | 87.38                                |
| 10                    | 21:00 | 1.52                    | 1307                                 | 3.70                    | 2.08                                 | 5.78                                 | 98.43                                |
| 11                    | 22:00 | 1.53                    | 1364                                 | 3.67                    | 2.46                                 | 6.33                                 | 112.53                               |
| 12                    | 23:00 | 1.54                    | 1397                                 | 3.71                    | 2.10                                 | 5.81                                 | 57.60                                |
| 13                    | 00:00 | 1.52                    | 1426                                 | 3.75                    | 2.01                                 | 5.76                                 | 59.04                                |
| 14                    | 01:00 | 1.17                    | 1458                                 | 3.78                    | 2.25                                 | 6.04                                 | 89.21                                |
| 15                    | 02:00 | 1.11                    | 1505                                 | 3.75                    | 2.05                                 | 5.79                                 | 74.63                                |
| 16                    | 03:00 | 1.05                    | 1514                                 | 3.72                    | 2.03                                 | 5.75                                 | 71.60                                |
| 17                    | 04:00 | 1.03                    | 1463                                 | 3.70                    | 2.07                                 | 5.76                                 | 61.54                                |
| 18                    | 05:00 | 1.01                    | 1406                                 | 3.69                    | 2.07                                 | 5.75                                 | 81.92                                |
| 19                    | 06:00 | 1.21                    | 1357                                 | 3.76                    | 2.16                                 | 5.92                                 | 87.43                                |
| 20                    | 07:00 | 0.96                    | 1310                                 | 3.80                    | 2.07                                 | 5.86                                 | 87.43                                |
| 21                    | 08:00 | 0.78                    | 1285                                 | 3.80                    | 2.10                                 | 5.90                                 | 89.44                                |
| 22                    | 09:00 | 1.13                    | 1235                                 | 3.80                    | 2.12                                 | 5.92                                 | 59.74                                |
| 23                    | 10:00 | 1.26                    | 1201                                 | 3.72                    | 2.03                                 | 5.75                                 | 36.26                                |
| 24                    | 11:00 | 1.39                    | 1156                                 | 3.66                    | 1.95                                 | 5.61                                 | 41.77                                |
| Average Concentration |       | 1.40                    | 1264                                 | 3.80                    | 2.14                                 | 5.96                                 | 79.23                                |

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## AMBIENT AIR MONITORING REPORT

### Monitoring Details

Report Reference No: A25-ENV-AL-197-2025-AA-04 Monitoring Point: Chak 88 Abbasia Chatta  
Date of Monitoring: 04-10-2025 to 05-10-2025 Monitoring Coordinates: 28°48'41" N 70°55'34" E

| Parameters                                | Method of Measurement                         | Monitoring Duration | LDL  | Average Obtained Concentration | PEQS                    | Remarks |
|-------------------------------------------|-----------------------------------------------|---------------------|------|--------------------------------|-------------------------|---------|
| Nitrogen Dioxide (NO <sub>2</sub> ) *     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 2.16                           | 80.0 µg/m <sup>3</sup>  | Optimal |
| Nitrogen Oxide (NO) *                     | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 3.60                           | 40.0 µg/m <sup>3</sup>  | Optimal |
| NO <sub>x</sub> *                         | Gas Phase Chemiluminescence                   | 24 Hours            | 1.00 | 3.96                           | NGVS µg/m <sup>3</sup>  | -       |
| Sulphur Dioxide (SO <sub>2</sub> ) *      | Ultraviolet Fluorescence method               | 24 Hours            | 1.00 | 79.23                          | 120.0 µg/m <sup>3</sup> | Optimal |
| Carbon Monoxide (CO) *                    | Non-Dispersive Infra-Red (NDIR)               | 24 Hours            | 0.01 | 1.40                           | 05.0 mg/m <sup>3</sup>  | Optimal |
| Carbon Dioxide (CO <sub>2</sub> )         | -                                             | 24 Hours            | -    | 1264                           | NGVS mg/m <sup>3</sup>  | -       |
| Ozone (O <sub>3</sub> ) *                 | Non-Dispersive Ultra-Violet Absorption Method | 01 Hour             | 1.00 | 0.03                           | 130 µg/m <sup>3</sup>   | Optimal |
| Particulate Matter (PM <sub>10</sub> ) *  | β Ray absorption method                       | 24 Hours            | 1.00 | 81                             | 150.0 µg/m <sup>3</sup> | Optimal |
| Particulate Matter (PM <sub>2.5</sub> ) * | β Ray absorption method                       | 24 Hours            | 1.00 | 20                             | 35.0 µg/m <sup>3</sup>  | Optimal |
| Total Particulate Matter (TSP)            | Gravimetric Sampling                          | 24 Hours            | 1.00 | 111                            | 500.0 µg/m <sup>3</sup> | Optimal |

\* Parameters are measured from Punjab Environmental Protection Agency.

Note: The standard for O<sub>3</sub> monitoring is for 08 hours, however the average Obtained Concentration is of 24 hours.

### Abbreviations:

LDL = Lower Detection Limit

µg/m<sup>3</sup> = micro Gram per meter Cube

### Remarks:

Optimal = Close to or within Permissible Range

Low = Less than Permissible Range

NGVS = Punjab Environmental Quality Standards

NGVS = No Gasoline Vehicle per

µg/m<sup>3</sup> = Micro Gram per Meter Cube

High = Exceeds from Permissible Range



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**AMBIENT AIR MONITORING REPORT****Monitoring Details**

Report Reference No: AES-ENV-AL-197-2025-AA-04 Monitoring Point: Chak 88 Abbasia Chatta  
Date of Monitoring: 04-10-2025 to 05-10-2025 Monitoring Coordinates: 28°48'41" N 70°55'34" E

| Sr. No. | Time  | Ambient Temperature °C | Wind Direction | Wind Velocity m/s | Humidity % | Pressure (mm of Hg) |
|---------|-------|------------------------|----------------|-------------------|------------|---------------------|
| 1       | 12:00 | 35                     | N              | 2.67              | 50         | 756.81              |
| 2       | 13:00 | 36                     | N              | 2.11              | 44         | 756.58              |
| 3       | 14:00 | 37                     | SW             | 2.89              | 42         | 756.32              |
| 4       | 15:00 | 37                     | W              | 3.05              | 42         | 756.06              |
| 5       | 16:00 | 35                     | S              | 2.16              | 39         | 755.89              |
| 6       | 17:00 | 35                     | SW             | 1.97              | 39         | 755.64              |
| 7       | 18:00 | 35                     | SW             | 3.05              | 41         | 755.31              |
| 8       | 19:00 | 34                     | N              | 2.63              | 44         | 755.13              |
| 9       | 20:00 | 33                     | S              | 2.11              | 49         | 754.85              |
| 10      | 21:00 | 32                     | S              | 2.46              | 55         | 754.56              |
| 11      | 22:00 | 31                     | S              | 2.04              | 59         | 753.81              |
| 12      | 23:00 | 30                     | S              | 1.95              | 62         | 753.43              |
| 13      | 00:00 | 30                     | S              | 1.75              | 62         | 753.06              |
| 14      | 01:00 | 29                     | S              | 1.43              | 70         | 753.45              |
| 15      | 02:00 | 28                     | SW             | 2.89              | 70         | 753.87              |
| 16      | 03:00 | 28                     | N              | 2.54              | 70         | 754.67              |
| 17      | 04:00 | 27                     | NE             | 3.05              | 79         | 754.87              |
| 18      | 05:00 | 25                     | NE             | 2.97              | 74         | 754.97              |
| 19      | 06:00 | 25                     | E              | 2.67              | 69         | 754.62              |
| 20      | 07:00 | 24                     | E              | 2.11              | 74         | 754.15              |
| 21      | 08:00 | 24                     | E              | 2.46              | 68         | 753.97              |
| 22      | 09:00 | 26                     | NW             | 1.9               | 58         | 753.63              |
| 23      | 10:00 | 27                     | N              | 3.05              | 54         | 753.1               |
| 24      | 11:00 | 28                     | E              | 2.97              | 51         | 753.63              |

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## NOISE MONITORING REPORT

### Monitoring Details

|                     |                           |                        |                         |
|---------------------|---------------------------|------------------------|-------------------------|
| Report Reference No | AES-ENV-AL-197-2025-AA-04 | Monitoring Point       | Chak 88 Abbasia Chattri |
| Date of Monitoring  | 04-10-2025 to 05-10-2025  | Monitoring Coordinates | 28°48'41" N 70°55'34" E |

| Sr. No. | Time  | Noise dB (A) |            |
|---------|-------|--------------|------------|
| 1       | 12:00 | 47           |            |
| 2       | 13:00 | 48           |            |
| 3       | 14:00 | 50           |            |
| 4       | 15:00 | 46           |            |
| 5       | 16:00 | 46           |            |
| 6       | 17:00 | 47           | Day Time   |
| 7       | 18:00 | 45           |            |
| 8       | 19:00 | 43           |            |
| 9       | 20:00 | 44           |            |
| 10      | 21:00 | 42           |            |
| 11      | 22:00 | 45           |            |
| 12      | 23:00 | 41           |            |
| 13      | 00:00 | 43           |            |
| 14      | 01:00 | 40           |            |
| 15      | 02:00 | 40           | Night Time |
| 16      | 03:00 | 42           |            |
| 17      | 04:00 | 41           |            |
| 18      | 05:00 | 43           |            |
| 19      | 06:00 | 45           |            |
| 20      | 07:00 | 46           |            |
| 21      | 08:00 | 47           |            |
| 22      | 09:00 | 47           | Day Time   |
| 23      | 10:00 | 48           |            |
| 24      | 11:00 | 46           |            |

| Time       | PEQS | Average Values | Remarks |
|------------|------|----------------|---------|
| Day Time   | 55   | 46             | Optimal |
| Night Time | 45   | 42             | Optimal |

### Abbreviations:

#### Remarks:

Optimal = Compliance with Permissible Range

Low = Less than Permissible Range

OK (No Control Required to Reduce Noise)

Close to Permissible Range

Exceeds Permissible Range

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## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                         |                                   |                           |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2025-GW-88/25                                                                                                            | Report Issue Date                 | 14-10-2025                |
| Nature of Sample                                               | Groundwater                                                                                                                             | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                    | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                              | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                              | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                         |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-88/25                                                                                                                        | Sample location                   | Chak 51 Abbasia           |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1(Ukootpur) |                                   |                           |



### Ground Water Analysis Results

| Parameter                                 | Analysis Method | PEQS              | WHO               | Result            | MU (CL95%) | Remarks |
|-------------------------------------------|-----------------|-------------------|-------------------|-------------------|------------|---------|
| <b>Laboratory Analysis</b>                |                 |                   |                   |                   |            |         |
| Color*                                    | SMWW 2120 C     | ≤ 15 TCU          | ≤ 15 TCU          | 02                | N.A.       | Optimal |
| Taste*                                    | SMWW 2160 C     | Non-Objectionable | Non-Objectionable | Objectionable     | N.A.       | High    |
| Odor*                                     | SMWW 2150 B     | Non-Objectionable | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                                | SMWW 2130 B     | ≤ 5 NTU           | ≤ 5 NTU           | 20.9              | N.A.       | High    |
| Total Hardness (as CaCO <sub>3</sub> ) ** | SMWW 2540 C     | ≤ 500 mg/L        | 300-500 mg/L      | 1440              | ± 10.70    | High    |
| Total Dissolved Solids (TDS)**            | SMWW 2540 C     | ≤ 1000 mg/L       | ≤ 1000 mg/L       | 2831              | ± 30.54    | High    |
| pH**                                      | SMWW 4300 H*    | 6.5-8.5           | 6.5-8.5           | 7.04              | ± 0.04     | Optimal |
| Aluminum (Al)                             | SMWW 3111 B     | ≤ 0.2 mg/L        | 0.2 mg/L          | < 0.005           | N.A.       | Optimal |
| Antimony (Sb)                             | SMWW 3114 B     | ≤ 0.05 mg/L       | 0.02 mg/L         | < 0.005           | N.A.       | Optimal |
| Arsenic (As)                              | SMWW 3114 B     | ≤ 0.05 mg/L       | 0.01 mg/L         | < 0.005           | N.A.       | Optimal |
| Barium (Ba)                               | SMWW 3113 B     | 0.7 mg/L          | 0.7 mg/L          | < 0.0035          | N.A.       | Optimal |
| Boron (B)                                 | SMWW 3113 B     | 0.3 mg/L          | 0.3 mg/L          | < 0.02            | N.A.       | Optimal |
| Cadmium (Cd)                              | SMWW 3113 B     | 0.01 mg/L         | 0.005 mg/L        | < 0.006           | N.A.       | Optimal |
| Chloride (Cl) **                          | SMWW 4500-Cl B  | < 250 mg/L        | 250 mg/L          | 365               | ± 6.07     | High    |
| Chromium (Cr)                             | SMWW 3113 B     | ≤ 0.05 mg/L       | 0.05 mg/L         | < 0.004           | N.A.       | Optimal |

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## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                        |                                   |                           |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2022-GW-06/25                                                                                                           | Report Issue Date                 | 16-10-2022                |
| Nature of Sample                                               | Groundwater                                                                                                                            | Sample Collection Reference       | AES/MS/GSP-014            |
| Grab/Composite                                                 | Grab                                                                                                                                   | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2022                                                                                                                             | Sample Receiving Date             | 08-10-2022                |
| Analysis Completion Date                                       | 14-10-2022                                                                                                                             | Laboratory Temperature & Humidity | (25 ± 3) °C & (55 ± 15) % |
| Ambient Temperature & Humidity of the time of Sample collected |                                                                                                                                        |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-06/25                                                                                                                       | Sample Location                   | Chak 51 Abbottia          |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Udgaon) |                                   |                           |



### Ground Water Analysis Results

| Parameter                                         | Analysis Method             | FEQS                                             | WHO        | Result  | MU (CL95%) | Remarks |
|---------------------------------------------------|-----------------------------|--------------------------------------------------|------------|---------|------------|---------|
| Copper (Cu)                                       | SMWW 3111 B                 | 2.0 mg/L                                         | 2.0 mg/L   | 0.164   | N.A.       | Optimal |
| Cyanide (CN) <sup>-</sup>                         | SMWW 4500-CN F              | ≤ 0.05 mg/L                                      | 0.07 mg/L  | 0       | N.A.       | Optimal |
| Fluoride (F) <sup>-</sup>                         | SMWW 4500-F C               | ≤ 1.5 mg/L                                       | 1.5 mg/L   | 1.39    | ± 0.06     | Optimal |
| Lead (Pb)                                         | SMWW 3114 B                 | ≤ 0.05 mg/L                                      | 1.5 mg/L   | < 0.005 | N.A.       | Optimal |
| Manganese (Mn)                                    | SMWW 3113 B                 | ≤ 0.5 mg/L                                       | 0.5 mg/L   | < 0.015 | N.A.       | Optimal |
| Mercury (Hg)                                      | SMWW 3114 B                 | ≤ 0.001 mg/L                                     | 0.001 mg/L | < 0.001 | N.A.       | Optimal |
| Nickel (Ni)                                       | SMWW 3113 B                 | ≤ 0.02 mg/L                                      | 0.02 mg/L  | < 0.02  | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> ) <sup>2-</sup>          | SMWW 4500-SO <sub>4</sub> P | NGVS mg/L                                        | NGVS mg/L  | 384     | ± 3.63     | -       |
| Nitrate (NO <sub>3</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>3</sub> D | ≤ 50 mg/L                                        | 50 mg/L    | 66.6    | ± 0.51     | High    |
| Nitrite (NO <sub>2</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>2</sub> B | ≤ 3.0 mg/L                                       | 3.0 mg/L   | 0.11    | N.A.       | Optimal |
| Selenium (Se)                                     | SMWW 3114 B                 | 0.01 mg/L                                        | 0.01 mg/L  | < 0.01  | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) <sup>+</sup> | SMWW 4500-Cl <sub>2</sub> B | 0.2 to 0.5 of Consumer & 0.5-1.5 of Service mg/L | NGVS mg/L  | 0       | N.A.       | Optimal |
| Phenolic Compounds (as Phenol) <sup>+</sup>       | SMWW 5530 D                 | NGVS mg/L                                        | ≤ 0.002    | 0       | N.A.       | -       |
| Zinc (Zn)                                         | SMWW 3113 B                 | 5.0 mg/L                                         | 3.0 mg/L   | 0.005   | N.A.       | -       |

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## GROUND WATER ANALYSIS REPORT

## Sample Details

|                                                                |                                                                                                                                           |                                   |                           |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AE5-ENV-AL-157/2025-GW-88/25                                                                                                              | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Groundwater                                                                                                                               | Sample Collection Reference       | AE5/IMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                      | Sample Collected/Sent by          | AE5                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                                | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                                | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                           |                                   | 26°C & 57 %               |
| Sample ID                                                      | AE5-ENV-GW-88/25                                                                                                                          | Sample Location                   | Chak E1, Ashbasia         |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Jalgaipur) |                                   |                           |



## Ground Water Analysis Results

| Parameter                | Analysis Method | PEQS           | WHO            | Result | MU (CL95%) | Remarks |
|--------------------------|-----------------|----------------|----------------|--------|------------|---------|
| Microbiological Analysis |                 |                |                |        |            |         |
| Total Coliforms*         | SMWW 9222 B     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Fecal Coliforms*         | SMWW 9222 D     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Escherichia coli*        | SMWW 9223 G     | 0 CFU / 100 mL | 0 CFU / 100 mL | -ve    | N.A.       | Optimal |

\*Parameters are approved from Punjab Environmental Protection Agency (PEPA).

\*Parameters are accredited from Pakistan National Accreditation Council &amp; approved from PEPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor of 2, providing a coverage probability of approximately 95%.

## Abbreviations:

PEQS = Punjab Environmental Quality Standards

TCU = True Color Unit

NTU = Nephelometric Turbidity Unit

WHO = World Health Organization

SMWW 24th Edition = Standard Methods for the examination of Water and Wastewater

N.A. = Not Available

MU = Measurement Uncertainty

CFU = Colony forming Unit

MSYS = No Customer Inside Test

## Remarks:

Optimal = Compliance with Permissible Range

Low = Less than Permissible Range

Marginal = Close to Extreme Edge

High = Exceeds from Permissible Range

## Report Disclaimer

- If provided in the report, the statement of conformity is based on a factory decision on sample acceptance (inherent risk).
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- Validity of the testing results decision for usage of report finally depends on Customer.

Analyzed By



Reviewed By

(TM) 16/10/2025

Approved By

(QM/Chief Chemist)

-----End of Report-----

Document No: AE5/MS/PEMA-115, Date of Issue 07 July 2022; Revision No. 03

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## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                         |                                   |                           |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2023-GW-07/23                                                                                                            | Report Issue Date                 | 16-10-2023                |
| Nature of Sample                                               | Groundwater                                                                                                                             | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                    | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2023                                                                                                                              | Sample Receiving Date             | 08-10-2023                |
| Analysis Completion Date                                       | 14-10-2023                                                                                                                              | Laboratory Temperature & Humidity | (25 ± 5) °C & (50 ± 10) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                         |                                   | 34°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-89/25                                                                                                                        | Sample Location                   | Chak 09 Abboda            |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1(Jalotpur) |                                   |                           |

### Ground Water Analysis Results

| Parameter                                 | Analysis Method | PEQS              | WHO               | Result            | MU (CL95%) | Remarks |
|-------------------------------------------|-----------------|-------------------|-------------------|-------------------|------------|---------|
| Laboratory Analysis                       |                 |                   |                   |                   |            |         |
| Color*                                    | SMWW 2120 C     | ≤ 13 TCU          | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                    | SMWW 2160 C     | Non-Objectionable | Non-Objectionable | Objectionable     | N.A.       | High    |
| Odor*                                     | SMWW 2150 B     | Non-Objectionable | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                                | SMWW 2130 B     | < 5 NTU           | < 5 NTU           | 1.61              | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> ) ** | SMWW 2540 C     | < 500 mg/L        | NGVS mg/L         | 1340              | ± 10.70    | High    |
| Total Dissolved Solids (TDS)**            | SMWW 2540 C     | < 1000 mg/L       | < 1000 mg/L       | 3735              | ± 30.54    | High    |
| pH**                                      | SMWW 4500 B     | 6.5-8.5           | 6.5-8.5           | 7.53              | ± 0.04     | Optimal |
| Aluminum (Al)                             | SMWW 3111 B     | ≤ 0.2 mg/L        | 0.2 mg/L          | < 0.005           | N.A.       | Optimal |
| Antimony (Sb)                             | SMWW 3114 B     | ≤ 0.005 mg/L      | 0.02 mg/L         | < 0.005           | N.A.       | Optimal |
| Arsenic (As)                              | SMWW 3114 B     | ≤ 0.05 mg/L       | 0.01 mg/L         | < 0.005           | N.A.       | Optimal |
| Barium (Ba)                               | SMWW 3113 B     | 0.7 mg/L          | 0.7 mg/L          | < 0.0035          | N.A.       | Optimal |
| Boron (B)                                 | SMWW 3113 B     | 0.3 mg/L          | 0.3 mg/L          | < 0.02            | N.A.       | Optimal |
| Cadmium (Cd)                              | SMWW 3113 B     | 0.01 mg/L         | 0.005 mg/L        | < 0.006           | N.A.       | Optimal |
| Chloride (Cl) **                          | SMWW 4500-Cl B  | < 250 mg/L        | 250 mg/L          | 227               | ± 6.07     |         |
| Chromium (Cr)                             | SMWW 3113 B     | ≤ 0.05 mg/L       | 0.05 mg/L         | < 0.004           | N.A.       |         |

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## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                          |                                   |                           |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2025-GW-89/25                                                                                                             | Report Issue Date                 | 18-10-2025                |
| Nature of Sample                                               | Groundwater                                                                                                                              | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                     | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                               | Sample Receiving Date             | 06-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                               | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 10) % |
| Ambient Temperature & Humidity of the Time of Sample collected |                                                                                                                                          |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-89/25                                                                                                                         | Sample Location                   | Chak DP, ABOBOD           |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Liquatou) |                                   |                           |



### Ground Water Analysis Results

| Parameter                                         | Analysis Method             | PEQS                                            | WHO        | Result  | MU (CL95%) | Remarks |
|---------------------------------------------------|-----------------------------|-------------------------------------------------|------------|---------|------------|---------|
| Copper (Cu)                                       | SMWW 3111 B                 | 2.0 mg/L                                        | 2.0 mg/L   | 0.166   | N.A.       | Optimal |
| Cyanide (CN) <sup>-</sup>                         | SMWW 4500-CN F              | ≤ 0.05 mg/L                                     | 0.07 mg/L  | 0       | N.A.       | Optimal |
| Fluoride (F) <sup>-</sup>                         | SMWW 4500-F C               | ≤ 1.5 mg/L                                      | 1.5 mg/L   | 0.63    | ± 0.06     | Optimal |
| Lead (Pb)                                         | SMWW 3114 B                 | ≤ 0.05 mg/L                                     | 1.0 mg/L   | < 0.005 | N.A.       | Optimal |
| Manganese (Mn)                                    | SMWW 3113 B                 | < 0.5 mg/L                                      | 0.5 mg/L   | < 0.015 | N.A.       | Optimal |
| Mercury (Hg)                                      | SMWW 3114 B                 | ≤ 0.001 mg/L                                    | 0.001 mg/L | < 0.001 | N.A.       | Optimal |
| Nickel (Ni)                                       | SMWW 3113 B                 | ≤ 0.02 mg/L                                     | 0.02 mg/L  | < 0.02  | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> ) <sup>2-</sup>          | SMWW 4500-SO <sub>4</sub> D | NGVS mg/L                                       | NGVS mg/L  | 547     | ± 3.63     | -       |
| Nitrate (NO <sub>3</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>3</sub> D | ≤ 50 mg/L                                       | 50 mg/L    | 35.4    | ± 0.30     | Optimal |
| Nitrite (NO <sub>2</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>2</sub> B | ≤ 3.0 mg/L                                      | 3.0 mg/L   | 0       | N.A.       | Optimal |
| Selenium (Se)                                     | SMWW 3114 B                 | 0.01 mg/L                                       | 0.01 mg/L  | < 0.01  | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) <sup>+</sup> | SMWW 4500-Cl <sub>2</sub> S | 0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L | NGVS mg/L  | 0       | N.A.       | Optimal |
| Phenolic Compounds (as Phenol) <sup>+</sup>       | SMWW 5030 D                 | NGVS mg/L                                       | ≤ 0.002    | 0       | N.A.       |         |
| Zinc (Zn)                                         | SMWW 3113 B                 | 5.0 mg/L                                        | 3.0 mg/L   | 0.026   | N.A.       |         |

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## GROUND WATER ANALYSIS REPORT

| Sample Details                                                 |                                                                                                                                        |                                   |                           |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-A-197/2025-GW-89/25                                                                                                            | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Groundwater                                                                                                                            | Sample Collection Reference       | AES/LMS/QSP-D14           |
| Grab/Composite                                                 | Grab                                                                                                                                   | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                             | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                             | Laboratory Temperature & Humidity | (25 ± 5) °C & (35 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                        |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-85/25                                                                                                                       | Sample Location                   | Chak QV Abbala            |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Lahore) |                                   |                           |

| Ground Water Analysis Results |                 |                |                |        |            |         |
|-------------------------------|-----------------|----------------|----------------|--------|------------|---------|
| Parameter                     | Analysis Method | PEQS           | WHO            | Result | MU (CL95%) | Remarks |
| Microbiological Analysis      |                 |                |                |        |            |         |
| Total Coliforms*              | SMWW 9222 E     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Fecal Coliforms *             | SMWW 9222 D     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Escherichia coli*             | SMWW 9221 G     | 0 CFU / 100 mL | 0 CFU / 100 mL | →      | N.A.       | Optimal |

\*Parameters are approved from Punjab Environmental Protection Agency (EPA)

\*\*Parameters are approved from Pakistan National Accreditation Council & approved from EPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

### Abbreviations:

PEQS = Punjab Environmental Quality Standards

TCU = Total Color Unit

RTU = Residual Free Turbidity Unit

WHO = World Health Organization

SMWW 24<sup>th</sup> Edition = Standard Methods for the Examination of Water and Wastewater

N.A. = Not Available

MU = Measurement Uncertainty

CRU = Colony Forming Unit

NDVS = No Guideline Value Set

### Remarks:

Optimal = Compliance with Permissible Range

Low = Less than Permissible Range

High = Close to Extremes Edge

High = Beyond from Permissible Range

### Report Disclaimer:

- Provided in this report, the statement of conformity is based on a binary decision rule of single acceptance (passed/fail).
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- The provided results relate only to the sample provided collected.
- Validity of the testing results/decisions for usage of report totally depends on Customer.

Analyzed By



Reviewed By

(TM)

16/10/2025

Approved By

(QM/Chief Chemist)

16/10/2025

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## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                          |                                   |                           |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | ATS-ENV-AI-197/2025-QW-90/25                                                                                                             | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Groundwater                                                                                                                              | Sample Collection Reference       | ATS/LAS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                     | Sample Collected/Sent by          | ATS                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                               | Sample Receiving Date             | 06-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                               | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the time of Sample collected |                                                                                                                                          |                                   | 26°C & 57 %               |
| Sample ID                                                      | ATS-ENV-QW-90/25                                                                                                                         | Sample Location                   | Chak 45 Abbasia           |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Ladokpur) |                                   |                           |



### Ground Water Analysis Results

| Parameter                                | Analysis Method | PEQS              | WHO               | Result            | MU (Cl95%) | Remarks |
|------------------------------------------|-----------------|-------------------|-------------------|-------------------|------------|---------|
| Laboratory Analysis                      |                 |                   |                   |                   |            |         |
| Color*                                   | SMWW 2120 C     | ≤ 15 TCU          | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                   | SMWW 2160 C     | Non-Objectionable | Non-Objectionable | Objectionable     | N.A.       | High    |
| Odor*                                    | SMWW 2150 B     | Non-Objectionable | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                               | SMWW 2130 B     | ≤ 5 NTU           | ≤ 5 NTU           | 0.01              | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> )** | SMWW 2340 C     | ≤ 500 mg/L        | NGVS mg/L         | 2120              | ± 10.70    | High    |
| Total Dissolved Solids (TDS)**           | SMWW 2540 C     | ≤ 1000 mg/L       | ≤ 1000 mg/L       | 4072              | ± 30.54    | High    |
| pH**                                     | SMWW 4500 H* B  | 6.5-8.5           | 6.5-8.5           | 7.45              | ± 0.04     | Optimal |
| Aluminum (Al)                            | SMWW 3111 B     | ≤ 0.2 mg/L        | 0.2 mg/L          | ≤ 0.005           | N.A.       | Optimal |
| Antimony (Sb)                            | SMWW 3114 B     | ≤ 0.005 mg/L      | 0.02 mg/L         | ≤ 0.005           | N.A.       | Optimal |
| Arsenic (As)                             | SMWW 3114 B     | ≤ 0.05 mg/L       | 0.01 mg/L         | ≤ 0.005           | N.A.       | Optimal |
| Barium (Ba)                              | SMWW 3113 B     | 0.7 mg/L          | 0.7 mg/L          | ≤ 0.0035          | N.A.       | Optimal |
| Boron (B)                                | SMWW 3113 B     | 0.3 mg/L          | 0.3 mg/L          | ≤ 0.02            | N.A.       | Optimal |
| Cadmium (Cd)                             | SMWW 3113 B     | 0.01 mg/L         | 0.003 mg/L        | ≤ 0.006           | N.A.       | Optimal |
| Chloride (Cl) <sup>-</sup>               | SMWW 4500-Cl* B | ≤ 250 mg/L        | 250 mg/L          | 385               | ± 6.07     |         |
| Chromium (Cr)                            | SMWW 3113 B     | ≤ 0.05 mg/L       | 0.05 mg/L         | ≤ 0.004           | N.A.       |         |

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LAB 208  
17025



## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                           |                                   |                           |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-157/2023-GW-PO/25                                                                                                              | Report Issue Date                 | 16-10-2023                |
| Nature of Sample                                               | Groundwater                                                                                                                               | Sample Collection Reference       | AES/UMS/GSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                      | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 08-10-2023                                                                                                                                | Sample Receiving Date             | 08-10-2023                |
| Analysis Completion Date                                       | 14-10-2023                                                                                                                                | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                           |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-PO/25                                                                                                                          | Sample Location                   | Chak 46 Abotia            |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Lodhatpur) |                                   |                           |



| Ground Water Analysis Results                     |                              |                                                 |            |         |            |         |
|---------------------------------------------------|------------------------------|-------------------------------------------------|------------|---------|------------|---------|
| Parameter                                         | Analysis Method              | PEQS                                            | WHO        | Result  | MU (CL95%) | Remarks |
| Copper (Cu)                                       | SMWW 3111 B                  | 2.0 mg/L                                        | 2.0 mg/L   | 0.144   | N.A.       | Optimal |
| Cyanide (CN) <sup>-</sup>                         | SMWW 4500-CN-F               | ≤ 0.05 mg/L                                     | 0.07 mg/L  | 0       | N.A.       | Optimal |
| Fluoride (F) <sup>-</sup>                         | SMWW 4500-F-C                | ≤ 1.5 mg/L                                      | 1.5 mg/L   | 0.51    | ± 0.54     | Optimal |
| Lead (Pb)                                         | SMWW 3114 B                  | ≤ 0.05 mg/L                                     | 1.5 mg/L   | < 0.005 | N.A.       | Optimal |
| Manganese (Mn)                                    | SMWW 3113 B                  | ≤ 0.5 mg/L                                      | 0.5 mg/L   | < 0.015 | N.A.       | Optimal |
| Mercury (Hg)                                      | SMWW 3114 B                  | ≤ 0.001 mg/L                                    | 0.001 mg/L | < 0.001 | N.A.       | Optimal |
| Nickel (Ni)                                       | SMWW 3113 B                  | ≤ 0.02 mg/L                                     | 0.02 mg/L  | < 0.02  | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> ) <sup>2-</sup>          | SMWW 4500-SO <sub>4</sub> -D | NGVS mg/L                                       | NGVS mg/L  | 556     | ± 3.63     | -       |
| Nitrate (NO <sub>3</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>3</sub> -D | ≤ 50 mg/L                                       | 50 mg/L    | 36.5    | ± 0.20     | Optimal |
| Nitrite (NO <sub>2</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>2</sub> -B | ≤ 3.0 mg/L                                      | 3.0 mg/L   | 0.02    | N.A.       | Optimal |
| Selenium (Se)                                     | SMWW 3114 B                  | 0.01 mg/L                                       | 0.01 mg/L  | < 0.01  | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) <sup>+</sup> | SMWW 4500-Cl <sub>2</sub> -B | 0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L | NGVS mg/L  | 0       | N.A.       | Optimal |
| Phenolic Compounds (as Phenol) <sup>+</sup>       | SMWW 5530 D                  | NGVS mg/L                                       | ≤ 0.002    | 0       | N.A.       |         |
| Zinc (Zn)                                         | SMWW 3113 B                  | 3.0 mg/L                                        | 3.0 mg/L   | 0.049   | N.A.       |         |

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## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                         |                                   |                           |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2025-GW-90/25                                                                                                            | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Groundwater                                                                                                                             | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                    | Sample Collected/Sent by          | AIS                       |
| Sample Collection Date                                         | 04-10-2025                                                                                                                              | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                              | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                         |                                   | 34°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-90/25                                                                                                                        | Sample Location                   | Chak 44 Abbasia           |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1(Udaotpur) |                                   |                           |



### Ground Water Analysis Results

| Parameter                       | Analysis Method | PEQS           | WHO            | Result | MU (CL95%) | Remarks |
|---------------------------------|-----------------|----------------|----------------|--------|------------|---------|
| <b>Microbiological Analysis</b> |                 |                |                |        |            |         |
| Total Coliforms*                | SMWW 9222 B     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Fecal Coliforms*                | SMWW 9222 D     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Escherichia coli*               | SMWW 9221 C     | 0 CFU / 100 mL | 0 CFU / 100 mL | —ve    | N.A.       | Optimal |

\*Parameters are approved from Punjab Environmental Protection Agency (EPA).

\*\*Parameters are accredited from Pakistan National Accreditation Council & approved Test (PA).

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor and, providing a coverage probability of approximately 95%.

#### Abbreviations:

PEQS = Punjab Environmental Quality Standards

TCB = True Color Unit

NBT = Nephelometric Turbidity Unit

WHO = World Health Organisation

#### Remarks:

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

SMWW 9222 B = Standard Methods for the examination of Water and Wastewater

N.A. = Not Available

ME = Measurement Uncertainty

CFU = Colony Forming Unit

NGWS = No Guideline Value Set

High = Exceeds from Permissible Range

#### Report Disclaimer

- If provided in the report, the statement of conformity is based on a binary decision rule of simple acceptance (pass/fail).
- The decision rule will be provided upon request.
- The remaining portion of the sample (if) will be disposed off after 15 days after the issuance date of report from the laboratory, unless otherwise instructed (Consent apply).
- The report shall not be reproduced in any form.
- This report is not intended to be used legally.
- The provided results relate only to the sample provided/collected.
- Values reflect the testing results decision for stage of report totally depends on Client's.



Reviewed By  
(TM)  
16/10/2025

Approved By  
(QM/Chief Chemist)

-----End of Report-----



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LAB 208  
17026



## GROUND WATER ANALYSIS REPORT

| Sample Details                                                 |                                                                                                                                        |                                   |                           |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2025-GW-91/25                                                                                                           | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Ground Water                                                                                                                           | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                   | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                             | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                             | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity of the Time of Sample collected |                                                                                                                                        |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-91/25                                                                                                                       | Sample Location                   | Chak 88 Abbasia Chakla    |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Lahore) |                                   |                           |

| Ground Water Analysis Results            |                 |                   |                   |                   |            |         |
|------------------------------------------|-----------------|-------------------|-------------------|-------------------|------------|---------|
| Parameter                                | Analysis Method | PEQS              | WHO               | Result            | MU (CL95%) | Remarks |
| Laboratory Analysis                      |                 |                   |                   |                   |            |         |
| Color*                                   | SMWW 2120 C     | ≤ 15 TCU          | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                   | SMWW 2160 C     | Non-Objectionable | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Odor*                                    | SMWW 2150 B     | Non-Objectionable | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                               | SMWW 2130 B     | ≤ 5 NTU           | ≤ 5 NTU           | 0                 | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> )** | SMWW 2340 C     | < 300 mg/L        | NGVS mg/L         | 364               | ± 1.40     | Optimal |
| Total Dissolved Solids (TDS)**           | SMWW 2540 C     | < 1000 mg/L       | < 1000 mg/L       | 750               | ± 8.28     | Optimal |
| pH**                                     | SMWW 4500 H* B  | 6.5-8.5           | 6.5-8.5           | 7.70              | ± 0.04     | Optimal |
| Aluminum (Al)                            | SMWW 3111 B     | ≤ 0.2 mg/L        | 0.2 mg/L          | < 0.005           | N.A.       | Optimal |
| Antimony (Sb)                            | SMWW 3114 B     | ≤ 0.005 mg/L      | 0.02 mg/L         | < 0.005           | N.A.       | Optimal |
| Arsenic (As)                             | SMWW 3116 B     | ≤ 0.05 mg/L       | 0.01 mg/L         | < 0.005           | N.A.       | Optimal |
| Barium (Ba)                              | SMWW 3113 B     | 0.7 mg/L          | 0.7 mg/L          | < 0.0005          | N.A.       | Optimal |
| Boron (B)                                | SMWW 3115 B     | 0.3 mg/L          | 0.8 mg/L          | < 0.02            | N.A.       | Optimal |
| Cadmium (Cd)                             | SMWW 3113 B     | 0.01 mg/L         | 0.003 mg/L        | < 0.006           | N.A.       | Optimal |
| Chloride (Cl) **                         | SMWW 4500-Cl* B | < 250 mg/L        | 250 mg/L          | 87                | ± 1.59     | Optimal |
| Chromium (Cr)                            | SMWW 3113 B     | ≤ 0.05 mg/L       | 0.05 mg/L         | < 0.004           | N.A.       | Optimal |

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LAB 208  
17528



## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                          |                                   |                           |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-BNY-AL-197/2023-GW-91/25                                                                                                             | Report Issue Date                 | 16-10-2023                |
| Nature of Sample                                               | Ground Water                                                                                                                             | Sample Collection Reference       | AES/LMS/QSP-Q14           |
| Grab/Composite                                                 | Grab                                                                                                                                     | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2023                                                                                                                               | Sample Receiving Date             | 08-10-2023                |
| Analysis Completion Date                                       | 14-10-2023                                                                                                                               | Laboratory Temperature & Humidity | (25 ± 5) °C & (65 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                          |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-BNY-GW-91/25                                                                                                                         | Sample Location                   | Chak 88 Abbasa Chatta     |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Ludhiana) |                                   |                           |



### Ground Water Analysis Results

| Parameter                                         | Analysis Method              | PEQS                                            | WHO        | Result  | MU (CL95%) | Remarks |
|---------------------------------------------------|------------------------------|-------------------------------------------------|------------|---------|------------|---------|
| Copper (Cu)                                       | SMWW 3111 B                  | 2.0 mg/L                                        | 2.0 mg/L   | 0.164   | N.A.       | Optimal |
| Cyanide (CN) <sup>-</sup>                         | SMWW 4500-CN-F               | ≤ 0.05 mg/L                                     | 0.07 mg/L  | 0       | N.A.       | Optimal |
| Fluoride (F) <sup>-</sup>                         | SMWW 4500-F-C                | ≤ 1.5 mg/L                                      | 1.5 mg/L   | 0.26    | ± 0.66     | Optimal |
| Lead (Pb)                                         | SMWW 3114 B                  | ≤ 0.05 mg/L                                     | 1.5 mg/L   | < 0.005 | N.A.       | Optimal |
| Manganese (Mn)                                    | SMWW 3113 B                  | ≤ 0.5 mg/L                                      | 0.5 mg/L   | < 0.015 | N.A.       | Optimal |
| Mercury (Hg)                                      | SMWW 3114 B                  | ≤ 0.001 mg/L                                    | 0.001 mg/L | < 0.001 | N.A.       | Optimal |
| Nickel (Ni)                                       | SMWW 3113 B                  | ≤ 0.02 mg/L                                     | 0.02 mg/L  | < 0.02  | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> ) <sup>2-</sup>          | SMWW 4500-SO <sub>4</sub> -D | NGVS mg/L                                       | NGVS mg/L  | 103     | ± 0.63     | -       |
| Nitrate (NO <sub>3</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>3</sub> -D | ≤ 50 mg/L                                       | 50 mg/L    | 19.0    | ± 0.20     | Optimal |
| Nitrite (NO <sub>2</sub> ) <sup>-</sup>           | SMWW 4500-NO <sub>2</sub> -B | ≤ 3.0 mg/L                                      | 5.0 mg/L   | 0       | N.A.       | Optimal |
| Selenium (Se)                                     | SMWW 3114 B                  | 0.07 mg/L                                       | 0.07 mg/L  | < 0.01  | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) <sup>*</sup> | SMWW 4500-Cl <sub>2</sub> -B | 0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L | NGVS mg/L  | 0       | N.A.       | Optimal |
| Phenolic Compounds (as Phenol) <sup>*</sup>       | SMWW 5530 D                  | NGVS mg/L                                       | ≤ 0.002    | 0       | N.A.       | -       |
| Zinc (Zn)                                         | SMWW 3113 B                  | 5.0 mg/L                                        | 3.0 mg/L   | 0.027   | N.A.       |         |

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LAB 208  
17/2025

## GROUND WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                        |                                   |                           |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-192/2025-GW-91/25                                                                                                           | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Ground Water                                                                                                                           | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                   | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                             | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                             | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity of the Time of Sample collected |                                                                                                                                        |                                   | 28°C & 57 %               |
| Sample ID                                                      | AES-ENV-GW-91/25                                                                                                                       | Sample Location                   | Chak 88 Abasala Chakla    |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Lahore) |                                   |                           |

### Ground Water Analysis Results

| Parameter                | Analysis Method | PEQS           | WHO            | Result | MU (C195%) | Remarks |
|--------------------------|-----------------|----------------|----------------|--------|------------|---------|
| Microbiological Analysis |                 |                |                |        |            |         |
| Total Coliform*          | SMWW 9222 B     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Fecal Coliforms*         | SMWW 9222 D     | 0 CFU / 100 mL | 0 CFU / 100 mL | 0      | N.A.       | Optimal |
| Escherichia coli*        | SMWW 9221 G     | 0 CFU / 100 mL | 0 CFU / 100 mL | -ve    | N.A.       | Optimal |

\*Parameters are referenced from Punjab Environmental Protection Agency (PEPA).

\*Parameters are dispatched from Punjab National Accreditation Council & approved from EPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor of 2, providing a coverage probability of approximately 95%.

### Abbreviations:

PEQS = Punjab Environmental Quality Standards

TQM = True Color Unit

MU = Measurement Uncertainty

WHO = World Health Organization

### Remarks:

Compliance = Compliance with Permissible Range

Less = Less than Permissible Range

Marginally Close to Permissible Range

High = Exceeds from Permissible Range

### Report Disclaimer

- If provided in the report, the statement of conformity is based on a single declaration of sample appearance (where applicable).
- The declaration will be provided upon request.
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- Values reflect the testing results/decision for usage of report totally depends on Customer.

Analyzed By

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## SURFACE WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                         |                                   |                           |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2025-SW-27/25                                                                                                            | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Surface Water                                                                                                                           | Sample Collection Reference       | AES/MS/QSP-014            |
| Grab/Composite                                                 | Grab                                                                                                                                    | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                              | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                              | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity of the Time of Sample collected |                                                                                                                                         |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-SW-27/25                                                                                                                        | Sample Location                   | Abbasia Canal             |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Khanpur) |                                   |                           |



| Surface Water Analysis                    |                             |      |                |            |
|-------------------------------------------|-----------------------------|------|----------------|------------|
| Parameter                                 | Analysis Method             | Unit | Result         | MU (CL95%) |
| <b>Laboratory Analysis</b>                |                             |      |                |            |
| Color*                                    | SMWW 2120 C                 | PCU  | 04             | N.A.       |
| Taste*                                    | SMWW 2160 C                 | -    | Objectable     | N.A.       |
| Odor*                                     | SMWW 2130 B                 | -    | Non-Objectable | N.A.       |
| Turbidity*                                | SMWW 2130 B                 | NTU  | 716            | N.A.       |
| Total Hardness (as CaCO <sub>3</sub> ) ** | SMWW 2340 C                 | mg/L | 140            | ± 1.40     |
| Total Dissolved Solids (TDS)**            | SMWW 2540 C                 | mg/L | 295            | ± 2.77     |
| pH**                                      | SMWW 4500 H <sup>+</sup> B  | -    | 7.96           | ± 0.04     |
| Aluminum (Al)                             | SMWW 3111 B                 | mg/L | < 0.005        | N.A.       |
| Antimony (Sb)                             | SMWW 3114 B                 | mg/L | < 0.005        | N.A.       |
| Arsenic (As)                              | SMWW 3114 B                 | mg/L | < 0.005        | N.A.       |
| Barium (Ba)                               | SMWW 3113 B                 | mg/L | < 0.0035       | N.A.       |
| Boron (B)                                 | SMWW 3113 B                 | mg/L | < 0.02         | N.A.       |
| Cadmium (Cd)                              | SMWW 3113 B                 | mg/L | < 0.006        | N.A.       |
| Chloride (Cl) **                          | SMWW 4500-Cl B              | mg/L | 45             | ± 1.59     |
| Chromium (Cr)                             | SMWW 3113 B                 | mg/L | < 0.004        | N.A.       |
| Copper (Cu)                               | SMWW 3117 B                 | mg/L | 0.164          | N.A.       |
| Cyanide (CN) <sup>-</sup>                 | SMWW 4500-CN F              | mg/L | 0              | N.A.       |
| Fluoride (F) <sup>-</sup>                 | SMWW 4500-F C               | mg/L | 0.29           | ± 0.06     |
| Lead (Pb)                                 | SMWW 3114 B                 | mg/L | < 0.005        | N.A.       |
| Manganese (Mn)                            | SMWW 3113 B                 | mg/L | < 0.015        | N.A.       |
| Mercury (Hg)                              | SMWW 3114 B                 | mg/L | < 0.001        | N.A.       |
| Nickel (Ni)                               | SMWW 3113 B                 | mg/L | < 0.02         | N.A.       |
| Nitrate (NO <sub>3</sub> ) **             | SMWW 4500-NO <sub>3</sub> D | mg/L | 40.1           | ± 0.20     |
| Nitrite (NO <sub>2</sub> ) *              | SMWW 4500-NO <sub>2</sub> B | mg/L | 0              | N.A.       |
| Selenium (Se)                             | SMWW 3114 B                 | mg/L | < 0.01         | N.A.       |

Page 3 of 4

*Signature*  
16/10/2025



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## SURFACE WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                         |                                   |                           |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2023-SW-27/25                                                                                                            | Report Issue Date                 | 16-10-2023                |
| Nature of Sample                                               | Surface Water                                                                                                                           | Sample Collection Reference       | AES/MS/QSP-014            |
| Grab/Composite                                                 | Grab                                                                                                                                    | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2023                                                                                                                              | Sample Receiving Date             | 08-10-2023                |
| Analysis Completion Date                                       | 14-10-2023                                                                                                                              | Laboratory Temperature & Humidity | (23 ± 3) °C & (55 ± 13) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                         |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-SW-27/25                                                                                                                        | Sample Location                   | Abbotta Canal             |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Jandaur) |                                   |                           |



| Surface Water Analysis                 |                 |            |        |            |
|----------------------------------------|-----------------|------------|--------|------------|
| Parameter                              | Analysis Method | Unit       | Result | MU (CL95%) |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500-Cl B  | mg/L       | 0      | N.A.       |
| Phenolic Compounds (as Phenol) *       | SMWW 5530 D     | mg/L       | 0      | N.A.       |
| Zinc (Zn)                              | SMWW 3113 B     | mg/L       | 0.027  | N.A.       |
| Microbiological Analysis:              |                 |            |        |            |
| Total Coliforms*                       | SMWW 9222 B     | CFU/mL     | 0      | N.A.       |
| Fecal Coliforms *                      | SMWW 9223 D     | CFU/mL     | 0      | N.A.       |
| Escherichia coli*                      | SMWW 9221 G     | 0 CFU / mL | 0      | N.A.       |

\*Parameters are approved from Punjab Environmental Protection Agency (PEPA).

\*\*Parameters are controlled from Pakistan National Accreditation Council (PNAC) & approved from EPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor (k), providing a coverage probability of approximately 95%.

### Abbreviations:

PEPS = Punjab Environmental Protection Agency  
TCU = True Color Unit  
N/A = Not Available  
MU = Measurement Uncertainty

### Remarks:

0.027 = Compliance with Permissible Range  
Low = Low than Permissible Range  
Marginal = Close to Extreme Edge  
High = Exceeds from Permissible Range

### Report Disclaimer

- It is provided in the report, the statement of conformity is based on a binary decision rule of simple acceptance (shown OK).
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Analyzed By



Reviewed By

(TM) 16/10/2023

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(QM/Chief Chemist)

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## SURFACE WATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                           |                                   |                           |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2023-SW-29/25                                                                                                              | Report Issue Date                 | 16-10-2023                |
| Nature of Sample                                               | Surface Water                                                                                                                             | Sample Collection Reference       | AES/UMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                      | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2023                                                                                                                                | Sample Receiving Date             | 08-10-2023                |
| Analysis Completion Date                                       | 14-10-2023                                                                                                                                | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity of the Time of Sample collected |                                                                                                                                           |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-SW-29/25                                                                                                                          | Sample location                   | Chak D1 Dhostraka         |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Lahoriput) |                                   |                           |



| Surface Water Analysis                    |                             |      |                   |            |
|-------------------------------------------|-----------------------------|------|-------------------|------------|
| Parameter                                 | Analysis Method             | Unit | Result            | MU (CL95%) |
| <b>Laboratory Analysis</b>                |                             |      |                   |            |
| Color*                                    | SMWW 2120 C                 | TCU  | 18                | N.A.       |
| Taste*                                    | SMWW 2140 C                 | -    | Objectionable     | N.A.       |
| Odor*                                     | SMWW 2150 B                 | -    | Non-Objectionable | N.A.       |
| Turbidity*                                | SMWW 2130 B                 | NTU  | 412               | N.A.       |
| Total Hardness (as CaCO <sub>3</sub> ) ** | SMWW 2340 C                 | mg/L | 132               | ± 1.40     |
| Total Dissolved Solids (TDS)**            | SMWW 2540 C                 | mg/L | 274               | ± 2.77     |
| pH**                                      | SMWW 4500 H* B              | -    | 7.81              | ± 0.04     |
| Aluminum (Al)                             | SMWW 3111 B                 | mg/L | < 0.005           | N.A.       |
| Antimony (Sb)                             | SMWW 3114 B                 | mg/L | < 0.005           | N.A.       |
| Arsenic (As)                              | SMWW 3114 B                 | mg/L | < 0.005           | N.A.       |
| Barium (Ba)                               | SMWW 3113 B                 | mg/L | < 0.0035          | N.A.       |
| Boron (B)                                 | SMWW 3113 B                 | mg/L | < 0.02            | N.A.       |
| Cadmium (Cd)                              | SMWW 3113 B                 | mg/L | < 0.006           | N.A.       |
| Chloride (Cl) **                          | SMWW 4500-Cl B              | mg/L | 35                | ± 1.59     |
| Chromium (Cr)                             | SMWW 3113 B                 | mg/L | < 0.004           | N.A.       |
| Copper (Cu)                               | SMWW 3111 B                 | mg/L | 0.164             | N.A.       |
| Cyanide (CN)*                             | SMWW 4500-CN* F             | mg/L | 0                 | N.A.       |
| Fluoride (F)**                            | SMWW 4500-F* C              | mg/L | 0.27              | ± 0.06     |
| Lead (Pb)                                 | SMWW 3114 B                 | mg/L | < 0.005           | N.A.       |
| Manganese (Mn)                            | SMWW 3113 B                 | mg/L | < 0.015           | N.A.       |
| Mercury (Hg)                              | SMWW 3114 B                 | mg/L | < 0.001           | N.A.       |
| Nickel (Ni)                               | SMWW 3113 B                 | mg/L | < 0.02            | N.A.       |
| Nitrate (NO <sub>3</sub> ) **             | SMWW 4500-NO <sub>3</sub> D | mg/L | 25.3              | ± 0.23     |
| Nitrite (NO <sub>2</sub> ) *              | SMWW 4500-NO <sub>2</sub> B | mg/L | 0                 | N.A.       |
| Selenium (Se)                             | SMWW 3114 B                 | mg/L | < 0.01            | N.A.       |
| Residual Chlorine (Cl <sub>2</sub> ) *    | SMWW 4500-Cl B              | mg/L | 0                 | N.A.       |

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## SURFACE WATER ANALYSIS REPORT

### Sample Details

Report Reference No. AES-ENV-AL-197/2023-SW-29/23  
Nature of Sample Surface Water  
Grab/Composite Grab  
Sample Collection Date 06-10-2023  
Analysis Completion Date 14-10-2023  
Ambient Temperature & Humidity at the time of sample collected 26°C & 57%  
Sample ID AES-ENV-SW-29/23  
Project Details Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Laharpur)

Report Issue Date 16-10-2023  
Sample Collection Reference AES/LMS/QSP-01-4  
Sample Collected/Sent by AES  
Sample Receiving Date 08-10-2023  
Laboratory Temperature & Humidity (25 ± 5) °C & (55 ± 15) %  
Check 01 Dhoshaka



| Surface Water Analysis           |                 |          |        |            |
|----------------------------------|-----------------|----------|--------|------------|
| Parameter                        | Analysis Method | Unit     | Result | MU (CL95%) |
| Phenolic Compounds (as Phenol) * | SMWW 5330 D     | mg/L     | 0      | N.A.       |
| Zinc (Zn)                        | SMWW 3113-B     | mg/L     | 0.026  | N.A.       |
| Microbiological Analysis         |                 |          |        |            |
| Total Coliforms*                 | SMWW 9222 B     | O CFU/mL | 0      | N.A.       |
| Fecal Coliforms *                | SMWW 9222 D     | O CFU/mL | 0      | N.A.       |
| Escherichia coli*                | SMWW 9221 G     | O CFU/mL | no     | N.A.       |

\*For details are approved from Punjab Environmental Protection Agency (PEPA).

\*For details are approved from Pakistan National Accreditation Council & approved from EPA.

The reported expanded uncertainty is based on certified standard uncertainty multiplied by a coverage factor of 2, providing a coverage probability of approximately 95%.

### Abbreviations:

PEPA = Punjab Environmental Protection Agency  
TCU = Type Certificate Unit  
MPL = Measurement Laboratory

SMWW 3470 Series = Standard Methods for the examination of water and wastewater  
N.A. = Not Available  
MPL = Measurement Laboratory

CRU = Colony Forming Unit  
NGVS = No Guideline Value Set

### Remarks:

Outlined = Compliance with Permissible Range  
Low = Less than Permissible Range

Margin = Close to Permissible Range

High = Exceeds from Permissible Range

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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                          |                                   |                                          |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------|
| Report Reference No.                                           | AES-ENV-WW-172/2025-WW-172                                                                                                               | Report Issue Date                 | 16-10-2025                               |
| Nature of Sample                                               | Wastewater                                                                                                                               | Sample Collection Reference       | AES/LMS/QSP-014                          |
| Grab/Composite                                                 | Grab                                                                                                                                     | Sample Collected/Sent by          | AES                                      |
| Sample Collection Date                                         | 04-10-2025                                                                                                                               | Sample Receiving Date             | 08-10-2025                               |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                               | Laboratory Temperature & Humidity | (25 ± 3) °C & (55 ± 10) %<br>25°C & 57 % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                          |                                   |                                          |
| Sample ID                                                      | AES-ENV-WW-172/2025                                                                                                                      | Sample Location                   | Chak 31, Abolpota                        |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project Cluster South-1 (Uqarapur) |                                   |                                          |



| Wastewater Analysis Results                    |                              |           |        |            |         |
|------------------------------------------------|------------------------------|-----------|--------|------------|---------|
| Parameter                                      | Analysis Method              | PEQS      | Result | MU (CL95%) | Remarks |
| <b>Laboratory Analysis</b>                     |                              |           |        |            |         |
| pH**                                           | SMWW 4500-H* B               | 6 - 9     | 7.65   | ± 0.04     | Optimal |
| Biochemical Oxygen Demand (BOD) <sup>5</sup> * | SMWW 5210-B                  | 60 mg/L   | 128    | N.A.       | High    |
| Chemical Oxygen Demand (COD)**                 | SMWW 5220-D                  | 150 mg/L  | 184    | ± 1.31     | High    |
| Total Suspended Solids (TSS)**                 | SMWW 2540-D                  | 300 mg/L  | 102    | ± 1.12     | Optimal |
| Total Dissolved Solids (TDS)**                 | SMWW 2540-C                  | 3500 mg/L | 2066   | ± 11.98    | Optimal |
| Phenolic Compounds (as Phenol)*                | SMWW 5550-B, D               | 0.1 mg/L  | 0      | N.A.       | Optimal |
| Grease and Oil**                               | SMWW 5520-B                  | 10 mg/L   | 04     | ± 0.89     | Optimal |
| Chloride (Cl)**                                | SMWW 4500-Cl-B               | 1000 mg/L | 256    | ± 6.07     | Optimal |
| Fluoride (F)**                                 | SMWW 4500-F-D                | 10 mg/L   | 0.96   | ± 0.06     | Optimal |
| Cyanide (CN)*                                  | SMWW 4500-CN-F               | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Anionic Detergents (as MBA)*                   | SMWW 5540-C                  | 20.0 mg/L | 1.5    | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> )**                   | SMWW 4500-SO <sub>4</sub> -D | 600 mg/L  | 227    | ± 3.63     | Optimal |
| Sulfide (S <sup>2-</sup> )*                    | SMWW 4500-S <sup>2-</sup> -F | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Ammonia (NH <sub>3</sub> )*                    | SMWW 4500-NH <sub>3</sub> -C | 40 mg/L   | 0      | N.A.       | Optimal |
| Cadmium (Cd)                                   | SMWW 3110-B                  | 0.1 mg/L  | <0.004 | N.A.       | Optimal |
| Chromium (Cr)                                  | SMWW 3113-B                  | 1.0 mg/L  | <0.004 | N.A.       | Optimal |
| Copper (Cu)                                    | SMWW 3113-B                  | 1.0 mg/L  | 0.164  | N.A.       | Optimal |
| Lead (Pb)                                      | SMWW 3113-B                  | 0.5 mg/L  | <0.005 | N.A.       | Optimal |
| Mercury (Hg)                                   | SMWW 3112-B                  | 0.01 mg/L | <0.001 | N.A.       | Optimal |
| Selenium (Se)                                  | SMWW 3114-B                  | 0.5 mg/L  | <0.01  | N.A.       | Optimal |
| Nickel (Ni)                                    | SMWW 3113-B                  | 1.0 mg/L  | <0.02  | N.A.       | Optimal |
| Silver (Ag)                                    | SMWW 3113-B                  | 1.0 mg/L  | <0.002 | N.A.       | Optimal |
| Total Toxic Metals                             | Calculated Value             | 2.0 mg/L  | 0.24   | N.A.       | Optimal |
| Zinc (Zn)                                      | SMWW 3111-B                  | 5.0 mg/L  | 0.005  | N.A.       | Optimal |
| Arsenic (As)                                   | SMWW 3114-B                  | 1.0 mg/L  | <0.005 | N.A.       | Optimal |
| Sodium (Na)                                    | SMWW 3113-B                  | 1.5 mg/L  | <0.003 | N.A.       | Optimal |

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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                        |                                   |                           |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-ENV-AL-177/2025-WW-172                                                                                                             | Report Issue Date                 | 14-10-2025                |
| Nature of Sample                                               | Wastewater                                                                                                                             | Sample Collection Reference       | AES/LAB/GSP-314           |
| Grab/Composite                                                 | Grab                                                                                                                                   | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                             | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                             | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample Collected |                                                                                                                                        |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-ENV-WW-172/2025                                                                                                                    | Sample Location                   | Chak 51, Abbotpota        |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Lahore) |                                   |                           |



| Wastewater Analysis Results            |                 |          |         |            |         |
|----------------------------------------|-----------------|----------|---------|------------|---------|
| Parameter                              | Analysis Method | PEQS     | Result  | MU (CL95%) | Remarks |
| Iron (Fe)                              | SMWW 3113 B     | 8.0 mg/L | 0.091 g | N.A.       | Optimal |
| Manganese (Mn)                         | SMWW 3111 B     | 1.5 mg/L | <0.015  | N.A.       | Optimal |
| Boron (B)                              | SMWW 3119 B     | 4.0 mg/L | <0.02   | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl-8  | 1.0 mg/L | 0       | N.A.       | Optimal |

\*Parameters are approved from Punjab Environmental Protection Agency (PEPA).

\*\*Parameters are approved from Pakistan National Accreditation Council & approved from EPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

### Abbreviations:

PEQS = Punjab Environmental Quality Standards  
N.A. = Not Available

SMWW = Standard Methods for the Examination of Water and Wastewater  
MU = Measurement Uncertainty

### Remarks:

Optimal = Compliance with Permissible Range

High = Close to Permissible Range

High = Exceeds from Permissible Range

Low = Less than Permissible Range

### Report Disclaimer:

- It is provided in the report, the statement of conformity is based on a laboratory decision rule of single acceptance (should not).
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- The provided results relate only to the sample provided/collected.
- Values reflect the testing results; decision for usage of report solely depends on Customer.

Analyzed By  
16/10/2025  
Environmental Services  
LAHORE

Reviewed By  
(TM)

Approved By  
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End of Report

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Document No. AES/LHS/PRM-115 Date of Issue 07 July 2022, Revision No. 00

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17025



## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                            |                                   |                                                                                                                                         |
|----------------------------------------------------------------|----------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Report Reference No.                                           | AES-ENV-AL-197/2025-WW-173 | Report Issue Date                 | 16-10-2025                                                                                                                              |
| Nature of Sample                                               | Wastewater                 | Sample Collection Reference       | AES/UNS/QSPH/14                                                                                                                         |
| Grab/Composite                                                 | Grab                       | Sample Collected/Sent by          | AES                                                                                                                                     |
| Sample Collection Date                                         | 06-10-2025                 | Sample Receiving Date             | 08-10-2025                                                                                                                              |
| Analysis Completion Date                                       | 14-10-2025                 | Laboratory Temperature & Humidity | (23 ± 5) °C & (35 ± 10) %<br>26°C & 37 %                                                                                                |
| Ambient Temperature & Humidity at the Time of Sample collected |                            | Sample Location                   | Chak 99 Abbaria                                                                                                                         |
| Sample ID                                                      | AES-ENV-WW-173/2025        |                                   | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Jalgaon) |
| Project Details                                                |                            |                                   |                                                                                                                                         |



### Wastewater Analysis Results

| Parameter                                       | Analysis Method              | PEQS      | Result | MU (CL95%) | Remarks |
|-------------------------------------------------|------------------------------|-----------|--------|------------|---------|
| <b>Laboratory Analysis</b>                      |                              |           |        |            |         |
| pH**                                            | SMWW 4500 H+ B               | 6 - 9     | 7.61   | ± 0.04     | Optimal |
| Biochemical Oxygen Demand (BOD <sub>5</sub> ) * | SMWW 5210-B                  | 80 mg/L   | 278    | N.A.       | High    |
| Chemical Oxygen Demand (COD)**                  | SMWW 5220-B                  | 180 mg/L  | 319    | ± 2.29     | High    |
| Total Suspended Solids (TSS) **                 | SMWW 2540-D                  | 200 mg/L  | 423    | ± 4.30     | High    |
| Total Dissolved Solids (TDS)**                  | SMWW 2540-C                  | 2500 mg/L | 4871   | ± 30.54    | High    |
| Phenolic Compounds (as Phenol) *                | SMWW 5330-B, D               | 0.1 mg/L  | 0      | N.A.       | Optimal |
| Grease and Oil**                                | SMWW 5520-B                  | 10 mg/L   | 05     | ± 0.09     | Optimal |
| Chloride (Cl <sup>-</sup> )**                   | SMWW 4500-CL-B               | 1800 mg/L | 296    | ± 6.07     | Optimal |
| Fluoride (F <sup>-</sup> )**                    | SMWW 4500-F-B                | 10 mg/L   | 0.46   | ± 0.06     | Optimal |
| Cyanide (CN <sup>-</sup> ) *                    | SMWW 4500-CN-F               | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Anionic Detergents (as MBAS) *                  | SMWW 5540-C                  | 20.0 mg/L | 2.5    | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> <sup>2-</sup> ) **     | SMWW 4500-SO <sub>4</sub> -D | 600 mg/L  | 372    | ± 3.63     | Optimal |
| Sulfide (S <sup>2-</sup> ) *                    | SMWW 4500-S <sup>2-</sup> -F | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Ammonia (NH <sub>3</sub> ) *                    | SMWW 4500-NH <sub>3</sub> -C | 40 mg/L   | 0      | N.A.       | Optimal |
| Cadmium (Cd)                                    | SMWW 3113-B                  | 0.1 mg/L  | <0.004 | N.A.       | Optimal |
| Chromium (Cr)                                   | SMWW 3113-B                  | 1.0 mg/L  | <0.004 | N.A.       | Optimal |
| Copper (Cu)                                     | SMWW 3113-B                  | 1.0 mg/L  | 0.165  | N.A.       | Optimal |
| Lead (Pb)                                       | SMWW 3113-B                  | 0.5 mg/L  | <0.005 | N.A.       | Optimal |
| Mercury (Hg)                                    | SMWW 3113-B                  | 0.01 mg/L | <0.001 | N.A.       | Optimal |
| Selenium (Se)                                   | SMWW 3113-B                  | 0.5 mg/L  | <0.01  | N.A.       | Optimal |
| Nickel (Ni)                                     | SMWW 3113-B                  | 1.0 mg/L  | <0.02  | N.A.       | Optimal |
| Silver (Ag)                                     | SMWW 3113-B                  | 1.0 mg/L  | <0.002 | N.A.       | Optimal |
| Total Toxic Metals                              | Calculated Value             | 2.0 mg/L  | 0.24   | N.A.       | Optimal |
| Zinc (Zn)                                       | SMWW 3111-B                  | 5.0 mg/L  | 0.037  | N.A.       | Optimal |
| Antimony (Sb)                                   | SMWW 3114-B                  | 1.0 mg/L  | <0.005 | N.A.       | Optimal |

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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                          |                                   |                               |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------|
| Report Reference No.                                           | AES-ENV-WW-197/2025-WW-173                                                                                                               | Report Issue Date                 | 16-10-2025                    |
| Nature of Sample                                               | Wastewater                                                                                                                               | Sample Collection Reference       | AES/LMS/QSP-014               |
| Grab/Composite                                                 | Grab                                                                                                                                     | Sample Collected/Sent by          | AES                           |
| Sample Collection Date                                         | 06-10-2025                                                                                                                               | Sample Receiving Date             | 09-10-2025                    |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                               | Laboratory Temperature & Humidity | (25 ± 5) °C A.<br>(55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                          |                                   | 24°C & 57 %                   |
| Sample ID                                                      | AES-ENV-WW-173/2025                                                                                                                      | Sample Location                   | Chak 09 Abbaila               |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-I (Lilacpur) |                                   |                               |



### Wastewater Analysis Results

| Parameter                              | Analysis Method | PEQS     | Result  | MU (CL95%) | Remarks |
|----------------------------------------|-----------------|----------|---------|------------|---------|
| Barium (Ba)                            | SMWW 3113 B     | 1.5 mg/L | <0.0035 | N.A.       | Optimal |
| Iron (Fe)                              | SMWW 3113 B     | 5.0 mg/L | 0.0950  | N.A.       | Optimal |
| Manganese (Mn)                         | SMWW 3111 B     | 1.5 mg/L | <0.015  | N.A.       | Optimal |
| Boron (B)                              | SMWW 3113 B     | 6.0 mg/L | <0.02   | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl-8  | 1.0 mg/L | 0       | N.A.       | Optimal |

\* Parameters are approved from Punjab Environmental Protection Agency (PEPA).

\*\* Parameters are accredited from Pakistan National Accreditation Council & approved from EPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

#### Abbreviations:

PEQS = Punjab Environmental Quality Standards  
N.A. = Not Available

SMWW = Standard Methods for the Examination of Water and Wastewater  
MU = Measurement Uncertainty

#### Remarks:

Optimal = Conforms with Permissible Range

Medium = Close to Excessive Stage

High = Exceeds from Permissible Range

Low = Less than Permissible Range

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- If provided in the report, the statement of conformity is based on a binary decision rule of simple acceptance (or not).
- The decision rule will be provided upon request.
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- The provided results relate only to the sample provided as tested.
- Values reflect the testing results obtained for stage of test if fully depends on Customer.

Analyzed By



Reviewed By  
(TM)

18/10/2025

Approved By

(QM/Chief Chemist)

16/10/25

End of Report

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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                        |                                   |                                          |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------|
| Report Reference No.                                           | AES/ENV-WW/197/2025-WW-174                                                                                                             | Report Issue Date                 | 16-10-2025                               |
| Nature of Sample                                               | Wastewater                                                                                                                             | Sample Collection Reference       | AES/LMS/QSP-014                          |
| Grab/Composite                                                 | Grab                                                                                                                                   | Sample Collected/Sent by          | AES                                      |
| Sample Collection Date                                         | 04-10-2025                                                                                                                             | Sample Receiving Date             | 09-10-2025                               |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                             | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) %<br>20°C & 57 % |
| Ambient Temperature & Humidity at the time of Sample collected |                                                                                                                                        |                                   |                                          |
| Sample ID:                                                     | AES/ENV-WW-174/2025                                                                                                                    | Sample Location                   | Chak 43 Abbasia                          |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1(Udaqpur) |                                   |                                          |



| Wastewater Analysis Results                     |                              |           |        |            |         |
|-------------------------------------------------|------------------------------|-----------|--------|------------|---------|
| Parameter                                       | Analysis Method              | FEQS      | Result | MU (CL95%) | Remarks |
| Laboratory Analysis                             |                              |           |        |            |         |
| pH**                                            | SMWW 4500-H <sup>+</sup> B   | 6-9       | 7.45   | ± 0.04     | Optimal |
| Biochemical Oxygen Demand (BOD <sub>5</sub> ) * | SMWW 5210-B                  | 50 mg/L   | 170    | N.A.       | High    |
| Chemical Oxygen Demand (COD)**                  | SMWW 5220-D                  | 150 mg/L  | 321    | ± 2.29     | High    |
| Total Suspended Solids (TSS)**                  | SMWW 2540-D                  | 200 mg/L  | 36     | ± 1.12     | Optimal |
| Total Dissolved Solids (TDS)**                  | SMWW 2540-C                  | 3500 mg/L | 2234   | ± 30.54    | Optimal |
| Phenolic Compounds (as Phenol) *                | SMWW 5330-B, D               | 0.1 mg/L  | 0      | N.A.       | Optimal |
| Grease and Oil*                                 | SMWW 5320-B                  | 10 mg/L   | 3.5    | ± 0.89     | Optimal |
| Chloride (Cl)**                                 | SMWW 4500-Cl-B               | 1000 mg/L | 177    | ± 1.89     | Optimal |
| Fluoride (F)**                                  | SMWW 1900-F-D                | 10 mg/L   | 0.34   | ± 0.06     | Optimal |
| Cyanide (CN)*                                   | SMWW 4500-CN-F               | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Anionic Detergents (as MBAs) *                  | SMWW 5540-C                  | 20.0 mg/L | 1.6    | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> )* **                  | SMWW 4500-SO <sub>4</sub> -D | 600 mg/L  | 286    | ± 3.63     | Optimal |
| Sulfide (S <sup>2-</sup> ) *                    | SMWW 4500-S <sup>2-</sup> -F | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Ammonia (NH <sub>3</sub> ) *                    | SMWW 4500-NH <sub>3</sub> -D | 40 mg/L   | 0      | N.A.       | Optimal |
| Cadmium (Cd)                                    | SMWW 3113-B                  | 0.1 mg/L  | <0.005 | N.A.       | Optimal |
| Chromium (Cr)                                   | SMWW 3113-B                  | 1.0 mg/L  | <0.004 | N.A.       | Optimal |
| Copper (Cu)                                     | SMWW 3113-B                  | 1.0 mg/L  | 0.165  | N.A.       | Optimal |
| Lead (Pb)                                       | SMWW 3113-B                  | 0.5 mg/L  | <0.005 | N.A.       | Optimal |
| Mercury (Hg)                                    | SMWW 3113-B                  | 0.01 mg/L | <0.001 | N.A.       | Optimal |
| Selenium (Se)                                   | SMWW 3114-B                  | 0.5 mg/L  | <0.01  | N.A.       | Optimal |
| Nickel (Ni)                                     | SMWW 3113-B                  | 1.0 mg/L  | <0.02  | N.A.       | Optimal |
| Silver (Ag)                                     | SMWW 3113-B                  | 1.0 mg/L  | <0.002 | N.A.       | Optimal |
| Total Toxic Metals                              | Calculated Value             | 2.9 mg/L  | 0.24   | N.A.       | Optimal |
| Zinc (Zn)                                       | SMWW 3111-B                  | 5.0 mg/L  | 0.035  | N.A.       | Optimal |
| Arsenic (As)                                    | SMWW 3114-B                  | 1.0 mg/L  | <0.005 | N.A.       | Optimal |
| Barium (Ba)                                     | SMWW 3113-B                  | 1.5 mg/L  | <0.005 | N.A.       | Optimal |

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1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 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1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 20



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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                           |                                   |                           |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-BNY-AL-197/2025-WW-174                                                                                                                | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Wastewater                                                                                                                                | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                      | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                                | Sample Receiving Date             | 06-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                                | Laboratory temperature & Humidity | (25 ± 5) °C & (55 ± 10) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                           |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-BNY-WW-174/2025                                                                                                                       | Sample Location                   | Chak 46 Abbasia           |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1(Jalgaonpur) |                                   |                           |



| Wastewater Analysis Results            |                 |          |        |            |         |
|----------------------------------------|-----------------|----------|--------|------------|---------|
| Parameter                              | Analysis Method | PEQS     | Result | MU (CI95%) | Remarks |
| Iron [Fe]                              | SMWW 3113 B     | 8.0 mg/L | 0.0893 | N.A.       | Optimal |
| Manganese [Mn]                         | SMWW 3111 B     | 1.3 mg/L | 0.015  | N.A.       | Optimal |
| Boron [B]                              | SMWW 3113 B     | 5.0 mg/L | 0.02   | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl-B  | 1.0 mg/L | 0      | N.A.       | Optimal |

\*Parameter are approved from Punjab Environmental Protection Agency (PEPA).

\*\*Roommates are accredited from Pakistan National Accreditation Council &amp; approved from EPA.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor (k), providing a coverage probability of approximately 95%.

### Abbreviations:

PEQS = Punjab Environmental Quality Standards

N.A. = Not Available

### Remarks:

Optimal = Complies with Permissible Range

Low = Less than Permissible Range

SMWW = Standard Methods for the examination of Water and Wastewater

MU = Measurement Uncertainty

Midpoint = Close to Midpoint Edge

High = Exceeds from Permissible Range

### Report Disclaimer

- If provided in the report, the statement of conformity is based on a binary decision rule of simple acceptance/rejection.
- The decision rule will be provided upon request.
- The remaining portion of the sample (if any) will be disposed off after 10 days of the issuance date of the report from the laboratory unless otherwise instructed (Consent Apply).
- This report shall not be reproduced in part/whole.
- This report is not intended to be used legally.
- The provided results relate only to the sample provided/collected.
- Values reflect the testing results; decision for usage of report totally depends on customer.

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16/10/2025  
Asian Environmental Services  
LAHORE

Reviewed By  
(TM)  
16/10/2025

Approved By  
(QM/Chief Chemist)  
16/10/2025

End of Report

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Document No: AES/LMS/PRM-118; Date of Issue 07 July 2023; Revision No. 02

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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                           |                                   |                           |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-BNY-AL-197/2025-WW-175                                                                                                                | Report Issue Date                 | 14-10-2025                |
| Nature of Sample                                               | Wastewater                                                                                                                                | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                      | Sample Collected/Seal by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                                | Sample Receiving Date             | 09-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                                | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity of the Time of Sample collected |                                                                                                                                           |                                   | 26°C & 57 %               |
| Sample ID                                                      | AES-BNY-WW-175/2025                                                                                                                       | Sample Location                   | Chak 88 Abbasa Chofta     |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Jalootpur) |                                   |                           |



| Wastewater Analysis Results                    |                              |           |         |            |         |
|------------------------------------------------|------------------------------|-----------|---------|------------|---------|
| Parameter                                      | Analysis Method              | PEQS      | Result  | MU (CL95%) | Remarks |
| <b>Laboratory Analysis</b>                     |                              |           |         |            |         |
| pH**                                           | SMWW 4500-H <sup>+</sup> B   | 6 - 9     | 6.57    | ± 0.04     | Optimal |
| Biochemical Oxygen Demand (BOD) <sub>5</sub> * | SMWW 5210-B                  | 80 mg/L   | 1075    | N.A.       | High    |
| Chemical Oxygen Demand (COD)**                 | SMWW 5220-D                  | 150 mg/L  | 2010    | ± 1.18     | High    |
| Total Suspended Solids (TSS)**                 | SMWW 2540-D                  | 200 mg/L  | 1134    | ± 5.56     | High    |
| Total Dissolved Solids (TDS)**                 | SMWW 2540-C                  | 3500 mg/L | 1694    | ± 9.76     | Optimal |
| Phenolic Compounds (as Phenols) *              | SMWW 5530-B, D               | 0.1 mg/L  | 0       | N.A.       | Optimal |
| Grease and Oil**                               | SMWW 3520-B                  | 10 mg/L   | 9.5     | ± 0.69     | Optimal |
| Chloride (Cl)**                                | SMWW 4500-Cl-B               | 1000 mg/L | 296     | ± 1.29     | Optimal |
| Fluoride (F)**                                 | SMWW 4500-F-D                | 10 mg/L   | 0.63    | ± 0.06     | Optimal |
| Cyanide (CN)**                                 | SMWW 4500-CN-F               | 1.0 mg/L  | 0       | N.A.       | Optimal |
| Anionic Detergents (as MSA) *                  | SMWW 3540-C                  | 20.0 mg/L | 3.2     | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> ) **                  | SMWW 4500-SO <sub>4</sub> -D | 600 mg/L  | 46      | ± 3.63     | Optimal |
| Sulfide (S <sup>2-</sup> ) *                   | SMWW 4500-S <sup>2-</sup> -F | 1.0 mg/L  | 0       | N.A.       | Optimal |
| Ammonia (NH <sub>3</sub> ) *                   | SMWW 4500-NH <sub>3</sub> -C | 40 mg/L   | 0       | N.A.       | Optimal |
| Cadmium (Cd)                                   | SMWW 3113-B                  | 0.1 mg/L  | <0.006  | N.A.       | Optimal |
| Chromium (Cr)                                  | SMWW 3113-B                  | 1.0 mg/L  | <0.004  | N.A.       | Optimal |
| Copper (Cu)                                    | SMWW 3113-B                  | 1.0 mg/L  | 0.164   | N.A.       | Optimal |
| Lead (Pb)                                      | SMWW 3113-B                  | 0.5 mg/L  | <0.005  | N.A.       | Optimal |
| Mercury (Hg)                                   | SMWW 3112-B                  | 0.01 mg/L | <0.001  | N.A.       | Optimal |
| Selenium (Se)                                  | SMWW 3114-B                  | 0.5 mg/L  | <0.01   | N.A.       | Optimal |
| Nickel (Ni)                                    | SMWW 3113-B                  | 1.0 mg/L  | <0.02   | N.A.       | Optimal |
| Silver (Ag)                                    | SMWW 3113-B                  | 1.0 mg/L  | <0.002  | N.A.       | Optimal |
| Total Toxic Metals                             | Calculated Value             | 2.0 mg/L  | 0.25    | N.A.       | Optimal |
| Zinc (Zn)                                      | SMWW 3111-B                  | 5.0 mg/L  | 0.631   | N.A.       | Optimal |
| Arsenic (As)                                   | SMWW 3114-B                  | 1.0 mg/L  | <0.005  | N.A.       | Optimal |
| Barium (Ba)                                    | SMWW 3113-B                  | 1.5 mg/L  | <0.0035 | N.A.       | Optimal |

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## WASTEWATER ANALYSIS REPORT

### Sample Details

|                                                                |                                                                                                                                             |                                   |                           |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Report Reference No.                                           | AES-BNY-AL-197/2025-WW-175                                                                                                                  | Report Issue Date                 | 16-10-2025                |
| Nature of Sample                                               | Wastewater                                                                                                                                  | Sample Collection Reference       | AES/LMS/QSP-014           |
| Grab/Composite                                                 | Grab                                                                                                                                        | Sample Collected/Sent by          | AES                       |
| Sample Collection Date                                         | 06-10-2025                                                                                                                                  | Sample Receiving Date             | 08-10-2025                |
| Analysis Completion Date                                       | 14-10-2025                                                                                                                                  | Laboratory Temperature & Humidity | (25 ± 5) °C & (55 ± 15) % |
| Ambient Temperature & Humidity at the Time of Sample collected |                                                                                                                                             |                                   | 26 °C & 57 %              |
| Sample ID                                                      | AES-BNY-WW-175/2025                                                                                                                         | Sample Location                   | Chak 68 Abbaila Chahia    |
| Project Details                                                | Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project-Cluster South-1 (Dera Gajpur) |                                   |                           |



### Wastewater Analysis Results

| Parameter                | Analysis Method | PEQS     | Result | MU (CL95%) | Remarks |
|--------------------------|-----------------|----------|--------|------------|---------|
| Iron (Fe)                | SMWW 3113 B     | 8.0 mg/L | 0.0895 | N.A.       | Optimal |
| Manganese (Mn)           | SMWW 3111 B     | 1.5 mg/L | <0.015 | N.A.       | Optimal |
| Boron (B)                | SMWW 3113 B     | 0.0 mg/L | <0.02  | N.A.       | Optimal |
| Residual Chlorine (Cl) * | SMWW 4500 Cl-B  | 1.0 mg/L | 0      | N.A.       | Optimal |

\*Residuals are expressed from Punjab Environmental Quality Standards (PEQS)

Pharmaceuticals are controlled from Pakistan National Accreditation Council & approved from EPA

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor of 2, providing a coverage probability of approximately 95%.

#### Abbreviations:

PEQS = Punjab Environmental Quality Standards  
N.A. = Not Available

#### Remarks:

Optimal = Compliance with Permissible Range

Low = Less Than Permissible Range

SMWW = Standard Methods for the Examination of Water and Wastewater

MU = Measurement Uncertainty

Marginal = Close to Permissible Edge

High = Exceeds from Permissible Range

#### Report Disclaimer:

- If provided in the report, the statement of uncertainty is based on a binary decision rule of simple acceptance/rejection (pass/fail).
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- This report shall not be reproduced in any form.
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- The provided results relate only to the sample provided/collected.
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Analyzed By



Reviewed By

(TM)

End of Report

Approved By

(QM/Chief Chemist)

Page 2 of 2

Document No. AES/LMS/FRW-115, Date of Issue 07 July 2022, Revision No. 03

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#### **Annexure-4: Terms of References (TORs)**



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## TERMS OF REFERENCES (TORs)

### Environmental Expert

Environmental Expert is responsible for ensuring the environmental considerations should be integrated into project planning, implementation, and operation. Here's The job description of Environment al Management Specialist is as below:

- Conduct comprehensive environmental impact assessments to evaluate the potential effects of project activities on natural ecosystems, biodiversity, air and water quality, and local communities.
- Identify and assess potential environmental risks, including pollution, habitat loss, and ecosystem disruption, associated with water supply and sanitation infrastructure development.
- Ensure compliance with relevant environmental laws, regulations, and permitting requirements at the local, national, and international levels. Liaise with regulatory agencies and authorities to obtain necessary permits, approvals, and environmental clearances for project activities.
- Develop environmental management plans (EMPs) and mitigation measures to minimize adverse impacts and enhance environmental performance throughout the project lifecycle.
- Integrate environmental considerations into project design, construction, and operation, incorporating best practices for pollution prevention, waste management, and resource conservation.
- Organize public consultations, workshops, and outreach activities to raise awareness of environmental issues and promote community participation in decision-making processes.
- Assess the potential impacts of project activities on biodiversity hotspots, protected areas, and critical habitats, and develop strategies to minimize disturbance and preserve ecological integrity. Implement biodiversity offset measures and habitat restoration initiatives to compensate for any unavoidable impacts on natural ecosystems and wildlife.
- Water Resource Management:
  - Integrate climate resilience measures into project design and planning, including the use of green infrastructure, flood management strategies, and adaptive water supply solutions.
  - Establish environmental monitoring programs to track key indicators of environmental performance, such as air and water quality, noise levels, and habitat health.
  - Prepare regular environmental monitoring reports and compliance documentation for submission to project stakeholders, regulatory agencies, and funding organizations.
  - Conduct periodic environmental audits and site inspections to assess compliance with environmental management plans, regulatory requirements, and industry standards.
  - Identify areas for improvement and implement corrective actions to address non-compliance issues and enhance environmental performance.



## **Social Safeguard Expert**

Job description for a Social Safeguard Specialist in a water supply and sanitation project typically includes the following responsibilities, qualifications, and skills:

- Develop, implement, and monitor social safeguard policies, procedures, and plans for water supply and sanitation projects to ensure compliance with relevant regulations, standards, and guidelines.
- Conduct social impact assessments (SIAs) and stakeholder analyses to identify potential social risks, vulnerabilities, and impacts of project activities on affected communities, including marginalized groups.
- Develop strategies and mitigation measures to address social risks and safeguard the rights, interests, and well-being of affected communities, particularly vulnerable populations.
- Facilitate meaningful consultation and participation of affected communities, stakeholders, and indigenous peoples in project planning, decision-making, and implementation processes.
- Establish grievance mechanisms and feedback channels for community engagement, ensuring transparency, accountability, and responsiveness to community concerns and complaints.
- Provide training and capacity building to project staff, contractors, and partners on social safeguard principles, community engagement, and conflict resolution.
- Monitor and evaluate the implementation of social safeguard measures, conducting field visits, inspections, and social audits to assess compliance and effectiveness.
- Prepare social safeguard reports, documentation, and communication materials for internal and external stakeholders, including donors, government agencies, and affected communities.
- Collaborate with cross-functional teams, including engineers, economists, and environmental specialists, to integrate social safeguard considerations into project design, planning, and monitoring.

## **Gender Expert**

Job description for a Gender Specialist typically includes the following responsibilities:

- Lead the integration of gender equality and social inclusion considerations into development programs, policies, and projects.
- Conduct gender analysis and assessments to identify gender disparities, inequalities, and barriers to women's empowerment and gender equality.
- Provide technical guidance and support to project teams, partners, and stakeholders on gender mainstreaming strategies and approaches.
- Design and implement gender-responsive interventions, activities, and initiatives to address gender-based discrimination and promote women's rights and empowerment.



- Develop gender-sensitive indicators and monitoring frameworks to track progress and outcomes related to gender equality and women's empowerment.
- Conduct capacity building and training sessions on gender equality, women's rights, and gender mainstreaming for project staff, government officials, and community leaders.
- Facilitate gender-sensitive data collection, analysis, and reporting to ensure accurate and disaggregated gender data are used for evidence-based decision-making.
- Collaborate with women's groups, civil society organizations, and gender-focused networks to strengthen partnerships and promote gender equality advocacy and awareness.
- Support the development and implementation of gender policies, action plans, and strategies within organizations and institutions.

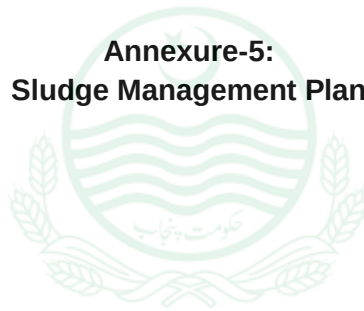
### **Solid Waste Management Expert**

Solid Waste Management Expert is responsible for managing and optimizing the collection, disposal, and treatment of solid waste materials. Their job description may include the following tasks and responsibilities:

- Designing comprehensive plans for the efficient management of solid waste, including collection, transportation, recycling, and disposal.
- Overseeing the execution of waste management programs, ensuring compliance with regulations and environmental standards.
- Conducting assessments and audits to evaluate the volume, composition, and sources of solid waste in a given area. Developing strategies to minimize waste generation, promote recycling, and encourage sustainable waste management practices.
- Managing waste treatment facilities such as landfills, recycling centers, composting facilities, and waste-to-energy plants. Assessing new technologies and techniques for waste management and implementing those that improve efficiency and sustainability.
- Ensuring compliance with local, national, and international regulations related to waste management, environmental protection, and public health. Educating the public about proper waste disposal practices, recycling initiatives, and the importance of reducing waste generation.
- Working with government agencies, private organizations, communities, and other stakeholders to develop collaborative solutions for waste management challenges. Monitoring waste management activities, collecting data on waste generation and disposal, and preparing reports for stakeholders and regulatory agencies.
- Overall, Solid Waste Management Experts shall ensure that solid waste is managed efficiently, sustainably, and in compliance with environmental regulations, thereby minimizing its impact on public health and the environment.



## **Annexure-5: Sludge Management Plan**



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## SLUDGE MANAGEMENT PLAN

### Introduction:

An integrated sludge management plan would cover aspects across the value chain of on-site sanitation including safe collection, conveyance, treatment and disposal/reuse of the treated sludge.

### Objectives of Sludge Management & Treatment

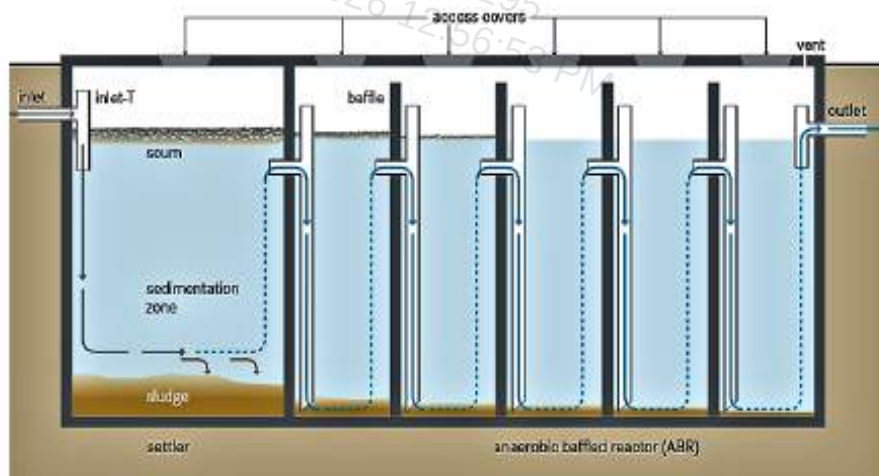
Following are the basic objectives of sludge management or treatment

- Reducing its Volume
- Stabilizing its Organic Materials
- Killing off the odor
- Ensure it can be reused
- Properly digested (Non activated)

#### ES-13.

#### Anaerobic Baffled Reactor (ABR)

An Anaerobic Baffled Reactor (ABR) technology will be used to treat sewerage water. ABR is an improved septic tank with a series of baffles under which the wastewater is forced to flow. This technology is easily adaptable and can be applied at the household level, in small neighborhoods or even in bigger catchment areas.





- **Sludge Production**

Sludge production is an inherent part of the operation of an anaerobic baffle reactor (ABR), as it involves the biological breakdown of organic matter by microorganisms. During the treatment process, organic matter is converted to a residual sludge, which consists of biomass, undigested organic matter, and inorganic solids. The amount of sludge produced by an ABR will depend on several factors, including the influent characteristics, hydraulic retention time, and the operating conditions of the reactor. Generally, the longer the hydraulic retention time, the higher the sludge production will be. However, longer retention times may also lead to improved treatment efficiency. It is important to manage the sludge produced by the ABR to prevent excessive accumulation and ensure efficient operation of the system. This may include regular removal of sludge, sludge thickening, digestion, dewatering disposal and monitoring.

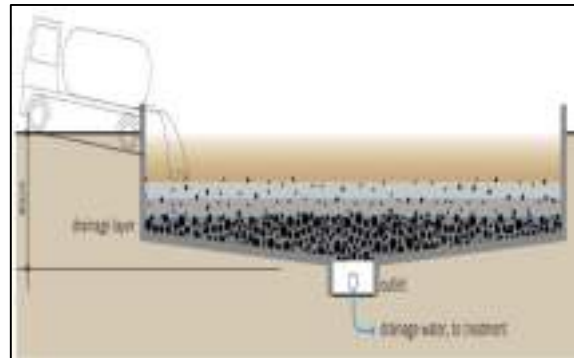
- **Sludge Removal from ABR**

Sludge removal from an Anaerobic Baffle Reactor (ABR) is typically required to maintain efficient operation of the system and prevent excessive accumulation of solids. The frequency of sludge removal will depend on factors such as the influent characteristics, hydraulic retention time, and the design of the ABR. In general, it is recommended that sludge should be removed from the ABR when it reaches a certain accumulation level, which can be determined by monitoring the sludge volume and concentration. A common practice is to remove the sludge volume when it reaches around 50% of the reactor volume.

- **Sludge Dewatering**

The digested sludge contains water content ranges from 70% to 95%, with an average of about 85%. This means that the sewerage sludge is relatively wet and contains a significant amount of water. But, even with that moisture content, sludge no longer behaves as a liquid and can be handled as a solid material. Sludge-drying beds provide the simplest method of dewatering. A digested sludge slurry is spread on an open bed

of sand and allowed to remain until dry. Drying takes place by a combination of evaporation and gravity drainage through the sand. A piping network built under the sand collects the water, which is pumped back to the head of the plant. After about six weeks of drying, the sludge cake, as it is called, may have a solids content of about 40 percent. It can then be removed from the sand with a pitchfork or a front-end loader. In order to reduce drying time in wet or cold weather, a glass enclosure may be built over the sand beds.

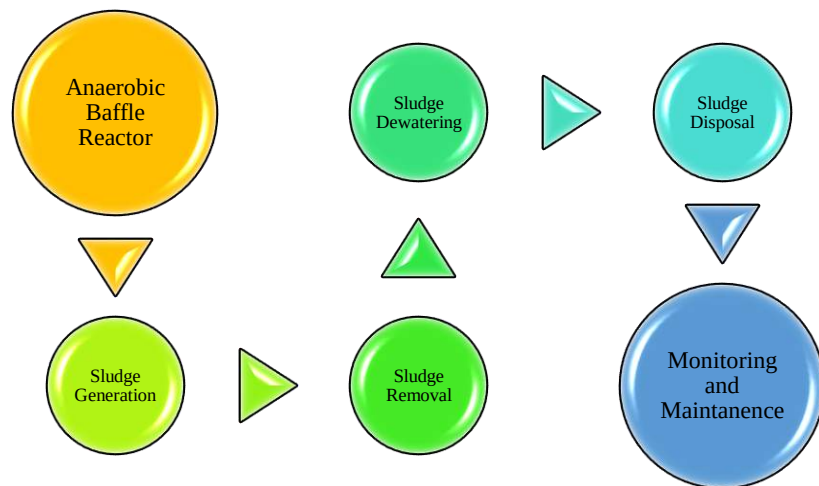


- **Sludge Disposal / Reuse**

The final destination of treated sewage sludge usually is the land. Dewatered sludge can be buried underground in a sanitary landfill. It also may be spread on agricultural land in order to make use of its value as a soil conditioner and fertilizer after the consent of Village Organization (VO).

- **Monitoring and Maintenance**

It is important to regularly monitor the sludge management process to ensure that it is operating effectively and efficiently. This includes monitoring the quality of the sludge and the effectiveness of the treatment processes.



**Sludge Management Plan Flowchart**



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**Annexure-6:  
Grievance Redressal Committees  
All Three Tiers**



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## Grievance Redressal Committee – (Tier- 1)

 **PUNJAB RURAL MUNICIPAL SERVICES COMPANY**  
(COMPANY REGISTERED WITH SECP UNDER SECTION 42 OF THE COMPANIES ACT, 2017) 

**PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT  
(PRSWSSP)**

**ESTABLISHMENT OF FIRST-TIER GRIEVANCES REDRESSAL COMMITTEE  
(GRC-I)**

**NOTIFICATION**

**NO.PRMSC/ORDER5/2022: 05**

In pursuance of the implementation of the Environment & Social Management Framework (ESMF), First Tier Grievance Redressal Committee (GRC-I) for the PRSWSSP is hereby constituted as under to address the resolution of outstanding/unsettled issues resulting from the Grievance Redressal Cell deliberation/proceedings.

|                                                                  |          |
|------------------------------------------------------------------|----------|
| 1 Chairperson Village Organization                               | Convener |
| 2 Vice Chairperson Village Organization                          | Member   |
| 3 Farmer/Worker                                                  | Member   |
| 4 Minority Member                                                | Member   |
| 5 Youth Member                                                   | Member   |
| 6 Female Member (Focal Person Females)                           | Member   |
| 7 Lady Health Worker (LHW)                                       | Member   |
| 8 BCC Officer, PRMSC                                             | Member   |
| 9 Line Department concerned<br>(Education, Health, Revenue etc.) | Member   |

This committee will be responsible to oversee the overall function of the GRM at a strategic level including monthly reviews at the village community level.

  
**ASADULLAH (PAS)**  
CEO/PROJECT DIRECTOR  
(PRMSC)

**Dated Lahore, the 30<sup>th</sup> October, 2022**

**No. & Date Even**

A copy is forwarded for information to:-

1. All DC's concerned
2. All AC's concerned
3. PA to CEO, PRMSC.
4. All Tehsil Managers, PRMSC.
5. All the remaining concerned
6. Master file

**ADDRESS: 5TH FLOOR, KD PLAZA MM ALAM ROAD, LAHORE**  
EMAIL: info.prmsc@punjab.gov.pk | WEBSITE: www.prmsc.punjab.gov.pk | PHONE : (042) 99333608 - (042) 99333616



## Grievance Redressal Committee – (Tier- 2)

 **PUNJAB RURAL MUNICIPAL SERVICES COMPANY**  
(COMPANY REGISTERED WITH SECP UNDER SECTION 42 OF THE COMPANIES ACT, 2017) 

**PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT**  
**(PRSWSSP)**

**ESTABLISHMENT OF SECOND-TIER GRIEVANCES REDRESSAL COMMITTEE**  
**(GRC-II)**

**NOTIFICATION**

**NO.PRMSC/ORDERS/2022: 04**

In pursuance of the implementation of the Environment & Social Management Framework (ESMF), a Second Tier Grievance Redressal Committee (GRC-II) for the PRWSSP is hereby constituted as under to address resolution on outstanding/unsettled issues resulting from the Grievance Redressal Cell deliberation/proceedings.

|                                                                   |                       |
|-------------------------------------------------------------------|-----------------------|
| 1. Tehsil Manager PRMSC                                           | Convener              |
| 2. Deputy Manager Operation PRMSC                                 | Member                |
| 3. Deputy Manager Infrastructure PRMSC                            | Member                |
| 4. Research Analyst E&S Safeguards PRMSC                          | Member                |
| 5. BCC Officer PRMSC                                              | Member (Focal Person) |
| 6. Assistant Manager Water & Sewerage PRMSC                       | Member                |
| 7. Assistant Manager SWM PRMSC                                    | Member                |
| 8. Chairperson VO/GRC-I of Village concerned                      | Member                |
| 9. Line Department concerned<br>(Education, Health, Revenue etc.) | Member                |

This committee established in SDU-TO for each Tehsil, will manage GRM aspects for all sub-project locations in each tehsil including decisions to be taken, actions and monitoring of complaints resolution at the sub-project level.

  
**ASADULLAH (PAS)**  
**CEO/PROJECT DIRECTOR**  
**(PRMSC)**

**Dated Lahore, the 30<sup>th</sup> October, 2022**

**No. & Date Even**

A copy is forwarded for information to:-

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## Grievance Redressal Committee – (Tier- 3)



### PUNJAB RURAL MUNICIPAL SERVICES COMPANY

(COMPANY REGISTERED WITH SECP UNDER SECTION 42 OF THE COMPANIES ACT, 2017)



#### **PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)**

#### **ESTABLISHMENT OF A THIRD-TIER GRIEVANCES REDRESSAL COMMITTEE (GRC-III)**

#### **NOTIFICATION**

**NO.PRMSC/ORDERS/2022: 03**

In pursuance of the implementation of the Environment & Social Management Framework (ESMF), a third Tier Grievance Redressal Committee (GRC-III) for the PRSWSSP is hereby constituted as under to address the resolution of outstanding/unsettled issues resulting from the Grievance Redressal Cell deliberation/proceedings.

- |                                                                   |                       |
|-------------------------------------------------------------------|-----------------------|
| 1. Project Director / CEO PRMSC                                   | Convener              |
| 2. Chief Operating Officer PRMSC                                  | Member                |
| 3. Chief Infrastructure PRMSC                                     | Member                |
| 4. Social & BCC Specialist PRMSC                                  | Member (Focal Person) |
| 5. Gender Specialist PRMSC                                        | Member                |
| 6. Environmental Specialist                                       | Member                |
| 7. Section Officer (Projects) LG&CD                               | Member                |
| 8. Chairperson VO/GRC-I of Village concerned                      | Member                |
| 9. Line Department concerned<br>(Education, Health, Revenue etc.) | Member                |

This committee will be responsible to oversee the overall function of the GRM at a strategic level including monthly review.

**PRMSC**

**ASADULLAH (PAS)  
CEO/PROJECT DIRECTOR  
(PRMSC)**

Dated Lahore, the 30<sup>th</sup> October, 2022

#### **No. & Date Even**

A copy is forwarded for information to:-

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2. All AC's concerned
3. PA to CEO, PRMSC.
4. All Tehsil Managers, PRMSC.
5. All the remaining concerned
6. Master file

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### **Annexure-7: Environmental Impact Matrix**



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## Environmental Impact Matrix

### Environmental Impact Matrix – Construction Phase

**Impact Significance Rating: HI = High Impact - MI= Moderate Impact - LI = Low Impact**

**PI = Positive Impact**

| Environmental/ Social Receptor                 | Site Clearance & Survey | Excavation & Trenching | Pipe Laying | Construction of Water Tanks / Pumping Stations | Transportation of Materials | Workforce Camps |
|------------------------------------------------|-------------------------|------------------------|-------------|------------------------------------------------|-----------------------------|-----------------|
| Air Quality (Dust & Emissions)                 | M                       | M                      | M           | M                                              | H                           | L               |
| Noise & Vibration                              | L                       | M                      | M           | H                                              | M                           | L               |
| Surface Water Quality                          | L                       | M                      | M           | M                                              | L                           | L               |
| Groundwater Quality                            | L                       | M                      | M           | M                                              | L                           | L               |
| Waste Generation                               | L                       | M                      | M           | M                                              | L                           | M               |
| Traffic & Road Safety                          | L                       | H                      | H           | M                                              | H                           | L               |
| Public Access & Mobility                       | L                       | M                      | H           | M                                              | M                           | L               |
| Occupational Health & Safety                   | L                       | H                      | M           | H                                              | M                           | M               |
| Community Health & Safety                      | L                       | H                      | H           | M                                              | M                           | L               |
| Vegetation & Trees                             | M                       | M                      | M           | M                                              | L                           | L               |
| Wildlife/Fauna                                 | L                       | L                      | L           | L                                              | L                           | L               |
| Utility Disruption (Gas, Electricity, Telecom) | M                       | M                      | L           | L                                              | L                           | L               |
| Employment Generation                          | P                       | P                      | P           | P                                              | P                           | P               |
| Local Business Opportunities                   | P                       | P                      | P           | P                                              | P                           | P               |





### Environmental Impact Matrix – Operation Phase

| Environmental/Social Receptor          | Water Supply System Operation | Pumping Stations/ Solar Parks | Water Storage Reservoirs/OHRs | Sewerage Network Operation | Maintenance Activities |
|----------------------------------------|-------------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|
| Air Quality                            | L                             | L                             | L                             | M (odors)                  | L                      |
| Noise Levels                           | L                             | M                             | L                             | L                          | M                      |
| Surface Water Quality                  | P                             | L                             | L                             | H                          | M                      |
| Groundwater Quality                    | P                             | L                             | L                             | H                          | M                      |
| Water Resource Availability            | M                             | L                             | L                             | -                          | L                      |
| Soil Quality                           | L                             | L                             | L                             | M                          | M                      |
| Public Health & Hygiene                | P                             | P                             | P                             | P                          | P                      |
| Community Safety                       | M                             | M                             | L                             | M                          | M                      |
| Occupational Health & Safety           | L                             | M                             | L                             | H                          | M                      |
| Solid Waste Generation                 | L                             | L                             | L                             | M                          | M                      |
| Wastewater/Sludge Generation           | -                             | -                             | -                             | H                          | H                      |
| Traffic Disturbance During Maintenance | -                             | L                             | -                             | M                          | M                      |
| Employment Opportunities               | P                             | P                             | P                             | P                          | P                      |
| Socio-economic Development             | P                             | P                             | P                             | P                          | P                      |
| Quality of Life Improvement            | P                             | P                             | P                             | P                          | -                      |



## **Annexure-8: References**



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## References

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