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# **ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT**

**PROJECT ID: P170811**

**PUNJAB MUNICIPAL SERVICES IMPROVEMENT PROJECT:  
Sub Project: Ludhiana Bulk Water Supply Project**

**Implementing Agency: Project Management Unit, Punjab Municipal  
Infrastructure Development Company (PMIDC), Government of Punjab  
and Project Implementation Unit, Municipal Corporation of Ludhiana  
(MCL)**

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**Punjab Municipal Infrastructure Development Company (PMIDC)  
(Department of Local Government, Punjab)**

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## ABBREVIATIONS

ABD	Area Based Development
AIDS	Acquired Immune Deficiency Syndrome
AIIB	Asian Infrastructure Investment Bank
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
AQI	Air Quality Index
ASI	Archaeological Survey of India
BGL	Below Ground Level
BIS	Bureau of Indian Standards
BOCW	Building & Other Construction Workers
BOD	Biochemical Oxygen Demand
BOQ	Bill of Quantities
BSNL	Bharat Sanchar Nigam Limited
C&D	Construction & Demolition
CCT	Chlorine Contact Tank
CEO	Chief Executive Officer
C-ESMP	Contractors- Environmental and Social Management Plan
CGWB	Central Ground Water Board
CoC	Code of conduct
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organization
CPR	Common Property Resources
CR	Critically Endangered
CSR	Corporate Social Responsibility
CTE	Consent to Establish
CTO	Consent to Operate
Cum	Cubic meter
DBOT	Design Build Operate Transfer
DFO	Divisional Forest Officer
DG	Diesel Generators
DI	Ductile Iron
DMA	District Metered Area
DMS	Detailed Measurement Survey
DWSS	Department of Water Supply and Sanitation



E&S	Environmental and Social
ECS	Electronic Clearance Service
EHS	Environment, Health, and Safety
EIA	Environment Impact Assessment
EN	Endangered
EP	Environment Protection
EPA	Environment Protection Act
ERP	Emergency Responses Plan
ESCP	Environment and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environment and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESR	Elevated Service Reservoir
ESS	Environmental and Social Standards
FB	Free Board
FCA	Forest Conservation Act
FGDs	Focused Group Discussions
FI	Financial Intermediaries
GADVASU	Guru Angad Dev Veterinary and Animal Sciences University
GAP	Gender Action Plan
GBV	Gender-Based Violence
GHG	Green House Gas
GLADA	Greater Ludhiana Area Development Authority
GoI	Government of India
GoP	Government of Punjab
GPRS	General Packet Radio Service
GRC	Grievance Redressal Committee
GRM	Grievance Redressal Mechanism
GSM	Global System for Mobile Communications
GW	Ground Water
Ha	Hectare
HDD	Horizontal Directional Drilling
HDPE	High-Density Polyethylene
HH	Household
HIRA	Hazardous Identification and Risk Assessment

HIV	Human Immunodeficiency Virus
HP	Horsepower
IBRD	International Bank for Reconstruction and Development
ICC	Internal Complaints Committees
IGL	Indian Gas Limited
INR	Indian Rupee
IUCN	International Union for Conservation of Nature
IVA	Independent Verification Agency
KM	Kilometres
KW	Kilowatts
LA	Land Acquisition
LARR	Land Acquisition, Rehabilitation, and Resettlement
LBWS	Ludhiana Bulk Water Supply
LC	Least Concern
LIT	Ludhiana Improvement Trust
LMP	Labour Management Plan
LPCD	Litres Per Capita per Day
M&E	Monitoring and Evaluation
MC	Municipal Corporation
MCL	Municipal Corporation of Ludhiana
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MLA	Members of the Legislative Assembly
MLD	Million Litre per day
MM	Millimetres
MoEFCC	Ministry of Environment, Forest, and Climate Change
MoU	Memorandum of Understanding
MSL	Mean Sea Level
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NABL	National Accreditation Board for Testing and Calibration Laboratories
NEFT	National Electronic Fund Transfer
NEP	National Environment Policy
NGO	Non-Governmental Organization
NHAI	National Highway Authority of India
NOC	No Objection Certificate
NRW	Non-Revenue Water

NT	Near Threatened
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSR	Over Head Service Reservoirs
PAP	Project Affected Persons
PAU	Punjab Agricultural University
PF	Protected Forest
PHED	Public Health Engineering Department
PIU	Project Implementation Unit
PLC	Programmable Logic Controllers
PM	Particulate Matter
PMIDC	Punjab Municipal Infrastructure Development Company
PMSIP	Punjab Municipal Services Improvement Project
PMU	Project Management Unit
PPB	Parts per Billion
PPE	Personal Protective Equipment
PSIDC	Punjab State Industrial Development Corporation
PSPCB	Punjab State Pollution Control Board
PUC	Pollution under Control
PWD	Public Works Department
PWRDA	Punjab Water Regulation and Development Authority
R&R	Rehabilitation & Resettlement
RCC	Reinforced Cement Concrete
RFCTLARR A	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement
RoW	Right of Way
RPF	Resettlement Policy Framework
RSC	Residual Sodium Carbonate
RTU	Remote Terminal Units
RWA	Resident Welfare Association
SAR	Sodium Absorption Ratio
SBR	Sequential Batch Reactor
SC	Scheduled Caste
SCADA	Supervisory Control and Data Acquisition
SEA	Sexual Exploitation & Abuse
SEIAA	State Environment Impact Assessment Authority
SEP	Stakeholder Engagement Plan

SH	Sexual Harassment
SO2	Sulphur Dioxide
SOP	Standard Operating Procedure
Sq. m.	Square meter
ST	Scheduled Tribe
STI	Sexually Transmitted Infections
STP	Sewage Treatment Plant
SWD	Side Water Depth
TDS	Total Dissolved Solids
TL	Transmission Line
TMP	Traffic Management Plan
TSS	Total Suspended Solids
ULB	Urban Local Body
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAP	Up flow Anaerobic Sludge Blanket Reactor
USD	US Dollars
VU	Vulnerable
WB	World Bank
WHO	World Health Organisation
WRD	Department of Water Resource
WSS	Water Supply and Sanitation
WTP	Water Treatment Plant

## EXECUTIVE SUMMARY

1. The Punjab Municipal Services Improvement Project (PMSIP; also referred to as ‘the Project’) is a collaborative effort between the Government of Punjab (GoP) and the Government of India (GoI), funded by the World Bank and the Asian Infrastructure Investment Bank (AIIB). This project comprises four main components: Strengthening Urban Service Delivery Systems, Improving Water Supply Infrastructure, COVID-19 Crisis Response, and Project Management. Under the ‘Improving Water Supply Infrastructure’ component of PMSIP, the Ludhiana Bulk Water Supply Project is a critical sub-project aimed at transitioning the city's water supply from groundwater to surface water sources. The sub-project aims to enhance water supply infrastructure while ensuring sustainable environmental and social outcomes for the city of Ludhiana. The shift from ground water dependency to surface water addresses concerns of groundwater over-exploitation and contamination. Key components of the sub-project include constructing a water treatment plant (WTP) with a capacity of 580 MLD, laying transmission lines covering 168 kilometers, demolishing and / or rehabilitating 67 Elevated Service Reservoirs (ESRs) and construction of 70 new ESRs. The Project conducted an environmental and social impact assessment (ESIA) for the Ludhiana sub-project investments to understand and evaluate the potential environmental and social risks and impacts throughout the project lifecycle and prepared an environmental and social management plan (ESMP) to mitigate the potential adverse risks and impacts.

2. The project entails upgrading Ludhiana's water supply system, transitioning from groundwater to surface water sources to mitigate contamination and over-extraction issues. Key components include, 1) Water Source Transition - Shifting from groundwater reliance to canal-based surface water from 1R distributary 2) Water Treatment Plant (WTP) - Constructing a 580 MLD capacity WTP in Village Bilga to treat raw water from 1-R canal which is a distributary of Sidhwan canal, which itself is a distributary of the Sirhind Canal through a processes including aeration, coagulation, flocculation, sedimentation, filtration, and chlorination, 3) Transmission Network - Pumping treated water from WTP to Elevated Service Reservoirs (ESRs) through a 168 km transmission network, through pipes with diameters ranging from 150mm to 2000mm, predominantly made of ductile iron (DI) and Steel, 4) Disinfection System - Implementing chlorination at inlet chambers to address microbiological concerns in raw water and ensuring standardized chlorination practices for consistent water treatment across the distribution network, 5) Elevated Service Reservoirs (ESRs): Constructing 70 ESRs with capacities ranging from 0.5ML to 3ML, demolishing about 67 ESRs and enhancing storage capacity and staging height to ensure efficient water distribution, 6) SCADA Monitoring - Implementing a Supervisory Control and Data Acquisition (SCADA) system for real-time monitoring and control of water supply and utilizing GPRS/GSM wireless technology for data transfer and leakage detection. The project aims to meet growing water demand, improve water quality, and ensure sustainable water supply for Ludhiana's residents through comprehensive infrastructure upgrades and advanced monitoring systems.

3. As per the Environmental Impact Assessment (EIA) Notification of 2006 issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC), all projects listed in Schedule 1 of the Notification necessitate prior environmental clearance. The proposed Bulk Water Supply Scheme in Ludhiana does not fall under the purview of the EIA Notification 2006 and therefore. Environmental Clearance are not required. However, since the World Bank’s environment and social review summary (ESRS) of the Project classified the project as a ‘High’ risk project (as per the World Bank’s Environment and Social Framework (ESF)) the two major sub-projects under PMSIP required ESIA studies to be conducted, risk and impact appropriate mitigation plans to be prepared and disclosed before the commencement of civil works.

4. The baseline analysis concludes that insufficient water storage infrastructure and poor rainfall contribute significantly to a diminished capacity for water supply. Limited access to surface water is attributed to decreased forest coverage, insufficient natural surface water resources, and local topographical challenges, resulting in constrained water supply. Excessive groundwater utilization, influenced by the region's topography and geology, leads to a growing dependency on groundwater. The quality of surface and groundwater is adversely affected by agricultural practices, urbanization, and climate variations, causing certain project areas to experience drinking water quality surpassing permissible limits. Additionally, intensified groundwater withdrawal is driven by the limited availability of surface water resources. The project does not involve any physical or economic displacement. ~53 acres of land have been purchased from 50 nos. of landowners for the construction of WTP on the basis of negotiated settlement. The proposed new ESRs (70 nos.) and Transmission network of 168 kms have been proposed on Government land. Necessary permission will be obtained for laying of transmission line

network from respective government authority like PWD, NHAI, Railway, Forest Department etc. As the project area is falling more than 300 m away from the protected monument as per Ancient Monuments and Archaeological Sites and Remains Act, 1958 and its amendments there will be no impact on the monuments. Therefore ESS 8 is not triggered for the sub-project.

5. The environmental impact assessment of the bulk water supply project in Ludhiana identifies various impacts across its different phases, including pre-construction, construction, and operation and maintenance. During the pre-construction phase, impacts include vegetation clearance, utility shifting, and transportation of construction materials, which may lead to changes in land use, ambient air pollution, noise pollution, and disturbance to cultural heritage sites. In the construction phase, impacts such as site clearance, construction of water treatment plants (WTPs), laying of transmission lines, and construction and dismantling of ESRs contribute to land use changes, ambient air pollution, noise pollution, vibration, groundwater and surface water contamination, soil erosion, disruption of ecological resources and health and safety impacts both on workers and community. During the operation and maintenance phase, impacts include sludge generation, waste and sewage generation, withdrawal of surface water, vehicular movement, and periodic maintenance activities, which may affect soil and water quality, contribute to ambient noise and air pollution, disrupt ecological balance and health and safety impacts both on workers and community. Overall, the project is categorized as having "Substantial Risk" due to its potential environmental consequences. However, the mitigation measures outlined in the Environmental Social Management Plan (ESMP), if implemented, are likely to reduce these risks to "Moderate Risk" level. Despite the negative impacts, the project also aims to bring positive outcomes such as mitigating groundwater over-exploitation, enhancing water supply reliability, boosting revenue for Urban Local Bodies (ULBs), and providing access to clean drinking water, thus improving public health and quality of life for residents of Ludhiana.

6. The social impact assessment of the water supply project in Ludhiana delineates various impacts across its different phases. In the pre-construction phase the most significant adverse impact – namely land acquisition and resultant issues related to resettlement and relocation of titleholders and involuntary resettlement of non-title holders were mitigated through direct purchase of the land parcels required for the construction of the WTP through a process of negotiated settlements. Other major negative impacts are – (a) community opposition to ESRs construction in parks, potentially leading to aesthetic degradation and restricted recreational activities, (b) temporary economic / livelihood impacts on people and businesses; approximately 744 businesses and 130 street vendors and hawkers are likely to be impacted for few days on account of laying of transmission lines, (c) involuntary resettlement of homes and businesses on account of demolition / rehabilitation of existing ESRs approximately 67 numbers (d) damage to structures during laying of transmission lines, (e) occupational health and safety (OHS) and community health and safety (CHS) risks during the construction phase and (f) risks of sexual exploitation and abuse / sexual harassment (SEA/SH) of communities and labor and gender based violence (GBV) in the labor camps. In the construction phase, positive impacts include job opportunities for locals due to increased demand for workers required for the sub-project. Transitioning to the operation phase, positive impacts include improved public health and household income from clean water provision. Other concerns, namely, exposure to hazardous materials, health risks arising from poor water quality, and the threat of communicable diseases like COVID-19 are also relevant for the sub-project. Overall, while stakeholders support the project for its anticipated improvements in quality of life and health benefits, the effective implementation of mitigation measures is essential to mitigate adverse impacts throughout the project lifecycle.

7. The stakeholder assessment for the project extensively engaged various community members, officials, and organizations to gather insights and perspectives on social and environmental aspects. Stakeholders were categorized into affected parties, interested parties, and vulnerable groups. Consultations involved diverse participants from different localities and sectors, ensuring comprehensive input. Major findings from stakeholder consultations included support for the project alongside concerns about dust emissions, park aesthetics, and impacts on livelihoods during demolition and construction phases. Specific recommendations were made regarding construction schedules, safety measures, and compensation for affected vendors. Gender-based violence consultations highlighted risks to women and children, emphasizing the need for mitigation strategies and awareness programs. Overall, stakeholders expressed favorable sentiments towards the project's long-term benefits, though opposition arose at certain ESR locations due to degradation of aesthetics at the existing parks, possibility of involuntary resettlement in 67 existing OSHRs that may need to be demolished and / or rehabilitated. Socio-economic conditions in the area were generally favorable, but concerns raised during

consultations must be addressed by the Project on a continual basis to ensure successful execution and community integration.

8. As a part of the ESIA, an Environmental and Social Management Plan (ESMP) is prepared Environmental & Social Mitigation Measures duly identifying the responsible parties for each of the mitigation/ management action. The ESIA has also identified the various permissions and clearances that need to be obtained. The ESMP Monitoring Plan has measurable monitoring indicators with frequency of measurement and responsibilities. A training the capacity Building program is proposed for the environmental and social functionaries of the project. The ESMP Budget is pegged at INR 18,98,32,125 Crores which is approximately 1-1.5% of the total cost of the Ludhiana sub-project.

9. The Stakeholder Consultations Strategy and Participation Framework, aligned with the World Bank's Environment and Social Framework, emphasizes continuous engagement throughout the project cycle. It outlines a systematic approach to identify stakeholders and involves them in decision-making processes. Various stakeholders, including project affected parties (PAPs), vulnerable groups, and other interested parties, are targeted for engagement through consultations, focus group discussions, and information dissemination using various tools and modes. The strategy covers pre-construction, construction, and operation stages, ensuring transparency, information disclosure, and addressing concerns effectively.

10. The Grievance Redressal Mechanism (GRM) is an essential aspect of the project's implementation, aiming to promptly address concerns and grievances of affected parties related to environmental and social performance. It follows a structured procedure involving field-level resolution, Grievance Redress Committee (GRC) intervention, and escalation to higher levels if needed. The mechanism ensures accessibility, transparency, and timely resolution of grievances, with an option for legal recourse if dissatisfied.

11. Institutional and implementation arrangements are anchored with the Punjab Municipal Infrastructure Development Corporation (PMIDC) at the state level and the Ludhiana Municipal Corporation (LMC) at the city level. The Project Management Unit (PMU) at the state level and Project Implementation Unit (PIU) at the city level oversee ESMP implementation. Various specialists – namely, Environment, Social Development, Health and Safety and Communications specialists – will work with the Municipal Commissioner Ludhiana and other PIU staff to manage different aspects of the project, ensuring compliance and effective implementation of the Environmental and Social Management Plan (ESMP). Overall, the framework ensures stakeholder engagement, grievance redressal, and effective implementation of environmental and social management plans, contributing to sustainable project execution and community welfare. The overall responsibility for Environmental and Social Management aspects and submission of required monitoring reports to the World Bank and AIIB is vested with PMU, PMIDC.

## 1. INTRODUCTION

The Government of Punjab (GoP), with the assistance of the Government of India (GoI), obtained financial loan from the World Bank and the Asian Infrastructure Investment Bank (AIIB) for the implementation of the Punjab Municipal Services Improvement Project (PMSIP).

### 1.1. Project Components

PMSIP is organized into the following four components:

- Strengthening Urban Service Delivery Systems
- Improving Water Supply Infrastructure
- COVID-19 Crisis Response
- Project Management

The Punjab Municipal Infrastructure Development Company (PMIDC), a government-owned entity, plays a pivotal role in ensuring the project's alignment with environmental and social regulations. Working in close collaboration with the Municipal Corporation of Ludhiana, designated as the Project Implementation Unit (PIU), PMIDC strives to facilitate the successful implementation of the project while minimizing adverse effects on the environment and local communities.

This Ludhiana Bulk water supply project (LBWS) is part of component 2 under this PMSIP project. The project encompasses the construction of a head regulator cum cross-regulator on the 1-R canal (which is a distributary of Sidhwan canal, which takes off from the Sirhind Canal), Water Treatment Plant (WTP) with capacity of 580 million liters per day (MLD), laying of transmission lines for 168 kilometers (diameters ranging from 150 mm to 2000 mm), rehabilitation of 67 Nos. of Elevated Service Reservoirs (ESRs) and the construction of 70 Nos of ESRs within the city of Ludhiana.

To identify environmental and social impacts due to the project, an Environmental and Social Impact Assessment (ESIA) is conducted, and an Environmental and Social Management Plan (ESMP) is prepared as part of the study. The ESMP provides mitigation measures to address significant environmental and social (E&S) impacts during the pre-construction, construction, and operation phases of the Ludhiana Bulk Water Supply Project.

### 1.2. Project Background

The Municipal Corporation of Ludhiana (MCL) currently depends only on groundwater for its water supply to the people of Ludhiana city. The Punjab Water Regulation and Development Authority (PWRDA) categorized Ludhiana as "over-exploited,"<sup>1</sup> indicating that there is an excessive use of groundwater due to rapid urbanization, population growth, and increased agricultural activities and lack of proper groundwater recharge systems. Currently, Ludhiana pumps nearly 350 MLD (Million Liters per Day) of water for domestic consumption from 1,262 tube wells. This water is then distributed to households through a distribution system. The supply is intermittent, occurring only for few hours a day. In Ludhiana, there are 67 Nos existing ESRs, of which 51 Nos of ESRs are not in use. Due to this, water obtained from tube wells is mostly pumped directly into the distribution network, and sometimes pumped to the nearby functioning ESRs & then fed into the existing distribution network. Presence of heavy metals including Selenium and Uranium<sup>2</sup>, and Fluoride<sup>3</sup>, Aluminum and Nitrate<sup>4</sup> have been found above permissible limits in the water from tube wells in Ludhiana.

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<sup>1</sup> <https://pwrda.org/wp-content/uploads/2023/02/GROUND-WATER-RESOURCES-OF-PUNJAB-STATE-2022.pdf>

<sup>2</sup> Selenium (0.01-0.014 mg/l) and WHO acceptable range is 0.01 mg/l

Uranium (30.54-45.71 ppb) and WHO acceptable range is 30 ppb

[https://www.researchgate.net/publication/340077873\\_Groundwater\\_Contamination\\_in\\_Punjab\\_due\\_to\\_Arsenic\\_Selenium\\_and\\_Uranium\\_Heavy\\_Metals](https://www.researchgate.net/publication/340077873_Groundwater_Contamination_in_Punjab_due_to_Arsenic_Selenium_and_Uranium_Heavy_Metals)

<sup>3</sup> The quantity of Fluoride is above 1.5 mg/l in Ludhiana. <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1809264>

<sup>4</sup> Aluminum (0.205 to 0.32 mg/l) and BIS 10500 permissible limit is 0.2 mg/l, Nitrate (46.74 to 95.45 mg/l) and BIS 10500 acceptable limit of 45mg/l.



To overcome over-use and contamination of groundwater, surface water, is seen as a more sustainable alternative for water supply. Therefore, Govt of Punjab (GoP) aims to transition Ludhiana city's drinking water supply source from groundwater to surface water.

### 1.3. Ludhiana City and the proposed project

Ludhiana is the most populous and the largest city in Punjab. The city's topography predominantly comprises an alluvial plain, shaped by the erosive forces exerted by the Sutlej River. Within Ludhiana district, elevations range from approximately 216 meters in the west to about 268 meters in the east, reflecting a varied terrain. A comprehensive depiction of the project's location is provided in Chapter 2.

**Proposed water supply source and arrangement:** The Water Resources Department (WRD) has signed a MoU with MCL to withdraw 300 cusecs of raw water from the 1R Distributary. At present, 1R Distributary has a capacity of 50 cusecs. For catering the future demand, it is proposed to enhance the capacity from 50 cusecs to 300 cusecs (250 cusecs for this project + 50 cusec or more to meet fluctuations in existing irrigation demand, which is 14.71% of the Sidhwan canal capacity and 1.98% of the Sirhind canal capacity) by the WRD through re-modelling and strengthening of 1R Distributary. The 1R Distributary is situated approximately 50 meters from the Water Treatment Plant (WTP). The intake structure for this purpose will be constructed by WRD on its own land at a chainage of ~1.6 KM 1R Distributary. The Environment and Social Impact Assessment for the WRD works is not a part of this study; a separate Environmental and Social Impact Assessment is being taken up for the WRD works.

An arrangement of head regulator cum cross regulator on 1R canal is proposed to divert the water from the Canal to the raw water collection tank in the WTP. The water will be treated in the proposed 580 MLD Water Treatment Plant (WTP) near the village Bilga. After treatment, treated water will be pumped from the clear water reservoir to the 137 nos. of Elevated Service Reservoirs (ESRs) (70 proposed and 67 existing) through a transmission pipeline of 168 Km, with pipe diameters ranging from 150mm to 2000mm.

### 1.4. Need for Environmental and Social Impact Assessment

This Environmental and Social Impact Assessment (ESIA) study has been conducted to assess the environmental and social impacts due to the DBOT works under the project and provide mitigation measures during pre-construction, construction, and the operational phases. The ESIA complies with requirements of the World Bank's Environmental and Social Framework (ESF) including Environmental and Social Standards (ESS 1 to ESS 10).

### 1.5. ESIA Objectives

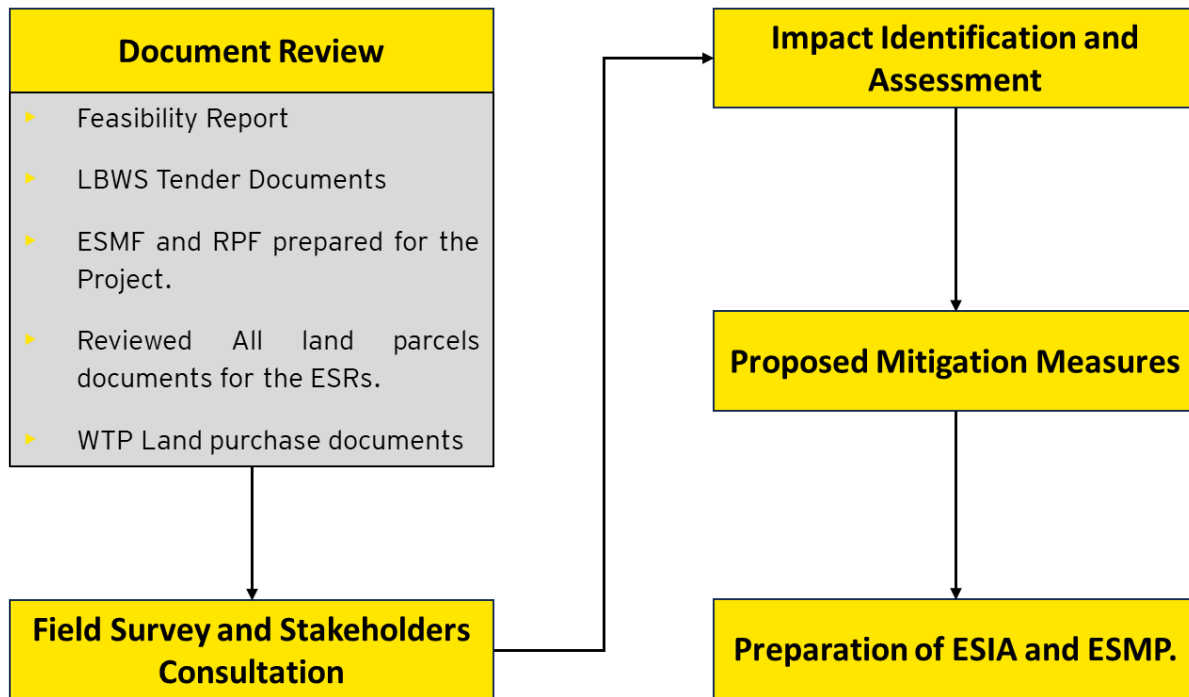
The objective of this assessment is to comprehensively evaluate the environmental and social impacts associated with the project and to propose mitigation measures to offset the adverse impacts of the project. The objectives of this Environmental and Social Impact Assessment (ESIA) are as follows:

- Identification of key environmental and social risks and impacts associated with the Ludhiana Bulk Water Supply Project during the pre-construction, construction, and the operational phases of the project.
- Identifying the necessary clearances/ approvals required from relevant statutory authorities for the project.
- Propose suitable mitigation measures for potentially adverse environmental and social impacts, and measures for enhancement of positive impacts. This will be attained through a comprehensive E&S assessment study and ensure sound E&S management in the project and preparing ESMP..
- Detail out roles and responsibilities of PIU, PMU, and DBOT Contractor involved in updating the environmental and social instruments and implementing the proposed ESMPs.

These objectives collectively aim to ensure a thorough understanding of the E&S implications of the project and to facilitate the implementation of appropriate mitigation measures.

## 1.6. Approach & Methodology for ESIA

The step-by-step approach and methodology for carrying out the ESIA study is illustrated in Figure 1.



**Figure 1: Approach and Methodology for ESIA**

The step-by-step methodology is given below:

**Step 1: Document Review:** Baseline data collection and analysis, involving both secondary and primary sources.

- Feasibility Report
- LBWS Tender Documents
- ESMF and RPF prepared for the Project.
- Reviewed All land parcels documents for the ESRs.
- WTP Land purchase documents

**Step 2: Field Survey and Stakeholder Consultation:** Site visits were conducted at all proposed sites and along the proposed transmission pipeline alignment. During visits, all potential impacts were identified and recorded. The identified impacts were categorised into Low, Medium, Substantial and High based on the impact significance criteria.

Consultations with various stakeholders were conducted to spread awareness about the project and discuss any concerns and challenges related to the project components. Further, consultations were conducted with multiple governmental officials to apprise them of the project risks and impacts and the proposed mitigation measures. Overall, 222 Nos of consultations were conducted at all ESRs, TL alignment, Line departments, community, and community representative. The details of these consultations are provided in Chapter 7.

**Step 3: Impact Identification and Assessment:** During site visits and analysis of secondary data, all impacts were identified at each ESR, WTP, and along the transmission line. For assessment, a risk assessment matrix was prepared based on spread, duration, and intensity. For all the activities, based on the risk assessment matrix, impact identification and significance were conducted. Post completion of assessment, an overall assessment of E&S impacts was identified and categorized.

**Step 4: Proposed Mitigation Measures:** Post identification and classification of impacts, adequate mitigation measures are proposed to mitigate the E&S risks and impacts.

**Step 5: Preparation of ESIA and ESMP:** Preparation of ESIA and ESMP report including a monitoring and evaluation (M&E) plan and institutional arrangement, incorporating key environmental and social indicators for monitoring.

### 1.7. Scope of ESIA Study

The scope of the Environmental and Social Impact Assessment (ESIA) study encompasses the following key areas:

- Assess the existing baseline status of the environment parameters within the Project Influence Area.
- Assess demographic and socio-economic conditions.
- Identify potential adverse and positive E&S risks and impacts due to the project during its entire life cycle i.e., from pre-construction to construction to Operation & Maintenance (O&M).
- Identify stakeholders and various groups/ institutions who are either affected or have an interest or a stake in the project, with additional emphasis on disadvantaged and vulnerable groups and to carry out consultations with stakeholders to help elicit their concerns, suggestions, and support.
- Identify all Environmental Social Health and Safety (ESHS) impacts arising due to the project activities and provide for mitigation measures in the ESMP.
- Budget estimate of the E&S management measures.

The ESIA, report has been structured as hereunder:

**Table 1: Structure of ESIA Report**

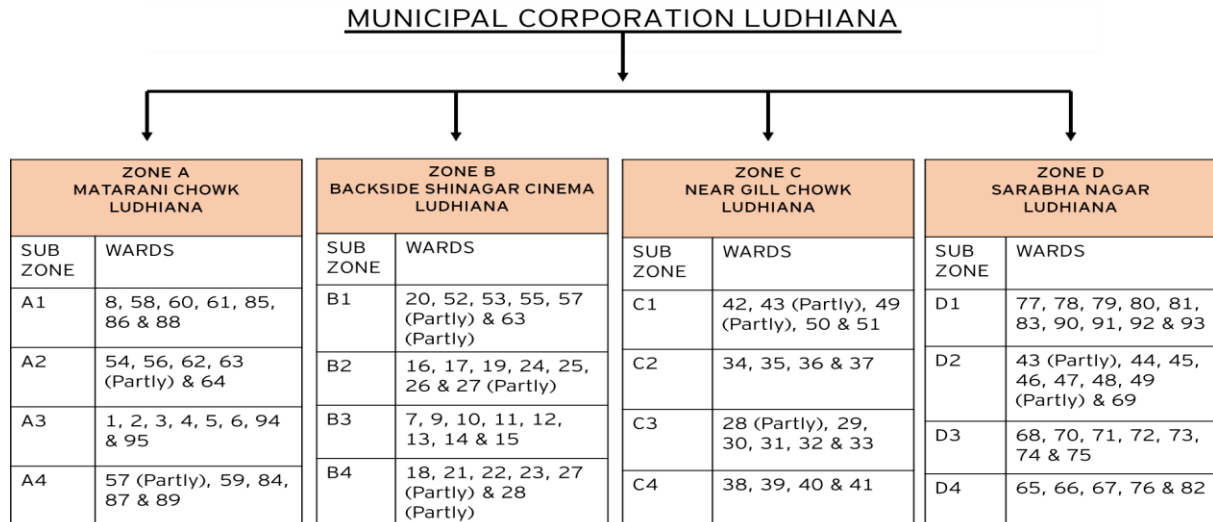
<b>Chapter 1: Introduction</b>	Provides an overview of the project background, the necessity, objective, scope of the ESIA and A&M adopted for the study.
<b>Chapter 2: Study Area and Project Description</b>	Summarizes key project details and features
<b>Chapter 3: Legislative, Regulatory &amp; Policy Framework</b>	Describes the environmental and social policies and regulations from the (GoI), (GoP), and the World Bank, required statutory clearances.
<b>Chapter 4: Baseline Environmental and Social Profile:</b>	Gives details of baseline environmental and socio-economic profile of the project area.
<b>Chapter 5: Assessment of Environmental Impacts</b>	Lists likely impacts caused on various environmental parameters by activities proposed during pre-construction, construction and operation of the project for which suitable mitigation measures are suggested.
<b>Chapter 6: Assessment of Social Impacts:</b>	Lists likely social impacts and mitigation measures during project cycle.
<b>Chapter 7: Stakeholders Assessment:</b>	Describes the outcomes of stakeholder consultations conducted for the project, this section provides insights into the perspectives and concerns of various stakeholders.
<b>Chapter 8: Environmental and Social Management and its Budget:</b>	Provides environmental and social mitigation measures for identified impacts, along with their implementation and monitoring responsibilities, as well as the environmental and social monitoring plan and the ESMP budget.
<b>Chapter 9: Stakeholder Consultations Strategy and Participation Framework:</b>	Outlines the strategy for public participation, consultation, and information dissemination throughout the project.

<b>Chapter 10: Grievance Redress Mechanism:</b>	Describes the Grievance Redress Mechanism (GRM), for construction or operation-related complaints throughout project cycle.
<b>Chapter 11: Institution and Implementation Arrangement:</b>	Describes the key roles and responsibilities of Project Implementation Unit (PIU), Project Management Unit (PMU), and Design-Build-Operate-Transfer (DBOT) contractor

## 2. Study Area and Project Description

### 2.1. Ludhiana City and its Characteristics

Ludhiana, situated in the state of Punjab, India, is a vital urban centre with significant industrial, commercial, and agricultural importance. The city is divided into four administrative zones<sup>5</sup>, which are further divided into ninety-five wards (Figure 2).



*Source: Municipal Corporation of Ludhiana*

**Figure 2: Division of Wards**

The above-mentioned zones are MCL’s administrative zones. As per feasibility of LBWS, the city is divided in two operational zones namely North and South. The operational North Zone caters the water demand for administrative Zone A & B, while the South Zone caters the water demand for administrative Zone C & D.



**Figure 3: Ludhiana, Punjab**

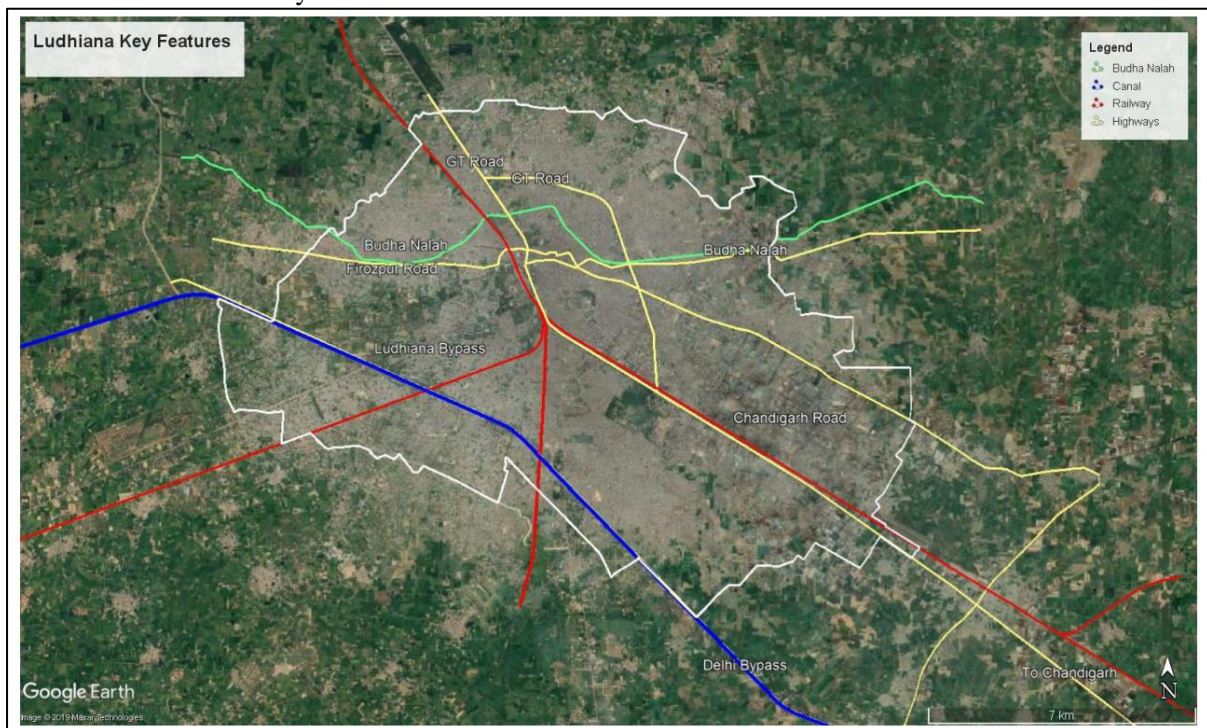
**Geography:** Ludhiana covers approximately 200 square kilometres of the fertile plains of Punjab, characterized by predominantly flat topography akin to surrounding alluvial plains. Elevations in the city range from 216 to 268 meters above Mean Sea Level (MSL).

<sup>5</sup> The zones are divided by the MCL for providing municipal services to Ludhiana.

**Demographic Profile:** The Municipal Corporation of Ludhiana has population of 1,618,879 of which 874,908 are males while 743,971 are females as per report released by Census India 2011. Population of children with age of 0-6 is 184,239 which is 11.38 % of total population of Ludhiana. In MCL, female sex ratio is of 850 against state average of 895. Moreover, child sex ratio is around 865 compared to Punjab state average of 846. Literacy rate of Ludhiana city is 85.77 % higher than state average of 75.84 % and male literacy is around 88.87 % while female literacy rate is 82.13 %. The present population of Ludhiana as in 2024 is 20,46,000<sup>6</sup>.

**Economic Significance:** Recognized as an economic powerhouse, Ludhiana significantly contributes to Punjab's economy. Industries such as textiles, manufacturing, agriculture, and small-scale enterprises drive the city's economic growth. The industrial sector attracts a large workforce and fosters urban development. Ludhiana reported per capita income of INR 1,80,109.00 which is higher than the Punjab state average of INR 1,73,873.00.<sup>7</sup>

**Connectivity:** The city is very well connected with other areas of the state and country through air, road and rail links. NH1-Grand Trunk Road passes through the city and the major road network connecting the city with other parts of the state/country are Ludhiana-Ambala, Ludhiana-Amritsar, Ludhiana Chandigarh, Ludhiana-Ferozpur, Ludhiana-Malerkotla and Ludhiana-Bhatinda. Similarly, Ludhiana lies on the main railway line and is identified as a junction. The main railway lines passing through the city are Amritsar-Delhi Railway Line, Delhi-Jammu, Ludhiana- Ferozpur and Ludhiana-Dhuri railway line. While Sahnewal Airport exists in Southeast of the city but has negligible flights and the Government has planned a new international airport near the Halwara Air Base located towards Southwest of city.



*Source: Feasibility Report*

**Figure 4: Ludhiana Map**

<sup>6</sup> As per feasibility report

<sup>7</sup> Punjab Economic Survey, 2022-23

## 2.2. Existing Water Supply and Sanitation System

Currently, MCL relies heavily on groundwater for water supply in Ludhiana city. According to the Punjab Water Regulation and Development Authority (PWRDA), Ludhiana falls into the "over-exploited" category, due to excessive use of groundwater for irrigation, industry purpose, domestic use, and lack of proper groundwater recharge systems. Further, Ludhiana ground-water quality testing has been done by Department for Water Supply and Sanitation (DWSS) labs and found that the water is contaminated with Selenium, Aluminium, Uranium and Nitrate<sup>8</sup>, water quality report is attached as Annexure-2. The over-use and contamination of groundwater is a major health concern for the residents. Surface water, on the other hand, is a more sustainable alternative water supply source.

### 2.2.1. Water Source

Currently, Ludhiana water supply arrangement is extracting 350 MLD through a total of 1,262 tube wells spread uniformly across the city. MCL employs two types of tube wells namely shallow tube wells and deep tube wells. Shallow tube wells have depth ranging from 100m to 130m and employ submersible pumps with capacity up to 12.5 HP. Deep tube wells have depth ranging from 165m to 200m and employ submersible pumps ranging from 25 HP to 40 HP. The details of the tube wells are provided in the Table 2.

**Table 2: Details of Tube Wells in Ludhiana City**

S.No.	Zone*	Shallow Tube wells	Deep Tube wells	Zone wise no. of Tube Wells
1	Zone A	114	202	316
2	Zone B	56	222	278
3	Zone C	46	212	258
4	Zone D	134	276	410
<b>Total No. of Tube Wells</b>		<b>350</b>	<b>912</b>	<b>1,262</b>

*Source: Municipal Corporation of Ludhiana* (\*Administrative zones as per MCL)

### 2.2.2. Pumping Systems

Water obtained from these tube wells is sometimes pumped to the ESRs and then fed to piped water supply distribution network while mostly direct pumping from tube wells to the distribution network is being done. Additionally, one existing pumping station in Dugri of pump capacity 100 HP (1 working + 1 Stand-by) pumps the water directly from a ground level service reservoir to consumers.

### 2.2.3. Service Reservoirs

At present MCL has 67 Nos of existing ESRs spread across the city. Out of 67 Nos. ESRs, 51 Nos are currently not in use, and require rehabilitation.<sup>9</sup> The total storage capacity of the 67 Nos ESRs is 44.11 million litres and the capacity of the ESRs that are not in use is 38.2 million litres. The DBOT contractor will undertake a condition assessment of the existing ESRs and determine whether rehabilitation is required or demolition and reconstruction of the ESR is required. Details of Existing ESRs are provided in **Annexure 1**.

### 2.2.4. Disinfection System

The exiting water supply infrastructure does not have any water treatment facility. However, disinfection of the extracted groundwater is done at the outlet of the tube wells before pumping the

<sup>8</sup> Contamination level are mentioned in section 1.2

<sup>9</sup> As per Annexure-1 of Amendment no.4, of (RFP) No: IN- PMIDC-281361- CW-RFP (TENDER ID: 2022\_WB\_90939\_1) FOR DESIGN, BUILD AND OPERATION OF 580 MLD WATER TREATMENT PLANT AND ASSOCIATED TRANSMISSION NETWORK AND ELEVATED SERVICE RESERVOIRS IN CITY OF LUDHIANA, STATE OF PUNJAB, INDIA.

water in the distribution network. Disinfection is carried out using dozers which includes liquid chlorination.

### 2.2.5. Distribution System

The existing water supply is distributed through a distribution system spanning over 2500 km, with diameters ranging from 50mm to 350mm.<sup>10</sup> The materials used for these pipes include Galvanized Iron, Ductile Iron, and Asbestos cement. The water is supplied intermittently to the households, nearly 7 hours a day.<sup>11</sup>

### 2.2.6. Consumer Connections

A total of 2,63,435 domestic and 26,539 commercial water supply connections are provided in Ludhiana by MCL.<sup>12</sup>

### 2.2.7. Existing Sewage Treatment Plant

Currently, Ludhiana has six Sewage Treatment Plants (STPs) at 3 different locations namely Bhattian, Balloke and Jamalpur. Currently, the STPs in Bhattian discharge the treated wastewater in river Sutlej and STPs in Balloke and Jamalpur discharge treated wastewater in Buddha Dariya. According to the water quality reports, pH, TSS, BOD and Total Kjeldahl Nitrogen (TKN) of the treated wastewater ranges from 7.1 to 8.3, 10 mg/l to 26 mg/l, 5 mg/l to 18mg/l, and 1.56 mg/l to 31 mg/l respectively, which indicates that treated wastewater is within the prescribed limits for disposal in water environment. The treated wastewater is safe for disposal in water environment and will not impact the receiving water body. The treated water quality reports of the STPs are provided in **Annexure 2**. The details of the STPs are provided in the Table 3.

**Table 3: Details of STPs**

S.No.	Name of the STP	Capacity of STP (MLD)	Type of Technology	Discharge Location
1.	Bhattian - I	111	USAP	Sutlej
2.	Bhattian - II	50	SBR	Sutlej
3.	Jamalpur	225	SBR	Buddha Dariya
4.	Balloke - I	152	USAP	Buddha Dariya
5.	Balloke - II	105	SBR	Buddha Dariya
6.	Balloke - III	60	SBR	Buddha Dariya

*Source: Municipal Corporation of Ludhiana*

## 2.3. Proposed Water Supply System

To meet the projected water demand for the city of Ludhiana in year 2055, 250 cusec of surface water is required. The details of population projection and water demand are provided in the Table 4.

**Table 4: Parameters and Projections**

Parameter	Unit	Ludhiana
<b>Projected Population</b>		
Population 2019	Lakhs	18.96
Population Year 2025	Lakhs	20.76
Population Intermediate year 2040	Lakhs	25.14
Population Ultimate year 2055	Lakhs	29.35

<sup>10</sup> The feasibility report does not mention about the conditional assessment of the distribution network; hence, it's present state is unknown. Further, diameter wise length of distribution network is not available.

<sup>11</sup> Feasibility Report

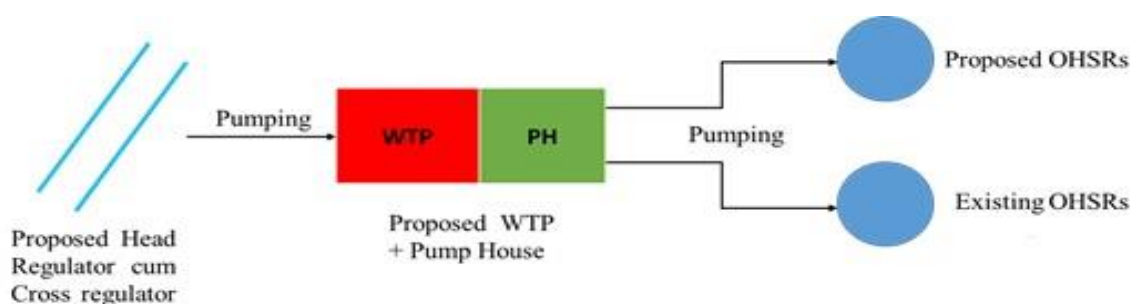
<sup>12</sup> Source: Municipal Corporation of Ludhiana



Parameter	Unit	Ludhiana
<b>Raw Water Demand</b>		
Base Year 2025	MLD	408
Intermediate Year 2040	MLD	495
Ultimate Year 2055	MLD	578
<b>Treated water Demand</b>		
Base year 2025	MLD	388
Intermediate year 2040	MLD	470
Ultimate year 2055	MLD	549

Source: Feasibility Report

The project involves enhancement of 1R distributary capacity from 50 cusec to 300 cusec, construction of head regulator cum cross regulator for diverting water from the 1-R canal. The water will then be pumped to the proposed 580 MLD Water Treatment Plant (WTP) near the village of Bilga. Following treatment at the WTP, the water will be pumped to 137 ESRs (70 Proposed and 67 Existing) through a transmission pipeline of 168 Km, with pipe diameters ranging from 150mm to 2000mm.



**Figure 5: Single Line Diagram for LBWS**

The project proposes two operational zones for water supply, viz., North and South. The North Zone encompasses the region located north of the operational railway lines and caters the administrative Zone A & B, while the South Zone includes the area to the south of Railway lines and caters the administrative Zone C & D. Each ESR will supply water to its designated District Metered Area. Existing distribution lines will be utilized to convey water from the ESRs to House Service Connections.

**Table 5: Summary of Proposed Components**

Parameters	Details
Total Land Area for WTP	53.39 Acres
WTP Capacity	580 MLD
Total power requirement of pumping systems (As per Feasibility Report)	10501 KW
Intake Source	Head Regulator cum Cross regulator at 1R canal, distributary of Sidhwan Canal
Current 1R canal capacity	50 cusecs
Proposed 1R canal capacity	300 cusecs
Current capacity of Sidhwan canal	1751.44 cusecs
Capacity of Sirhind Canal	12,600 cusecs
Length of Transmission Line	168 km, Dia ranges from 150mm to 2000mm

Parameters	Details
Number of ESRs	Total 137 ESRs 67 ESRs are existing of which 51 ESRs <sup>13</sup> are not in use 70 ESRs are new proposed

An integrated plan showing the locations of all key components for the project is annexed as **Annexure 3** and Key plan is attached as **Annexure -29**.

### 2.3.1. Water Source

The Sirhind Canal, originating from the Ropar head works draws water from river Satluj, has a sanctioned capacity of 12,600 cusecs and spans a length of 59.44 kilometres. Sidhwan Canal is distributary of Sirhind Canal, which diverts at Manpur headworks. The current capacity of Sidhwan Canal is 1751 cusecs. The 1-R Distributary is a distributary of the Sidhwan canal having water capacity of 50 cusecs. Municipal Corporation of Ludhiana has identified 1R Canal as the surface water supply source.

**Water Source Sustainability:** A Memorandum of Understanding was signed between MCL and WRD. Clause 4 of the MoU states “At present, 1R Distributary having capacity 50 cusecs passing through the proposed WTP site, which is proposed to be enhanced from 50 cusecs to 300 cusecs (250 cusecs for this project + 50 cusec or more to meet fluctuations in existing irrigation demand) by the Department of Water Resources after re-modelling and strengthening”. Further Clause 6. States “The Department of Water Resources shall ensure the uninterrupted water supply except for closure period of 21 to 30 days once or twice a year of Sirhind Canal during which the Municipal Corporation of Ludhiana will ensure sufficient water supply through tube wells.”. Clause 7. States “The Department of Water Resource shall inform the Municipal Corporation of Ludhiana at least 15 days prior to the closure of the Sirhind Canal”. The MoU signed between Department of Water Resource and Municipal Corporation of Ludhiana is attached in **Annexure 4**.

The lean period and maximum discharge of Satluj river for the year 2023 was 11,601 cusecs and 83,703 cusecs respectively and the full capacity of the Sirhind canal is 12,600 cusecs. The current capacity of the Sidhwan canal is 1,751.44 cusecs which is proposed to be enhanced to 1,946.29 cusecs.<sup>14</sup> The capacity of 1R canal is 50 cusecs which is proposed to be enhanced to 300 cusecs.<sup>15</sup> Hence, the proposed water supply source ultimately draws water from the Satluj river which has sufficient water flow throughout the year and it is sustainable to carry the projected water demand for the Ludhiana city.

However, it is recommended, that MCL shall ensure that during the forced closure period<sup>16</sup> of the Sirhind canal, the groundwater extracted and supplied to the residents shall comply with the drinking water quality standards as per the BIS standards 10500 (2012).

### 2.3.2. Water Treatment Plant

A 580 MLD water treatment plant is proposed, covering an area of ~53 acres in village Bilga. The design of the WTP considers not only the current usage levels but also accounts for the projected population up to the year 2055. The plant will have a conventional treatment system, incorporating processes such as aeration, coagulation, flocculation, sedimentation, rapid gravity filtration, and chlorination for disinfection. Additionally, the plant's operations will be facilitated by Programmable Logic Controllers (PLC) controls, for plant operation connected to Supervisory Control and Data Acquisition (SCADA) system. Pumping systems using a total of 10500 KWH of electric power are proposed for pumping of raw water and treated water. The raw water will be pumped from 1R canal

<sup>13</sup> Contractor shall conduct the conditional assessment to identify the requirement of demolition or rehabilitation of ESRs

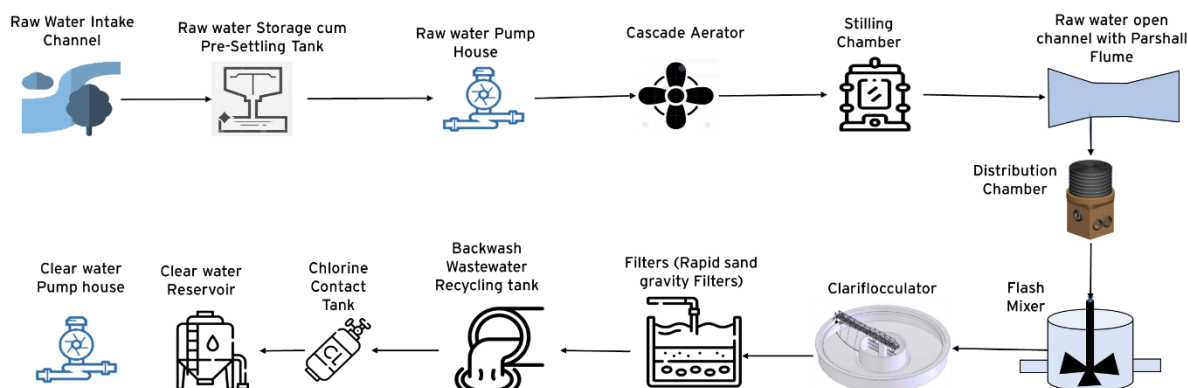
<sup>14</sup> As part of separate WRD Package

<sup>15</sup> As part of separate WRD Package

<sup>16</sup> The Sirhind canal is closed periodically by the WRD for routine maintenance.

to the WTP where it will be treated. Subsequently, after treatment the water will be pumped to all ESRs. The technical drawing of the proposed water treatment plant<sup>17</sup> is attached in **Annexure 5**.

The DBOT contract includes provisions for setting up a water testing laboratory at the WTP. All equipment will be purchased by the DBOT contractor under this contract.



**Figure 6: Process Flow Diagram**

*Source: Feasibility Report*

The sizes of various unit processes in the WTP are as follows:<sup>18</sup>

**Table 6: Sizes of Unit Processes in WTP**

S.No.	Unit Process	Unit	Dimensions
1.	Raw water intake channel	L*W*(SWD+FB)	1270m*5m*(1.6m+0.5m)
2.	Raw water storage cum pre-settling tank	L*W*SWD	186m*130m*6m
3.	Raw water pump house	L*W*H	62m*10m*6m
4.	Cascade Aerator	Dia.	25.5m
5.	Stilling Chamber	L*W*SWD	11m*10m*3.45m
6.	Raw water open channel with Parshall flume	W*SWD	6.6m*1.2m
7.	Distribution chamber, 2 Nos	W*L*SWD	7m*9.9m*3.2m
8.	Flash Mixer, 8 Nos	L*W*SWD	4.4m*4.4m*3.3m
9.	Clariflocculator, 8 Nos	Dia, (SWD+FB)	60m, (3.5m+0.5m)
10.	Filters (Rapid Sand gravity filters)	L*W*H	13.5m*16m*3.5m
11.	Backwash Wastewater Recycling Tank	L*W*SWD	33m*11.5m*3.5m
12.	Chlorine Contact Tank	L*W*SWD	53m*60m*4m
13.	Clear Water Reservoir, 2 Nos	L*W*(SWD+FB)	80m*30m*(5m+0.5m)
14.	Clear Water Pump House	L*W*H	90m*10m*6m
15.	Filter Annex Building	L*W*H	22.55m*17.6m*5m
16.	Chlorine Tonner Yard	L*W*H	33m*10m*6m
17.	Clarifier Sludge Sump cum Pump House	(Dia*SWD)	24.5m*2m
18.	Sludge Thickener 2 Nos	(Dia*SWD)	31m*3.5m
19.	Thickener Supernatant Collection Sump	L*W*D	10m*4.1m*3m
20.	Thickened Sludge Collection Sump	L*W*D	10m*10m*3m
21.	Centrifuge Building	L*W*H	22m*6.5m*(2*5m)
22.	Chemical House	L*W*H	29.7m*15m*(2*5m)

<sup>17</sup> Process Flow Diagram for WTP shall be updated by the DBOT contractor.

<sup>18</sup> As per Feasibility Report

S.No.	Unit Process	Unit	Dimensions
-------	--------------	------	------------

### 2.3.3. Disinfection System

Raw water extracted from the 1R canal will be initially stored in raw water storage cum pre-settling tank, ensuring a minimum retention period before its conveyance to the cascade aerator. The primary function of the cascade aerator is to remove/ reduce dissolved gases (such as carbon dioxide) and oxidizes dissolved metals such as iron, hydrogen sulphide, and Volatile Organic Chemicals (VOCs), if present, in the raw water. After that water will be let into inlet chamber and Pre-chlorination is envisaged in inlet chamber by injecting chlorine through bottom mounted diffusers to reduce the ammonia content and microbiological growth in raw water. Chlorine storage room will be constructed for providing pre-& post chlorination. Each chlorination system shall be provided with 2 vacuum type chlorinators and 2 motive pumps (1 working + 1 standby).

### 2.3.4. Clear Water Pumping Station and Pumping Machinery

The raw water and clear water pumping stations each of 620 sq. meters and 990 sq. meters are proposed inside the campus of the water treatment plant. The raw water pumping station will house 14 pumps. 12 pumps to pump the water from raw water collection tank to cascade aerator and 2 priming pumps. The clear water pumping station will house 24 pumps, of which 8 and 12 pumps are proposed to pump the water from clear water reservoir to the ESRs in the North and South zones respectively, and 2 priming pumps each for north and south zone. The details of the pumps are provided in Table 7.

**Table 7: Technical Details of the Proposed Pumping System**

S.No.	Particulars	Details
1	Raw water pumps: 12 Nos.	330 HP (7W+5S)
2	Treated Water pumps for North zone: 8 Nos.	460 HP (6W+2S)
3	Treated water pumps for south zone: 12 Nos.	540 HP (9W+3S)
4	Priming pump for raw water: 2 Nos	16 HP (1W+1S)
5	Priming pump for treated water North zone: 2 Nos	9 HP (1W+1S)
6	Priming Pump for treated water south zone: 2 Nos.	8 HP (1w+1s)

*Source: Feasibility Report*

### 2.3.5. Service Reservoirs

In the project area, there are 67 existing Elevated Service Reservoirs (ESRs) (including the ESR of 4ML capacity in Vishwakarma Park identified by the PMU during the survey conducted in the month of June 2024). The project proposes to construct 70 ESRs; which would bring the total to 137 ESRs. The preliminary conditional assessment of existing ESRs is provided by the MCL in the table below.<sup>19</sup> The staging height for ESRs vary from 30 meters to 35 meters, and capacity from 0.2 ML to 3 ML. The DBOT contractor will conduct a conditional assessment of all existing ESRs. Following this, details on whether the ESRs should be rehabilitated, demolished, or used in their present condition shall be finalized. After the DBOT contractor completes the condition assessment of the ESRs, the ESIA shall be updated accordingly.

<sup>19</sup> As per amendment no. 4 of the tender document for LBWS.

**Table 8: Details of Existing and Proposed ESRs**

S. No	ESR details	ESR/ UGSRs	North		South		Total	
		Capacity	Total Nos.	Total Capacity	Total Nos.	Total Capacity	Total Nos.	Total Capacity
		Mill. L	Nos.	Mill. L	Nos.	Mill. L	Nos.	Mill. L
1	Existing ESR (Conditional Assessment Required)	0.227	3	0.68	0	0	3	0.68
		0.455	20	9.1	9	4.095	29	13.2
		0.909	3	2.73	15	13.635	18	16.36
<b>Sub-total (1)</b>			<b>26</b>	<b>12.508</b>	<b>24</b>	<b>17.73</b>	<b>50</b>	<b>30.238</b>
2	Existing old MS surface SRs	0.227	2	0.45	0	0	2	0.45
<b>Sub- Total (2)</b>			<b>2</b>	<b>0.454</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0.454</b>
3	Existing ESR	0.113	0	0	1	0.113	1	0.11
		0.445	0	0	2	0.89	2	0.89
<b>Sub- Total (3)</b>			<b>0</b>	<b>0</b>	<b>3</b>	<b>1.003</b>	<b>3</b>	<b>1.003</b>
4	Existing ABD Smart city UGSR	1.885	0	0	1	1.885	1	1.89
		2.45	0	0	1	2.45	1	2.45
<b>Sub- Total (4)</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>4.335</b>	<b>2</b>	<b>4.335</b>
5	Existing GLADA	0.45	1	0.45	1	0.45	2	0.9
		0.9	2	1.8	0	0	2	1.8
<b>Sub- Total (5)</b>			<b>3</b>	<b>2.25</b>	<b>1</b>	<b>0.45</b>	<b>4</b>	<b>2.7</b>
6	Existing LIT	0.227	0	0	1	0.227	1	0.23
		0.68	0	0	2	1.36	2	1.36
		0.9	0	0	2	1.8	2	1.8
<b>Sub- Total (6)</b>			<b>0</b>	<b>0</b>	<b>5</b>	<b>3.387</b>	<b>5</b>	<b>3.387</b>
<b>6.a Identified during survey by PMU</b>					<b>1</b>	<b>4</b>	<b>1</b>	<b>4</b>
<b>A. Sub- Total (1 to 6a)</b>			<b>31</b>	<b>15.212</b>	<b>36</b>	<b>30.905</b>	<b>67</b>	<b>46.117</b>
7	Proposed under AMRUT (But to be built under the project)	0.23	0	0	1	0.23	1	0.23
		0.45	3	1.35	3	1.35	6	2.7
		0.68	1	0.68	0	0	1	0.68
		0.91	1	0.91	1	0.91	2	1.82
		1.14	2	2.28	1	1.14	3	3.42
		1.36	0	0	2	2.72	2	2.72
<b>Sub- Total (7)</b>			<b>7</b>	<b>5.22</b>	<b>8</b>	<b>6.35</b>	<b>15</b>	<b>11.57</b>
8	Proposed ESR under the project	1	9	9	4	4	13	13
		1.5	19	28.5	12	18	31	46.5
		2	3	6	8	16	11	22
<b>Sub- Total (8)</b>			<b>31</b>	<b>43.5</b>	<b>24</b>	<b>38</b>	<b>55</b>	<b>81.5</b>
<b>B. Sub- Total (7 to 8)</b>			<b>38</b>	<b>48.72</b>	<b>32</b>	<b>44.35</b>	<b>70</b>	<b>93.07</b>
<b>Total (A+B)</b>			<b>69</b>	<b>63.932</b>	<b>68</b>	<b>75.255</b>	<b>137</b>	<b>139.187</b>

According to the Ludhiana Bulk Water Supply project bidding documents, all the outlets of the ESRs are required to be equipped with digital measuring, recording and transmitting chlorine, pH and turbidity levels. Provision for SCADA is included for all the ESRs.

Out of 67 existing ESRs, the PIU found 02 ESRs to be unsafe for operation and recommend these for demolition in the project bidding document. The demolition will be taken up after proper assessment of the ESRs.

### 2.3.6. Transmission System

The project proposes two operational zones namely North and South based on the operational Railway line. Two bulk water supply lines are proposed to be laid for each operational zone. For North zone 1800mm dia pipe and for South zone 2000mm dia pipes are proposed, the diameter of both the pipes reduces as the smaller dia pipes branches out from the bulk line. The total length of transmission line network in the project area is 168 km with diameters of pipes ranging from 150 mm to 2000 mm. Diameter wise length of transmission main with required Right of Way and width of the trench is provided in Table 9.

**Table 9: Transmission Line Details**

S.No.	Dia of pipe (mm)	Length of pipe (m)	Depth of Trench (m)	Top Width of the Trench (m)	Working Width (m)	Remarks
1.	150	3,665	1.45	0.5	2	Day to day temporary restoration of damages shall be done depending upon the diameter of pipe. Complete restoration shall be done once the particular stretch is completed, tested, and approved by PIU/ MCL.
2.	200	10,640	1.5	0.5	2	
3.	250	9,117	1.55	0.5	2	
4.	300	26,700	1.6	0.5	2	
5.	350	15,808	1.65	0.6	2	
6.	400	10,430	1.7	0.6	2	
7.	450	10,122	1.75	0.75	2.5	
8.	500	13,685	1.8	0.75	2.5	
9.	600	7,124	1.9	0.75	2.5	
10.	700	5,976	2	1.2	4	
11.	750	1,954	2.05	1.2	4	
12.	800	4,711	2.1	1.2	4	
13.	900	1,710	2.2	1.2	4	
14.	1000	495	2.3	2	5	
15.	1050	1,338	2.35	2	5	
16.	1100	1,808	2.4	2	5	
17.	1200	2,780	2.5	2	5	
18.	1300	2,175	2.6	2.3	5	
19.	1400	2,000	2.7	2.5	5	
20.	1500	3,491	2.8	2.5	5	
21.	1600	2,690	2.9	2.7	6	
22.	1700	16,224	3	2.8	6	
23.	1800	14,000	3.1	3	6.5	
24.	2000	3,665	3.3	3.2	7	

The proposed transmission line system is crossing the national highways, state highways, canal, and railway tracks at several locations. Details of diameter of pipe, depth of trench and approximate length of crossing are provided in **Annexure 6**. The transmission lines are proposed to be laid along the narrow strip of protected forest area abutting the canals and highways, as per the Government of Punjab notification. This laying of transmission lines will necessitate the felling of trees within these slender sections of forest land. Details of length of transmission line and nos. of crossing are shown below.

**Table 10: Details of Length of Transmission Line and Nos. of Crossings**

Particulars	Length of Pipeline
National Highways	27.65 kms with 15 Crossings
Ludhiana-Chandigarh NH95	8.6 kms
National Highway 44 (NH44)	5.2 kms
National Highway 5 (NH5)	13.85 kms
State, Villages, Districts and Arterial Roads with 23 State Highway crossings	119.79 kms
Canal Inspection Roads (8 Canal Crossings)	6.4 kms
Forest Land (affecting 495 Tress and 895 Poles Trees)	~13 kms
No. of Railway Line Crossings	4

### 2.3.7. SCADA

The SCADA system is proposed for effective monitoring and control of water supply in the city. The water leakage will be checked through District Metered Area (DMAs) and SCADA monitoring, flow & pressure information will be measured and transferred through General Packet Radio Service (GPRS) / Global System for Mobile Communications (GSM) wireless technology. The SCADA system collects real-time data from sensors to provide an overview of the entire water distribution network. The SCADA system is proposed for Intake, WTP, Transmission Line and ESRs.

### 2.3.8. Land Requirement

The process of selecting a site for the WTP construction began early in 2016 with the notification and, with announcements posted in the local daily newspaper, ‘The Tribune,’ on September 13, 2020, and again on December 24, 2020. The Newspaper advertisements and the timeline for the purchase of the WTP land is presented in **Annexure 9**.

**Total Land Purchased:** As on date MCL has purchased a total of 53 Acre, 2 Kanal and 2.7 Marla (53.39 Acre) from 50 landowners. The land was purchased through direct negotiations with the landowners. While the circle rate was INR 36,74,400/- per acre, the landowners negotiated for a rate of INR 63,00,000/- per acre, which was mutually agreed upon.

The details for the land purchase and documentation for the documentation for purchase of WTP Land, gazette notification are attached as **Annexure 7**.

The Head regulator cum cross regulator at 1R canal will be constructed on WRD land. The ESRs will be constructed on MCL land, other government department lands including GLADA, and trust land. PIU Ludhiana is in the process of obtaining No objection certificates from the concerned departments/trusts. For laying of transmission main, available RoW to be used. Hence, no land acquisition is involved.

The possession details of the land parcels identified for the construction of the ESRs are provided in Table below.

**Table 11: Possession details of the Land Parcels identified for ESRs.**

S. No.	Land Possession Details	Total Numbers
<b>A. Existing ESRs</b>		
1	Land Parcels under MCL Possession	67
<b>SUB TOTAL (A)</b>		<b>67</b>
<b>B. Proposed ESRs</b>		
1	Land Parcels under MCL Possession	58
3	Land Parcels under GLADA Possession	3
4	Land Parcels under LIT Possession	3
5	Land Parcels under Loh Langar Trust Possession	1

S. No.	Land Possession Details	Total Numbers
6	Disputed MCL land, alternate land needs to be identified	3
7	Land Parcels under the possession of School, for which alternative land needs to be identified	2
<b>Sub Total (B)</b>		<b>70</b>
<b>Total</b>		<b>137</b>

The land possession details of each ESRs are attached in **Annexure-1**. The possession certificates for the existing 67 ESRs, and 58 proposed ESRs, as well as the No Objection Certificates for 3 land parcels under GLADA, 3 land parcels under LIT, and 1 land parcel under the Loh Langar Trust<sup>20</sup>, are all attached as **Annexure 8A**. MCL has identified alternate land parcels for the 3 disputed parcels which are currently under MCL's possession. They have also identified alternative parcels for the 2 parcels presently possessed by the school. However, MCL is in process to finalize the documents for the identified land parcels<sup>21</sup>.

No-objection Undertaking has been shared by 14 RWAs<sup>22</sup> stating that they have no objections to the proposed construction of the Elevated Service Reservoir (ESR) in the park located within their colony. The Undertaking are attached as **Annexure 8B**.

### 2.3.9. Water Requirement

The estimated Water Consumption for project purposes is given below:

**Table 12: Water Consumption for Purposes**

Purpose of Consumption	Estimation for Quantity of Water to be Consumed
Construction	1,50,000 L per day
Labours for Drinking, Cooking and Bathing	1500 Nos of workers, nearly 75,000 L of water is required per day
Water Sprinkling, cleaning vehicles etc.	2,00,000 L

### 2.3.10. Construction Material Requirement<sup>23</sup>

The Construction Material requirement for the project is given below:

**Table 13: Construction Material Requirement**

S.No.	Description	Unit	Quantity
1.	MS Pipes	KM	50
2.	DI Pipes	KM	115
3.	Concrete	CUM	1,65,000
4.	Sand	CUM	83,000
5.	Aggregates	MT	1,30,000
6.	Steel for reinforcement	MT	15,000
7.	Cement	MT	60,000

<sup>20</sup> No-objection Certificate from Loh Langar Trust was not received as on submission of this ESIA report, PIU shall add the NoC in the subsequent revised ESIA report.

<sup>21</sup> PIU to update the details of the identified alternate land parcels in the subsequent revised ESIA report.

<sup>22</sup> PIU shall procure the remaining no-objection undertakings from the pending RWAs prior to commencement of civil works

<sup>23</sup> These estimates are gross conservative estimates which needs to be updated upon final designs.



## 2.4. Study of Alternatives

Alternative analysis provides opportunity to integrate environmental and social considerations into early stages of project (i.e., pre-feasibility or feasibility study), so that adverse environmental impacts can be avoided or minimized by various alternatives. It also provides opportunity to study various options vis a vis costs, provides a logical base, via transparent process, assist in decision making and timely implementation. The alternative of the project “with and without project” condition has been evaluated. Details of the alternate study is attached as **Annexure 9**.

### 2.4.1. Demand Projections

The population of Ludhiana city is expected to reach 20.76 Lakhs by the year 2025 and 29.35 Lakhs by the year 2055. The treated water requirement of the city for the year 2025 is about 388 MLD and this demand will be increase to 549 MLD by 2055. The water supply to the city is from ground water source. Detail of the same already described in chapter 1 section 1.2.

### 2.4.2. Source Studies

MCL has identified two options for water sourcing that are:

Option-1 Existing groundwater abstraction and

Option-2: Abstraction of water from canal.

The latter option, i.e., Option-2 of abstracting water from the canal and improving water treatment systems appears to be the most viable choice, as it addresses the issues of groundwater over-extraction, poor quality of ground water, poor service quality, and sustainability while also offering potential environmental benefits.

### 2.4.3. Water Treatment Plant

During the feasibility study, several options were explored for the construction of the Water Treatment Plant (WTP). Initially, four options were considered:

- Option 1 – Location near Rampur Village: This site is approximately 2.7km from the canal and about 10km from Chandigarh Road. It needs construction of cross regulator for diversion of canal water, and it has right of way (ROW) for laying transmission system. This land costs about Rs.30 lakhs per Acre<sup>24</sup>.
- Option 2 – Location near Bowani Village: This site is adjacent to the canal and is about 11km from the Southern bypass road. It does not require cross regulator for diversion, and it has right of way (ROW) for laying transmission main. This land costs about Rs.140lakhs per Acre<sup>25</sup>.
- Option 3 – Location near Bilaspur Village: This site is adjacent to the canal and is approximately 15km from southern bypass road. It requires construction of cross regulator for diversion, and it has right of way (ROW) for laying transmission networks. This land costs about Rs.110lakhs per acre<sup>26</sup>.
- Option 4 - Location near Bilga village. This site is adjacent to the canal and is approximately 50 m from 1-R canal. It requires construction of cross regulator for diversion, and it has right of way (ROW) for laying transmission networks and enhancement of 1-R canal. This land costs about Rs. 63 lakhs per acre<sup>27</sup>.

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<sup>24</sup> As per Feasibility Report

<sup>25</sup> As per Feasibility Report

<sup>26</sup> As per Feasibility Report

<sup>27</sup> As per Feasibility Report

Considering the capital cost for land and diversion infrastructure and transmission networks, the option 4 of location near Bilga village was found to be the most suitable and economical and hence, it has been considered.

#### **2.4.4. Clear Water Transmission System**

Two transmission main system were analysed namely:

- I. Option 1: Pumping water to zonal reservoirs and further pumping the water from zonal reservoirs to service reservoirs through pumps at zonal reservoirs; and
- II. Option 2: Pumping directly to service reservoirs.

Option (i) simplifies the pumping operations as pumps of lower capacity shall be required. However, it also requires more land and infrastructure at zonal reservoirs, which will lead to increased operational costs. Hence, option (ii) direct pumping to the service reservoirs is more suitable. This method involves dividing the service area into North and South operational zones. However, it presents potential risk as each zone relies heavily on trunk mains without an alternate supply. To mitigate this risk, it is recommended that MCL shall consider the provision of cross-connecting loops between the two zones during the detailed design, especially in areas where it's feasible to cross railway lines. By positioning these loops in the central city area and at the end of each zonal pipeline, the operational flexibility will be improved; This will allow water transfer between zones in the event of a segment becoming redundant.

#### **2.4.5. Local Distribution System**

Distribution system is not proposed in the project.

For Details of Storage Capacity, Pumping Station and Pumping Machinery, refer **Annexure 9**.

### **3. Legislative, Regulatory and Policy Framework**

#### **3.1. Introduction**

This chapter provides a review of legal and regulatory framework concerning environmental and social aspects, and their applicability to the project. The Government of India has several policy guidelines, acts, and regulations pertaining to environmental and social aspects. Additionally, the chapter incorporates the World Bank's ESF and ESS.

#### **3.2. Applicable Policy, Rules & Regulations to project interventions/activities: Environmental**

##### ***3.2.1. EIA notification***

The Environmental Impact Assessment (EIA) Notification of 2006 and its amendment is a significant environmental regulation in India that outlines the process for assessing the potential environmental impacts of various developmental projects. All projects listed in Schedule -1 of the Notification require prior environmental clearance. Then, Ministry of Environment Forests and Climate Change (MoEFCC)/ SEIAA issues environmental clearances based on the recommendations of the appraisal committees. The clearance may include specific conditions and safeguards to mitigate potential environmental impacts.

As per notification, the project activities do not come under the purview of EIA Notification 2006. However, environmental, and social assessment needs to be carried out to address the impacts and suitable mitigation measures can be adopted, as it is mandatory as per the World Bank ESF 2018.

##### ***3.2.2. Legal Framework of Government of India for Environmental Compliance***

Ministry of Environment, Forests, and Climate Change (MoEFCC) functions as the primary agency responsible for nationwide planning, promotion, formulation of environmental laws, and their enforcement. The comprehensive legal framework for environmental protection is established by the Environment (Protection) Act, 1986.

### 3.2.3. Key Environmental Laws and other related Regulations

Table 14 outlines the essential environmental laws and regulations pertinent to the project's investments.

**Table 14: Applicability of the Environmental laws and Regulations**

S. No	Act / Law	Description	Applicability to Project	Regulating Authority	Phase
1	National Environmental Policy (NEP) 2006	This policy advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.	<b>APPLICABLE</b> Project shall adhere to the NEP principle, for conservation of environmental resources and abatement of pollution.	MoEF&CC	Construction and Operation phases
2	Environment Protection Act, 1986 and its subsequent amendments	The Environment (Protection) Act is an umbrella legislation seeking to supplement the existing laws on the control of pollution (the Water Act and the Air Act) by enacting a general legislation for environment protection and to fill the gaps in regulation of major environmental hazards.	<b>APPLICABLE</b> Before commencing any construction activity, the setup of a Batching Plant requires CTE from the SPCB. Furthermore, prior to initiating its operations, it is essential to obtain Consent to Operate (CTO) under the pertinent Air and Water Acts.	PPCB	Construction and Operation phases
3	Environmental Impact Assessment (EIA) Notification, 2006 and its subsequent amendment.	The EIA Notification set out the requirement for environmental assessment in India. The Schedule I of the notification defines threshold of activities which require to undertake an environmental assessment and obtain an environmental clearance from statutory bodies.	<b>NOT APPLICABLE</b> The Projects activities are not covered under the ambit of EIA Notification, 2006 dated 14.09.2006 and its amendment.	MoEF&CC/ State Environment Impact Assessment Authority (SEIAA)	-

S. No	Act / Law	Description	Applicability to Project	Regulating Authority	Phase
4	Indian Forest Act 2002 Forests (Conservation) Act, 1980 and its subsequent amendment 2023	Objectives of this Act are to enhancement of conservation of natural resources and ensuring ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility.	<b>APPLICABLE</b> The transmission line passes through the Right of Way (RoW) of roads such as National Highways (NH), State Highways (SH), Major District Roads (MDR), Canals, and Railway tracks, which are designated as protected forest areas.	Forest Department	Construction phase
5	The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & its subsequent amendment	The Act vests forest rights and occupation in forest land to forest dwellers, including Scheduled Tribes and traditional forest dwellers.	<b>NOT APPLICABLE</b> Based on the reconnaissance survey and available data, there are no Scheduled Tribes or traditional forest dwellers in the project area.	Ministry of Tribal Affairs. Tribal Welfare Department/MoEF&CC	-
6	Wildlife Protection Act, 1972 and its amendment	The Act provides for the protection of wild animals, birds and plants; and for matters connected therewith or ancillary or incidental there to.	<b>NOT APPLICABLE</b> The project is not passing through Wildlife and Eco sensitive areas.	Chief Conservator Wildlife, NBWL/State Forest Department and MoEF&CC	-
7	Ancient Monuments and Archaeological Sites and Remains Acts, 1958, its Rules, Ancient Monuments and Archaeological Sites and Remains (Amendment & Validation) Act 2010 and its amendment	Conservation of cultural and historical remains in India.	<b>NOT APPLICABLE</b> All locations are situated more than 300 meters away from the project site, thus indicating no impact. However, the acts related to chance finds are applicable.	National Monument Authority	Construction and Operation phases

S. No	Act / Law	Description	Applicability to Project	Regulating Authority	Phase
8	Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and its amendment	This rule obligates hazardous waste generators, transporter, and recycler of the hazardous waste for safe handling practices and its management.	<b>APPLICABLE</b> During both the construction and operation phases, the proposed project will produce waste oil from diesel generators. Additionally, chlorine will be used during the operational phase.	PPCB/CPCB	Construction and Operation phases
9	The Air (Prevention and Control of Pollution) Act, 1981 and its amendments	This act provides the prevention and control of air pollution and all other related matters. The act through CPCB sets the standard limits for projects and takes care of the prescribed limits of emissions.	<b>APPLICABLE</b> The setting up of Batching Plant requires CTE and CTO from the SPCB.	PPCB	Pre- Operation for CTO
10	The Water (Prevention and Control of Pollution) Act, 1974 and its amendments	This act provides the prevention and control of water pollution and maintaining or restoring water quality for any project.	<b>APPLICABLE</b> The setting up of Batching Plant requires CTE and CTO from the PPCB.	PPCB	Pre- Operation for CTO
11	The Noise Pollution (Regulation and Control) Rules, 2000 and the Noise Pollution (Regulation and Control) Amendment) Rules, 2010	As per the Rules 3 and 4 of the Noise (Regulation & Control) Rules, 2000 as amended in October 2002, noise generation due to the project, in the project area should not exceed the standards specified in the Schedule.	<b>APPLICABLE</b> Noise generation is anticipated during both the construction and operation phases of the project. It is essential to ensure the noise levels due to the project do not exceed ambient noise level standards by implementing appropriate measures.	CPCB/PPCB	Construction and Operation phases

S. No	Act / Law	Description	Applicability to Project	Regulating Authority	Phase
12	Solid Waste Management Rules, 2016	As per the rule, waste generated need to be segregated into three separate streams namely bio-degradable, non-biodegradable and domestic inert waste and disposed off at designated sites for processing. The hazardous wastes should be stored in suitable bins and handed over to authorized vendors.	<b>APPLICABLE</b> The generation of solid waste from construction and operation activities of the project falls under the provisions of the relevant regulations.	SPCB, Urban Local Bodies (ULBs)	Construction and Operation phases
13	Construction and Demolition Rules, 2016	These Rules prescribe the methods to manage construction waste resulting from construction, and demolition waste. Rules define C&D waste as waste comprising of building materials, debris resulting from construction, re-modelling, repair and demolition of any civil structure.	<b>APPLICABLE</b> Waste generated during the laying of transmission lines, construction of WTP, and ESR, as well as during the upgrading or demolition of ESRs, must be appropriately reused, recycled, and disposed of in accordance with the Construction and Demolition (C&D) Rules of 2016.	CPCB, PPCB, Urban Local bodies (ULBs).	Construction phases
14	Batteries Waste Management Rules, 2022	As per the rule, Consumers must responsibly deposit used batteries with dealers, manufacturers, importers, assemblers, registered recyclers, or at designated collection centers, avoiding any other disposal methods.	<b>APPLICABLE</b> Rules will be applicable during construction and operation phases, as the project will use batteries for machinery and other purposes.	CPCB, PPCB, Urban Local bodies (ULBs).	Construction and Operation phases
15	Plastic Waste Management Rules, 2022 and its amendment	These rules cover various aspects of plastic waste management, including collection, segregation, processing, recycling, and disposal. Waste generators are obligated to minimize plastic waste, segregate waste at the source, refrain from littering, and pay user fees for plastic waste management.	<b>APPLICABLE</b> Rules will be applicable during construction and operation phases for packaging material and use of plastic etc.	CPCB, PPCB, Urban Local bodies (ULBs).	Construction and Operation phases

S. No	Act / Law	Description	Applicability to Project	Regulating Authority	Phase
16	E-Waste (Management) Rules, 2022	Bulk consumers of electrical and electronic equipment will ensure that e-waste generated shall be channelized through collection centers or dealers of authorized producers or dismantlers or recyclers or through the designated (take back) service providers of the producers to authorized dismantlers and/or recyclers.	<b>APPLICABLE</b> The e-waste generated from the project during construction and operation phase must comply with the provisions of the rules and disposed through the prescribed channels only.	CPCB, PPCB, Urban Local bodies (ULBs).	Construction and Operation phase
17	Electricity Act, 2003 and its subsequent amendments 2022	Relevant sections of the Act pertaining to sub-stations, electrical equipment, motors, etc. to prescribe safety measures and standards, accident reporting, and investigation.	<b>APPLICABLE</b> The Section of Electricity Act is applicable on health and safety of the personnel involved and the community.	Contractor, Punjab State Power Corporation Limited (PSPCL).	Construction phases
18	Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 and as amended	These rules are aimed at ensuring the safe handling, storage, and importation of hazardous chemicals. The rules are designed to prevent and mitigate the risks associated with the manufacturing, storage, and import of such substances.	<b>APPLICABLE</b> Rules will be applicable during construction and operation phases, if any chemicals such paints, oils and grease, Chlorine etc. are stored at site and abide with the criteria laid down in the Rules.	PPCB	Construction and Operation phases
<b>International Conventions and Treaties</b>					
19	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	This international convention, to which India is a signatory category, lists the endangered flora and fauna and regulates trade of these species	<b>APPLICABLE</b> During the field survey, no observations of endangered species were noted.	MoEF&CC	Construction phases
20	Ramsar Convention, 1971	The Ramsar Convention is an international treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	<b>NOT APPLICABLE</b> There are no Ramsar sites in the project area.	MoEF&CC	-



S. No	Act / Law	Description	Applicability to Project	Regulating Authority	Phase
21	Convention on Migratory Species of Wild Animals (CMS), 1979 (Bonn convention)	CMS, which recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions and aims to conserve terrestrial, marine and avian migratory species throughout their ranges.	<b>NOT APPLICABLE</b> As no migratory species of wild animals are reported in the project areas.	MoEF&CC	-
22	Montreal Protocol 1992	India is a signatory of this convention which aims to reduction in the consumption and production of ozone depleting substances (ODS), while recognizing differences in a nation's responsibilities.	<b>NOT APPLICABLE</b> As no ODS are involved in construction works.	MoEF&CC	-
23	Basel Convention on Trans-boundary Movement of Hazardous Wastes, 1989	This convention came into force on 22 September 1992 which aims to reduce the amount of waste produced by signatories and regulates the international traffic in hazardous wastes.	<b>NOT APPLICABLE</b> As the project activities will not involve any trans boundary movement of hazardous wastes.	MoEF&CC	-
24	International Union for Conservation of Nature (IUCN)	The international organization committed to the conservation and sustainable use of biodiversity. Its pivotal role in developing and influencing global environmental policies. Along with this, the organization maintains the IUCN Red List of Threatened Species, a comprehensive database assessing the extinction risk of thousands of species worldwide.	<b>NOT APPLICABLE</b> The IUCN Red List of Threatened Species is a comprehensive source for identifying the conservation status of various species found within the project area.	MoEF&CC and concerned forest department/ Wildlife.	Pre-Construction phases
25	United Nations Educational, Scientific and Cultural Organization (UNESCO)	The specialized agency of the United Nations aimed at promoting world peace and security through international cooperation in education, the sciences, and culture. UNESCO is known for its World Heritage program, which identifies and protects cultural and natural sites of outstanding universal value.	<b>NOT APPLICABLE</b> As per the World Heritage List, no sites have been identified.	Punjab Heritage & Tourism Promotion Board (PHTPB)	-

### 3.3. Applicable Policy, Rules & Regulation to project interventions / activities: Social

This section encompasses an overview of national policies and acts, as detailed below:

#### 3.3.1. National Policies and Acts

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR, 2013): This Act repeals the Land Acquisition Act, 1894 and is applicable to all states in India. RFCTLARR, 2013 is the first National law that addresses land acquisition, and rehabilitation and resettlement. This Act provides enhanced compensation and resettlement & rehabilitation assistance as compared to earlier LA Act of 1894 and resettlement & rehabilitation assistance. However, as the land required for the project has been purchased through negotiated settlement vide under Gazette Notification No 24/109/2015-LR 1/9877 of August 2016 of the Government of Punjab.

#### 3.3.2. Other legislations in the social domain applicable to construction projects

Construction stage generally involves equity, safety, and public health issues. The construction agencies therefore will be required to comply with laws of the land, which include the following legislation presented in Table 15.

**Table 15: Applicable Social laws Regulations**

S. No	Act / Law	Description / Purpose	Applicability to Project	Authority
1	The Provision of the Panchayats (Extension to the Scheduled Areas) Act, 1996	The Gram Sabha or the Panchayats at the appropriate level shall be consulted before making the acquisition of land in the Scheduled Areas for development projects and before re-settling or rehabilitating persons affected by such projects in the Scheduled Areas. In areas classified under Schedule V, Panchayats are granted special powers over enforcing prohibition, regulating the sale of intoxicants, ownership of minor forest produce, prevention of land alienation in Scheduled Areas, and restoration of unlawfully alienated land to Scheduled Tribes.	<b>NOT APPLICABLE</b> The Act is not relevant for this project as the site does not fall in Schedule V area or any notified Tribal Zone.	Deputy Commissioner Ludhiana
2	The Indian Factories Act, 1948 and State Rules	This act is enacted for the welfare of workers.	<b>APPLICABLE</b> Comply with all requirements of Factories Rules and participate in periodic inspection.	Labour Department, Punjab.
3	The Bonded Labour System (Abolition) Act 1976	The Bonded Labour System (Abolition) Act, 1976, plays a crucial role in addressing issues related to bonded labor and promoting social justice. Its implementation involves the concerted efforts of government agencies, non-governmental organizations, and other stakeholders to ensure the effective abolition of bonded labour and the rehabilitation of those affected.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.

S. No	Act / Law	Description / Purpose	Applicability to Project	Authority
4	The Code on Wages 2019	The Code focuses on simplifying the existing Labour laws dealing with payment of wages, overtime, bonus, minimum wages etc. by bringing uniformity in the definition of terms and reducing the burden of filing returns and maintaining the registers under different acts.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.
5	The Code on Social Security, 2020	The Code amalgamates and replaces nine existing social security laws, bringing them under a single umbrella. This includes laws related to provident funds, employment injury benefits, health and maternity benefits, social security for workers, and other related provisions.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.
6	The Workmen's Compensation Act, 1923	It provides for payment of compensation by employers to their employees for injury by accident i.e., personal injury or occupational disease.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.
7	Payment of Wages Act, 1936 Minimum Wages Act, 1948	Lays down as to by what date, what wages are to be paid, when it will be paid and what deductions be made from the wages of the workers, if any.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.
8	Equal Remuneration Act, 1979	Provides for payment of equal wages for work of equal nature to male and female workers and not for making discrimination against female employees in the matters of transfers, training and promotions etc.	<b>APPLICABLE</b> Equal wages to male and female during construction and operation of the project	Department of Labour & Employment.
9	The Contract Labour (Regulation & Abolition) Act, 1970 and Rules	The contractors are also required to provide at minimum amenities like canteen, urinals, restrooms or alternate accommodation (if night halting labour), first aid, safe drinking water, etc.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance of the Act requirement as per agreement with DBOT Contractor.	Department of Labour & Employment.
10	The Child Labour (Prohibition and Regulation) Act, 1986	The Act prohibits employment of children in certain occupation and processes. The Act also specifies conditions of work for children, if permitted to work. There should not be any child labour (less than 14 years) in any project activity and adolescents (above 14 and less than 18 years) in any hazardous activity.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Social Security and Women & Child Development
11	The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996	This Act provides for safety, health and welfare measures of buildings and construction workers in every establishment which employs or employed during the preceding year ten or more such workers. These measures include fixing hours for normal working day, weekly paid rest day, wages for overtime, provision of basic welfare amenities like drinking water, latrines, urinals, crèches, first aid, canteens and temporary living quarters within or near the	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.

S. No	Act / Law	Description / Purpose	Applicability to Project	Authority
		work site.		
12	Public Liability and Insurance Act, 1991	The main objective of the Public Liability Insurance Act 1991 is to provide for damages to victims of an accident which occurs as a result of handling any hazardous substance. The Act applies to all owners associated with the production or handling of any hazardous chemicals.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Deputy Commissioner Ludhiana
13	Maternity benefit Act 1961	The Maternity Benefit Act is aimed at safeguarding the health and well-being of women employees during pregnancy and providing them with adequate benefits during the maternity period. It contributes to the promotion of gender equality and women's rights in the workforce.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour & Employment.
14	The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	This act aims to prevent and prohibit sexual harassment of women at workplace.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Social Security and Women & Child Development
15	The Occupational Safety, Health, and Working Conditions Code, 2020	The Occupational Safety, Health, and Working Conditions Code, 2020, is a pivotal legislation in India aimed at enhancing the welfare and safety of workers across diverse sectors. It mandates measures to ensure occupational safety and health, regulates working conditions including hours of work and leave entitlements, addresses issues related to the employment of contract labour, and extends social security coverage to workers in the unorganized sector. The Code emphasizes enforcement mechanisms to ensure compliance with its provisions, thereby striving to create a conducive and equitable working environment for all workers in the country.	<b>APPLICABLE</b> There are more than 1500 workers expected to be involved in this project	Department of Labour and Employment

### 3.3.3. *Applicable Policy, Rules & Regulation at State level*

Policy and regulatory frameworks at state level have been formulated to provide social and environmental safeguards in the last two decades as presented in Table 16.

**Table 16: Policy and Regulatory Framework at State level**

S. No	Act / Law	Description / Purpose	Applicability to Project	Authority
1	Punjab Ancient and Historical Monuments and Archaeological Sites and Remains Act, 1964.	A legislative enactment in the Indian state of Punjab aimed at the preservation, protection, and conservation of ancient and historical monuments, archaeological sites, and remains within the state.	<b>NOT APPLICABLE</b> No location is situated more than 300 meters away from the project site, thus indicating no impact. However, the acts related to chance finds are applicable.	Director of Archaeology, Chandigarh
2	Punjab Panchayati Raj Act, 1994	The act gives powers to the Panchayats to resolve any grievances of the local people. There is Provision for application of consent from the respective panchayat body/village administrative officer etc.	<b>APPLICABLE</b> PMU should ensure that all grievances raised by locals related to the project, including access to agricultural fields are addressed through Grievance Redressal Mechanism.	Village Panchayat
3	Punjab Govt. Notification, Revenue Department (Forests) dated 3 <sup>rd</sup> May, 1985 under Indian Forest act 1927	This notification detailed out for the management of the roadside strips, the land on either side of the canal, and the land along the railway track under forest department	<b>APPLICABLE</b> Project transmission line crosses canal, railway, and road strips which comes under the forest management.	State Forest Department
4	Punjab Water Resources Regulation and Management Act, 2020 Punjab Ground Water (Regulation and Control of Development and Management) Act, 2009	To regulate the water resources of the state for ensuring its judicious, equitable and sustainable utilization and management.	<b>APPLICABLE</b> Applicable during construction and operation phase for sustainable use of water.	Punjab Water Regulation & Development Authority
5	Gazette Notification No 24/109/2015-LR 1/9877, 18 <sup>th</sup> August 2016 under The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	The notification provides for departments/ government undertaking to purchase land directly from landowners through negotiation and submit their proposal to deputy commissioner - consistent with the 2013 Act.	<b>APPLICABLE</b> ~53 acres of the land purchased from 50 landowners through negotiated settlement.	Deputy Commissioner, Ludhiana
6.	The Indian Forest (Punjab Amendment) Act, 1962	This Act consolidate and amend the laws relating to forests, transit of forest produce, sale of timber, firewood, protection and conservation of land and natural resources, duty levied on timber and other forest produce, joint forest	<b>APPLICABLE</b> The project will include cutting of trees for construction of project components. Project also attract the	State Forest Department

S. No	Act / Law	Description / Purpose	Applicability to Project	Authority
		management and participation of stakeholders, management of public, communal, and private forests, environmental and biodiversity concerns, wildlife, and ecosystem management.	forest clearance.	
7.	Punjab public works department code	Public Works Department (Buildings and Roads) is a premier agency of the State Government for construction, up gradation and maintenance of roads, buildings, and bridges in the State.	<b>APPLICABLE</b> The project activity will include construction of WTP, ESRs and laying of transmission lines duly adhering to the PPWD code.	Public Works Department
8.	Punjab Irrigation Act 1935 and Punjab irrigation and drainage Act 2023	This Act has a provision for management and control of irrigation, drainage, and rivers in the Punjab. It is necessary to provide for better and sustainable irrigation, drainage, and control and management of rivers, streams, lakes, ground water and navigation in the Punjab	<b>APPLICABLE</b> The source of water is 1R canal, a distributary of the Sidhwan Canal.	Punjab irrigation Department/ WRD
9.	Punjab Building and Other Construction Workers (Regulation of Employment and Conditions of Services) (Amendment) Rules, 2023	This Act provides for safety, health and welfare measures of buildings and construction workers in every establishment which employs or employed during the preceding year ten or more such workers. These measures include fixing hours for normal working day, weekly paid rest day, wages for overtime, provision of basic welfare amenities like drinking water, latrines, urinals, crèches, first aid, canteens, and temporary living quarters within or near the work site.	<b>APPLICABLE</b> PIU/ MCL shall ensure compliance, as per the applicability.	Department of Labour, Punjab.

### 3.4. World Bank ESF and Applicable Environmental and Social Standards

The World Bank's Environmental and Social Standards (ESSs) are a cornerstone to its support to sustainable development. The Environmental and Social Standards set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. Any project that is likely to pose any form of adverse environmental impact will trigger the relevant ESSs. The ESSs relevant to this project are given in table below:

**Table 17: Applicable World Bank Environmental and Social Standards**

S. No	World Bank E&S Standards	Description	Relevance to the sub- project	Requirement	Relevant phase
1	ESS-1 Assessment and Management of Environmental and Social Risks and Impacts	Identify, assess, evaluate, and manage environment and social risks and impacts in a manner consistent with the ESF. Adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable and they are not disadvantaged in sharing development benefits and opportunities.	<b>Relevant</b> The construction and operational stages of the Water Supply project has the potential environmental and social impacts. To address these impacts, the project requires the preparation of an Environmental & Social Management Plan (ESMP). Consequently, the applicability of ESS1 to ESS10 the project. The identification of environmental and social risks and impacts has been done through the ESIA.	<ul style="list-style-type: none"> <li>Conduct an environmental and social assessment of the proposed project, including stakeholder engagement,</li> <li>Undertake stakeholder engagement and disclose appropriate information in accordance with ESS10,</li> <li>Develop an ESCP, and implement all measures and actions set out in the legal agreement including the ESCP; and</li> <li>Conduct monitoring and reporting on the environmental and social performance of the project against the ESSs.</li> </ul>	Pre-Construction and Construction Phases
2	ESS-2 Labour-and-Working-Conditions	Promote safety and health at work. Promote the fair treatment, non-discrimination, and equal opportunity of project workers.	<b>Relevant</b> The project will engage direct and indirect workers during construction and operation phase of the project. The ESS2 shall apply to all the workers directly or indirectly employed.	<ul style="list-style-type: none"> <li>Preparation of Labour Management Plan/Procedures applicable to the project.</li> <li>Establishing Grievance Mechanism including anonymity and sharing with all the workers,</li> <li>Design and Implement OHS measures.</li> </ul>	Construction and Operation phase
3	ESS-3 Resource-Efficiency-and-Pollution-Prevention-and-Management	Promote the sustainable use of resources. Avoid or minimize adverse impacts on human health and the environment caused by pollution from project activities. Avoid or minimize project-related emissions of short and long-lived climate pollutants. Avoid or	<b>Relevant</b> Identify practical measures for enhancing resource efficiency, including optimizing energy consumption, water usage, raw materials, recycled aggregates, and the adoption of innovative technologies to reduce the project's impact on finite natural resources.	<ul style="list-style-type: none"> <li>Conduct primary surveys to gather information of baseline data on environmental parameters of the project study area,</li> <li>Identify project impacts on the environmental parameters,</li> <li>Suggest mitigation, management</li> </ul>	Construction and Operation phase

S. No	World Bank E&S Standards	Description	Relevance to the sub- project	Requirement	Relevant phase
		minimize generation of hazardous and non-hazardous waste. Technically and financially feasible measures to improve efficient consumption of resources.	Construction vehicular movement and activities will generate air emissions, and the disposal of waste, including used oil and hazardous materials, may lead to soil, groundwater, and surface water contamination.	and monitoring plans, <ul style="list-style-type: none"> <li>Efficient muck and debris disposal plan.</li> </ul>	
4	ESS-4 Community-Health- and- Safety	Promote quality, safety, and climate change considerations in infrastructure design and construction. Avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials.	<b>Relevant</b> The implementation of project activities, including piling, trenching, chipping, operation of equipment, etc., carries the potential for accidents at the site. The transportation of heavy machinery or materials poses a potential threat to on-site workers. Additionally, unsanitary conditions at the site or labor camp may contribute to the spread of various diseases, posing significant health risks to the individuals affected.	<ul style="list-style-type: none"> <li>Conduct community interactions and discussions,</li> <li>Identify risk involved on community during construction and implementation phase of the Project,</li> <li>Suggest mitigation, management plans,</li> <li>Measures to address labor influx, SEA/SH, traffic management plans etc.</li> </ul>	Construction phase
5	ESS-5 Land-Acquisition- Restrictions-on- Land-Use- and- Involuntary- Resettlement	Avoid or minimize involuntary resettlement by exploring project design alternatives. Avoid forced eviction. Mitigate unavoidable adverse impacts from land acquisition or restrictions on land use by providing compensation at replacement cost.	<b>Relevant</b> The project does not involve involuntary land acquisition. The necessary land for constructing the Water Treatment Plant (WTP) has been purchased through direct negotiations with landowners. Nevertheless, street vendors who have established their businesses along the existing road and the proposed RoW of the transmission line may experience temporary disruptions due to the laying of pipeline.	<ul style="list-style-type: none"> <li>Vulnerable households will be identified by PIU/MCL after conducting detail surveys of all PAPs before construction of Civil works. If, there are any vulnerable PAPs and they will be compensated as per RPF.</li> </ul>	Pre-Construction Phase
6	ESS-6 Biodiversity- Conservation	Protect and conserve biodiversity and habitats. To promote the sustainable management of living natural resources.	<b>Relevant</b> The project activities within the RoW shall involve impact on flora and fauna for which adequate mitigation measures shall be implemented. The project activities do not extend into any	<ul style="list-style-type: none"> <li>Conduct primary ecology and wildlife surveys to gather information on ecology of the Project study area,</li> <li>Identify Project impacts on the</li> </ul>	Pre-Construction and Construction Phases



S. No	World Bank E&S Standards	Description	Relevance to the sub- project	Requirement	Relevant phase
			reserved forests, national parks, wildlife sanctuaries, critical habitats, etc. The proposed transmission line passes through an irrigation canal road; all such canal roads are notified as forest areas for planting trees.	<p>ecology,</p> <ul style="list-style-type: none"> <li>Suggest specific mitigation, management, and monitoring plans.</li> <li>Set out project’s mitigation strategy will be described in a Biodiversity Management Plan.</li> </ul>	
7	ESS-7 Indigenous-Peoples	Ensure that the development process fosters full respect for affected parties’ human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods.	<b>Not Relevant</b> Ludhiana doesn’t have any population of indigenous people. The project area or parts thereof also do not fall in any notified Tribal area <sup>28</sup> . Therefore, ESS7 is not relevant for this project.	<ul style="list-style-type: none"> <li>Not Applicable</li> </ul>	-
8	ESS-8 Cultural-Heritage	Protect cultural heritage from the adverse impacts of project activities and support its preservation.	<b>Relevant</b> A Kos Minar at Sanehwal {0.35 Alignment of TL} and Ancient Site Sunet have been identified {0.6 (W72-P1)} under cultural heritage. Chance find procedures will be adopted in case of any chance finds during excavations.	<ul style="list-style-type: none"> <li>Conduct primary surveys for identification of existing Private and Community Property Resources (CPRs) on both sides of the proposed Project alignment.</li> <li>Identify any potential conflict and impacts on cultural and religious structure due to the Project.</li> <li>Suggest mitigation, measures.</li> </ul>	Pre-Construction and Construction Phases
9	ESS-9 Financial-Intermediaries	Sets out how Financial Intermediaries (FI) will assess and manage environmental and social risks and impacts associated with the subprojects it finances.	<b>Not relevant</b> There is no financial intermediary involved.	<ul style="list-style-type: none"> <li>Not Applicable</li> </ul>	-
10	ESS-10 Stakeholder-Engagement- and-	Establish a systematic approach to stakeholder engagement that helps Borrowers identify stakeholders	<b>Relevant</b> Construction of WTP, laying of water transmission lines and construction of ESRs	<ul style="list-style-type: none"> <li>Public Consultation and Focus Group Discussions and In-depth Interviews with stakeholders.</li> </ul>	Construction phase

<sup>28</sup> <https://tribal.nic.in/ST/LatestListofScheduledtribes.pdf>

S. No	World Bank E&S Standards	Description	Relevance to the sub- project	Requirement	Relevant phase
	Information-Disclosure	and maintain a constructive relationship with them. Assess stakeholder interest and support for the project and enable stakeholders' views to be taken into account in project design.	would benefit the community but on the other hand might pose environmental and social impacts. Therefore, prior stakeholder engagement, collection of feedback from stakeholders, information disclosure and grievance redressal system are required.	<ul style="list-style-type: none"> <li>Identification of key stakeholders and preparation of Stakeholder Engagement Plan (SEP).</li> </ul>	
11	World Bank's Guidance note on managing the risks of adverse impacts on communities from temporary project induced labour influx, 2016	Applicable to the sub-project, as influx of skilled migrant labour in construction works is likely, even though in majority of the cases the construction workers would be housed within the project locations and therefore far away from habitations.	<b>Relevant</b> About 1500 workers will be involved in the Project. To mitigate the impacts due to labour influx a Labor Management Plan (LMP) is prepared.	<ul style="list-style-type: none"> <li>Requires preparation of a SEA/ SH &amp; GBV risks mitigation plan as part of ESS-1</li> </ul>	Construction phase
12	General EHS Guidelines, April 2007, IFC	The General EHS Guidelines contain information on environmental, health, and safety issues potentially applicable to all industry sectors	<b>Relevant</b> Adhere with the guidelines for environmental, health, and safety issue during construction and operation phase.	<ul style="list-style-type: none"> <li>Requirements on environmental, health, and safety issues during construction and operation of project.</li> </ul>	Construction phase and Operation Phase
13	EHS Guidelines for Construction Materials Extraction, April 2007, IFC	The EHS Guidelines contain the performance levels and measures that are considered to construction materials extraction activities such as aggregates, sand, gravel etc.	<b>Relevant</b> Guidelines contain the performance levels and measures that are considered to construction materials extraction activities	<ul style="list-style-type: none"> <li>Requirements on the resource management of construction materials extraction activities such as aggregates, sand, gravel, clay, silica sands, and quartzite etc.</li> </ul>	Construction phase
14	OP 7.50- Projects on International Waterways	This World Bank policy is applicable when works are proposed in any international waterways such as any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states, whether Bank members or not	<b>Relevant</b> As per Indus water treaty 1960 signed between India and Pakistan. It was brokered by the World Bank., As per OP 7.50 identifies the Sutlej and Ravi rivers as international waterways. As such, India needed to inform other riparian countries about the project. Notifications were dispatched to both China and Pakistan; China expressed no objections while Pakistan has remained unresponsive. Based		Pre-Construction phase

S. No	World Bank E&S Standards	Description	Relevance to the sub- project	Requirement	Relevant phase
			<p>on the project's attributes and location, the World Bank holds the opinion that it won't negatively impact the water quality or quantity in the Ravi and Sutlej rivers, nor will it impede the water usage of other countries.</p>		

### 3.5. Legal Monitoring Agency for Environmental Safeguards

The Punjab Pollution Control Board (PPCB) holds the authority for enforcing regulations, playing a more extensive role in environmental governance within the state than any other governmental body. Reporting to the Central Pollution Control Board (CPCB), the PPCB is tasked not only with monitoring and ensuring adherence to environmental standards but also with supervising various other environmental aspects. These encompass concerns such as municipal solid waste, hazardous waste, and biomedical waste.

### 3.6. Other Line Agencies Involved

Table 18 shows the key activities of relevant departments and agencies and their roles and responsibilities.

**Table 18: Key Activities of Line Agencies**

Department	Key Activities
Punjab Pollution Control Board	Regulatory authority in the Indian state of Punjab that is responsible for addressing environmental issues and ensuring environmental protection.
Department of Water Resources	The management and regulation of water resources in Punjab falls under the jurisdiction of Department of Water Resources.
Forest Department	The main function of the department is to protect, conserve and manage the forest.
Revenue Department	Confirm land ownership for land purchase, as required
Labour Department	Enforce labour legislations, issue licences and labour protection and welfare.
Town and Country Planning Department Punjab	This department is generally responsible for developing comprehensive plans for the physical development of urban areas. This includes planning for infrastructure such as water supply systems and other essential services.

### 3.7. Clearances and Permissions required for the Project

Applicable Statutory Clearances to the project along with the role and responsibility of the concerns department is given in Table 19.

**Table 19: Clearances and Permissions required for Project**

S.No.	Compliance	Compliance required from	Responsibility	Supervisory	Requirement Timeline	Current Status
1.	Permission for water extraction from Canal	Department of Water Resource	PIU	PMU	Before commencing feasibility report/ DPR	MoU signed
2.	Permission for felling of 495 Trees and 895 Poles of trees on forest land	Forest Department	PIU	PMU	Before commencement of civil works	Need to obtain
3.	Permission for felling of Trees (if any). of trees on non-forest land	Concerned Department/Agency	PIU	PMU	Before commencement of civil works	Need to obtain
4.	Permission for laying of transmission line along National Highway and for crossing of transmission line across National Highway	National Highway Authority of India	PIU	PMU	Before commencement of civil works	Need to obtain

S.No.	Compliance	Compliance required from	Responsibility	Supervisory	Requirement Timeline	Current Status
5.	Permission for laying of transmission line along State Highway, Arterial roads and for crossing of transmission line across State Highway and Arterial roads	Public Works Department	PIU	PMU	Before commencement of civil works	Need to obtain
6.	Permission for laying of transmission line across railway line	Indian Railways	PIU	PMU	Before commencement of civil works	Need to obtain
7.	Permission for laying of transmission line along Canal.	Forest Department	PIU	PMU	Before commencement of civil works	Need to obtain
8.	Permission for laying of transmission line along and across Canals.	Department of Water Resources	PIU	PMU	Before commencement of civil works	Need to obtain
9.	Permission for laying of transmission line in parks and construction of ESRs	Municipal Corporation of Ludhiana	PIU	PMU	Before commencement of civil works	Need to obtain
10.	Permission for diversion of traffic	Ludhiana traffic police	DBOT Contractor	PIU/ PMU	Before commencement of civil works	Need to obtain
11.	Shifting of Electrical utility	Punjab State Power Corporation Limited (PSPCL)	PIU	PMU	Before commencement of civil works	Need to obtain
12.	Shifting of telecom utility	Concerned Telecommunication Company/Agency	PIU	PMU	Before commencement of civil works	Need to obtain
13.	Permission for sourcing building material such as stone and sand	Mineral Sale Management and Monitoring System, Water Recourses Department (Mining & Geology), Punjab	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
14.	Consent to Establish and Consent to Operate for the	Punjab Pollution Control Board	DBOT Contractor	PIU/PMU	Before the start of civil works.	Need to obtain

S.No.	Compliance	Compliance required from	Responsibility	Supervisory	Requirement Timeline	Current Status
	Crushers and Ready-Mix Concrete Batching Plant					
15.	Permission for Establishing of labour camps	PPCB and MCL	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
16.	Labour License	Labour Commissioner	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
17.	Permission for Disposal of Construction and Demolition waste	MCL	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
18.	Permission for transportation and storage of Hazardous substance	Punjab Pollution Control Board	DBOT Contractor	PIU/PMU	Before the operational phase	Need to obtain
19.	Permission for Demolition of ESRs	MCL	DBOT Contractor	PIU/PMU	Before the award of civil works	Need to obtain
20.	Permission/ NoC for Construction of ESR in GLADA Area	Greater Ludhiana Area Development Authority	PIU	PMU	Before commencement of civil works	Partially obtained
21.	NoC for Construction of ESR from Loh Langar Trust	Loh Langar Trust	PIU	PMU	Before commencement of civil works	Need to obtain
22.	NoC for Construction of ESR in Ludhiana improvement trust area.	Ludhiana improvement trust	PIU	PMU	Before commencement of civil works	Obtained

## 4. Baseline Environmental and Social Profile

An analysis of the E&S characteristics has been carried out for the project area. The baseline environmental conditions are described in terms of land environment, climate & air environment, water environment, noise environment, soil environment, forest & biodiversity, and heritage. The baseline social environment conditions are described in terms of social profile, and socio-economic profile of Project Affected Persons.

### 4.1. Land Environment

Land environment is described in terms of geology, topography, irrigation, soil characteristics and land use.

#### 4.1.1. Geology, Topography, and Irrigation

Ludhiana, located in the fertile Indo-Gangetic Plain, features a flat landscape with minimal elevation changes. The city's proximity to the Sutlej River influences its slightly undulating terrain, predominantly covered by rich agricultural land due to the alluvial soil from riverine deposits.

The geological framework of Ludhiana comprises quaternary alluvial sediments from the Sutlej River and its tributaries. These layers of sand, silt, clay, and gravel provide a fertile base, making the region ideal for extensive agriculture and supporting the local economy. In the Ludhiana plain, elevations vary from approximately 216 meters in the east to around 268 meters in the west. The terrain slopes gently from east to west, with a slight gradient of about 38 cm per KM.



Source: <https://en-in.topographic-map.com/map-39dgp/Ludhiana/?center=30.89358%2C75.83608&zoom=10>

**Figure 7: Elevation Map**

Nearly 100%, or 3 lakh hectares, of Ludhiana's cultivated land relies heavily on irrigation for its double and triple cropping cycles. Tube wells dominate the irrigation landscape, but canals like the Sirhind Canal System, contribute a crucial share.

The district has 3 lakh ha of net area sown, Ludhiana' sown area/land is almost 100% being double cropped, and some areas even supporting three crops a year. All the land is irrigated, predominantly through tube wells. The crops grown majorly include rice, wheat, corn (maize), cotton, and peanuts (groundnuts). The kharif season in Ludhiana starts from May till end of October and Rabi starts from November till end of April. Rice and Wheat are the main crops grown in the district covering the 2.57 ha of land each.

**Pollution from agricultural activities** As per Punjab Agricultural University, Agricultural practices in Ludhiana have led to water and soil pollution primarily through the excessive use of fertilizers,

manures, and agrichemicals. These substances contribute to the leaching of nitrates and phosphates, which contaminate groundwater and soil.

#### 4.1.2. Soil Characteristics

Soils of Ludhiana are known for their rich, fertile characteristics. The soil profile primarily consists of sandy loam or loamy sand<sup>29</sup>, which are excellent for agriculture because they hold nutrients well and have great drainage properties. Minerals are also abundantly available in the soil. Moreover, the soil in Ludhiana is generally slightly alkaline, making it suitable for growing a wide range of crops. The intricacy of the district's soil profile can be attributed to the varying landforms and the actions of rivers like the Sutlej.

#### 4.1.3. Land Use Pattern

The land use pattern of Ludhiana city as per Master Plan 2031 is outlined in table below. The data reveals that the urbanised area is 82.23% of the total area, more than 50% of the total area is developed for Residential and Industrial uses.

**Table 20: Land use pattern of Ludhiana City**

S.No.	Land Use Category	Area (in hectare)	Percentage of total area
1.	Residential	43,395	34.14
2.	Commercial	5,294	4.16
3.	Mixed land use	1,920	1.51
4.	Industrial	24,688	19.42
5.	Recreational	7,416	5.83
6.	Traffic and Transportation	10,249	8.06
7.	Utilities	2,238	1.76
8.	Government	4,116	3.24
9.	Public and Semi-Public	5,220	4.11
10.	Agricultural & Water Bodies	22,586	17.77
<b>TOTAL</b>		<b>127,122</b>	<b>100</b>

*Source: Proposed Land use plan 2021 Master Plan for Ludhiana 2031*

For the purposes of ESIA study, a 500m buffer area around the project activities has been considered as the study area<sup>30</sup>. Table presents the land use pattern within this 500m buffer zone. Land use analysis reveals that the predominant land use type in the study area, is settlement, covering 90.6% of the area, followed by agricultural land at 8.7%, and water bodies at 0.45% and forest area at 0.15%.

**Table 21: Land Use Pattern of the Study Area**

S. No.	Land use category	Area in sq. km	Area in %
1	Agriculture Land	10.26	8.7%
2	Settlement	105.88	90.6%
3	Water body	0.53	0.45%
4	Forest Area	0.178	0.15%
<b>Total</b>		<b>116.848</b>	<b>100.00</b>

*Source: Survey of India Toposheet, SRTM Data and Google Earth Satellite Imagery*

<sup>29</sup> [https://www.cgwb.gov.in/old\\_website/District\\_Profile/Punjab/Ludhiana.pdf](https://www.cgwb.gov.in/old_website/District_Profile/Punjab/Ludhiana.pdf)

<sup>30</sup> [https://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/building-construction\\_may-10.pdf](https://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/building-construction_may-10.pdf)



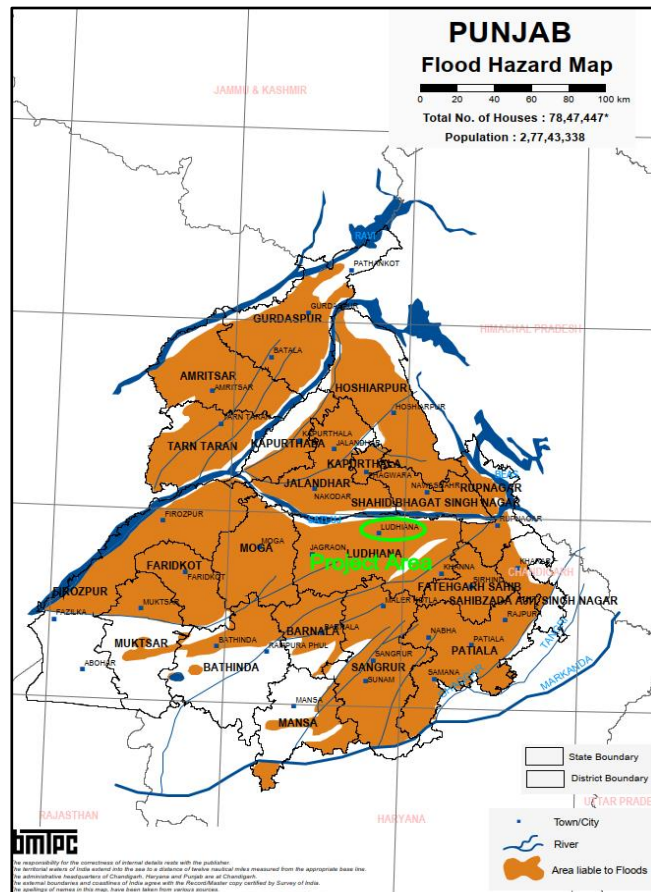
## 4.2. Natural Hazards and Vulnerability

### 4.2.1. Seismicity<sup>31</sup>

The project site falls under Seismic Zone IV, which is classified as a High Damage Risk Zone (MSK VIII) according to the seismic zone classification of Punjab. In this zone, buildings and infrastructure must be designed and constructed in accordance with the specifications outlined in the BIS IS 1893 (Part 1): 2016 standard<sup>32</sup>. These measures are necessary to ensure that structures are able to withstand the potential effects of earthquakes.

### 4.2.2. Flood<sup>33</sup>

As per the Flood Hazard Map of Punjab, the project location is a flood-prone area. The state has experienced major floods during 2004, 2008, 2010, 2013, 2019. Patiala has the most flood affected area in Punjab with 54% of the total flood affected area of Punjab. Ludhiana has a total of 6,654 hectare of flood prone area amounting to 4.67% of the total flood affected area. The floods experienced by the state cause heavy losses to crops, property, livestock, human lives and industries falling in the low laying areas. Flood occurrences are typically recorded during the monsoon period, particularly from July to September, making these months vulnerable each year.



Source: <https://vai.bmtpc.org/pun.html>

**Figure 8: Flood Hazard Map of Punjab**

<sup>31</sup> <https://vai.bmtpc.org/eq-pun.html>

<sup>32</sup> BIS IS 1893 (Part 1): 2016 standard “Criteria for Earthquake Resistant Design of Structures - Part 1: General Provisions and Buildings”

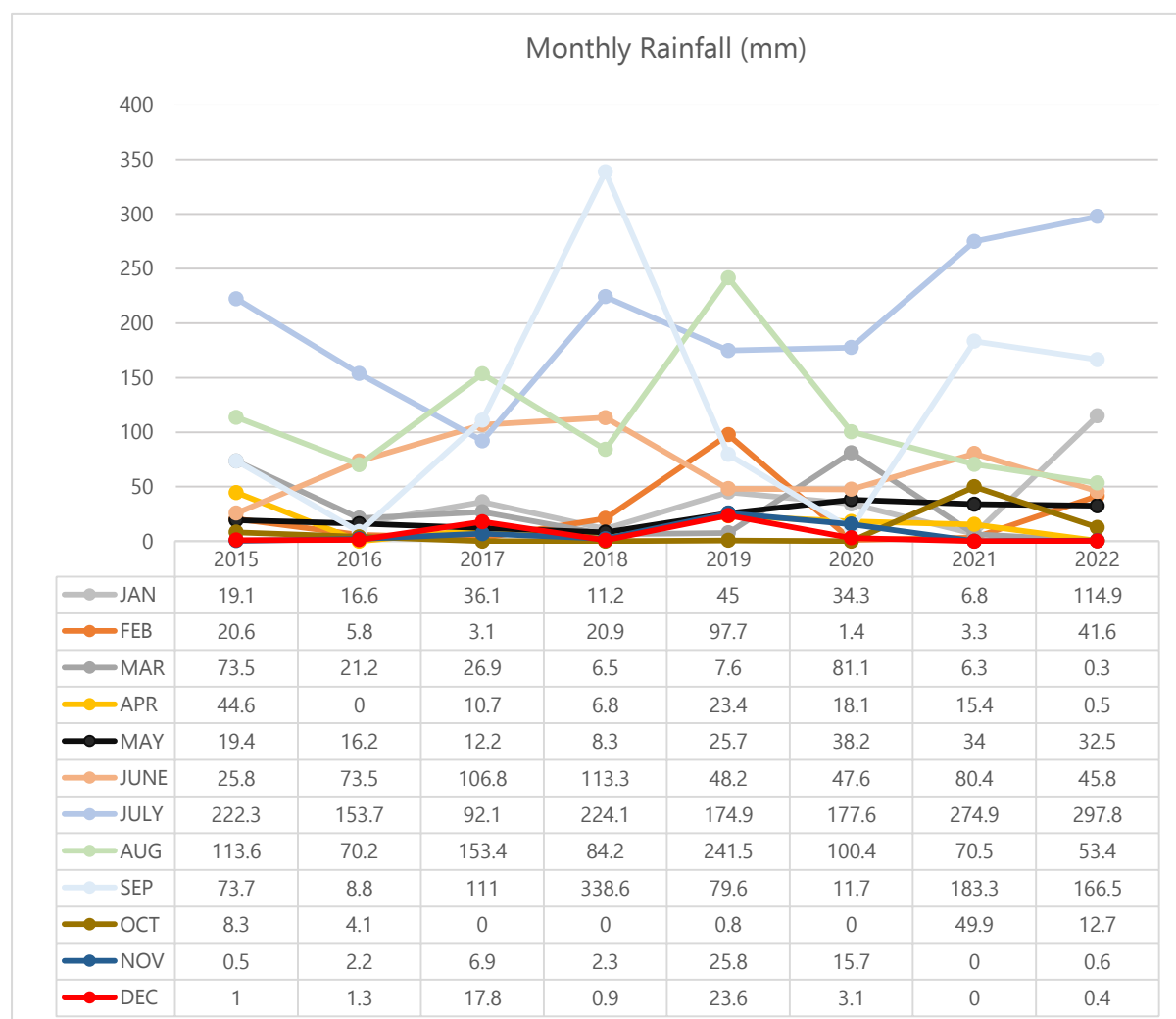
<sup>33</sup> [https://www.nrsc.gov.in/sites/default/files/pdf/DMSP/FloodAffectedAreaAtlas\\_Digital.pdf](https://www.nrsc.gov.in/sites/default/files/pdf/DMSP/FloodAffectedAreaAtlas_Digital.pdf)

### 4.3. Climate and Air Environment

#### 4.3.1. Climate and Rainfall

Ludhiana experiences a transitional climate bridging the semi-arid and monsoon-influenced humid subtropical climates<sup>34</sup>. The year is segmented into four seasons: summers (April-June) marked by high temperatures ranging from 35 degrees to 39 degrees Celsius; monsoons (July-September) bringing substantial rainfall pivotal for farming; the brief post-monsoon season (October-November); and winters (December-March) notorious for its frigid nights with temperatures around 5-7 degrees Celsius and pronounced foggy conditions due to proximity to the Himalayas. The climate significantly complements Ludhiana's largely agrarian lifestyle. The average max and min. temperature varies from 37-39 degrees to 5-6 degrees respectively.

Ludhiana receives most of its rainfall during the monsoon season from mid July to September. The average annual rainfall in the region is about 750 mm with maximum rainfall occurring in July to September accounting to 500 mm to 550 mm. The winter months see minimal rainfall, by light showers due to western disturbances ranging from 50mm to 100mm. However, it should be noted that Ludhiana's rainfall pattern can fluctuate annually, influencing the local farming practices.



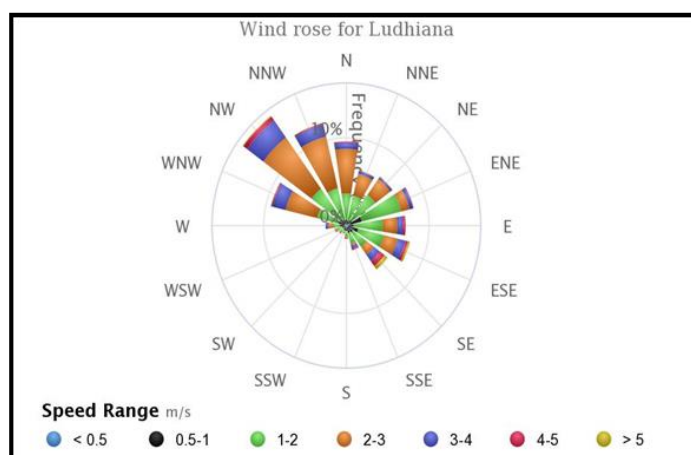
Source: [India Meteorological Department Annual Reports.](#)

**Figure 9: Monthly Rainfall Ludhiana (mm)**

<sup>34</sup> <https://www.imdpune.gov.in/climinform.php>

### 4.3.2. Wind Speed and Direction

The wind profile in Ludhiana exhibits seasonal variations in terms of direction and speed. From November to March, during the colder months, the wind blows primarily from the north-northeast. However, it shifts to a south-southwest direction amid the monsoon period from July to September, also witnessing an increase in speed due to monsoonal influence. The transition periods, notably April/ May and October/ November, typically register as the windiest periods of the year. Ludhiana's wind profile is significant in weather forecasting and assessing air quality as well as pollutant dispersal, crucial factors for health and environmental planning. The maximum mean wind speed is 8.1 km/h recorded in the month of June while the minimum mean wind speed is 2.8 km/h recorded in the month of November. The wind rose diagram is given in Figure 10.<sup>35</sup>



**Figure 10: Wind Speed Ludhiana**

### 4.3.3. Air Quality

Ambient Air quality was tested at 4 locations namely (i) At proposed WTP Site, (ii) at Mundian, (iii) at Kwaliti Chowk and (iv) at Sita Nagar in the month of March 2023 details are provided in Table 22. Baseline data collected was analysed in a NABL Accredited Laboratory in accordance with EPA Act, 1986. Monitoring stations were selected based on sensitive receptors and prominent wind direction.

**Table 22: Ambient Air Quality Monitoring Locations**

S. No	Location Code	Monitoring Locations	Coordinates (Lat & Long)	Direction	Selection Criteria
1	AAQ1	WTP Site	30°48'29.42"N, 75°59'20.25"E	SE	WTP site
2	AAQ2	Government Smart Primary School, Mundian (P)	30°53'29.08"N, 75°56'18.56"E	NE	Near sensitive receptor (School) and downwind direction of first predominant wind direction.
3	AAQ3	Baba Deep Singh Nagar/ Kwaliti Chowk	30°51'42.42"N, 75°51'21.16"E	S	Downwind direction of Second predominant wind direction and densely populated area.
4	AAQ4	Sita Nagar	30°54'11.22"N, 75°50'55.65"E	NW	Near to Major District Road and densely populated area.

The concentration of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> & NO<sub>x</sub> within the study area were found to vary from 81.7 to 85.9 µg/m<sup>3</sup>, 36.3 to 41.8 µg/m<sup>3</sup>, 9.1 to 14.6 µg/m<sup>3</sup>, 15.2 to 21.5 µg/m<sup>3</sup>, respectively while the CO concentrations within the study area were found to be in the range of 0.52 mg/m<sup>3</sup> to 1.61 mg/m<sup>3</sup>. The existing baseline concentrations for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> & NO<sub>x</sub> were found to be within the limits as mentioned in NAAQ standards 2009. The baseline quality reports are attached as **Annexure 11A**.

The AERMOD model has been setup and run to find out the cumulative maximum ground level concentration of PM<sub>10</sub> and PM<sub>2.5</sub> generated from different project activities. It can be concluded

<sup>35</sup> Source: Climatological Tables 1981-2010, Indian Meteorological Department

from model output that the maximum ground level concentration for PM10 and PM2.5 will increase by 5.0 µg/m<sup>3</sup> and 3.5 µg/m<sup>3</sup> respectively at a distance of 2 kms towards the Northwest direction. The modelling report along with the isopleths generated through AERMOD model is attached as **Annexure 11B**.

Air Quality result at Test Locations<sup>36</sup>:

**Table 23: Air Quality Test Reports**

S. No.	NAAQ Parameters	NAAQ Standard	WTP Site	Mundian	Kwality Chowk	Sita Nagar
1	PM10	100	82.3	82.3	82.4	85.9
2	PM2.5	60	38.3	37.3	39.4	39.9
3	SOX	80	9.1	11.7	13.8	13.1
4	NOX	80	15.2	19.6	18.7	18.9
5	CO	4	1.00	1.61	0.52	0.98
6	As	6	<0.10	<0.10	<0.10	<0.10
7	Ni	20	<0.1	<0.1	<0.1	<0.1
8	O3	180	12.5	10.4	9.42	8.59
9	Pb	1	<1.0	<1.0	<1.0	<1.0
10	NH3	400	<10	<10	<10	<10

#### 4.4. Noise Environment

Noise monitoring was conducted at four (4) locations within the project area, as detailed in Table 24. Monitoring was carried out during both day and night times, with Leq (equivalent continuous sound level) values computed hourly. Daytime monitoring conducted from 6:00 AM to 10:00 PM, while nighttime monitoring was conducted from 10:00 PM to 6:00 AM respectively. The primary baseline data was collected in March 2023. Noise monitoring was performed using a sound level meter, which provides direct readings of loudness.

**Table 24: Ambient Noise Quality Monitoring Location**

S. No.	Location Code	Monitoring Locations	Coordinates (Lat & Long)	Direction	Selection Criteria
1	N1	WTP Site	30°48'29.42"N, 75°59'20.25"E	SE	WTP site
2	N2	Mundian	30°53'29.08"N, 75°56'18.56"E	NE	Downwind direction of first predominant wind direction. (Commercial)
3	N3	Kwality Chowk	30°51'42.42"N, 75°51'21.16"E	S	Downwind direction of Second predominant wind direction and densely populated area. (Industrial)
4	N4	Sita Nagar	30°54'11.22"N, 75°50'55.65"E	NW	Near to Major District Road and densely populated area.

The results of noise monitoring as given in the table below:

**Table 25: Ambient Noise Quality Monitoring Results**

S. No.	Location Code	Leq Day	Leq Night	CPCB Standards		Environmental Setting
				Day	Night	
1	N1	56.8	42.3	55	45	Residential
2	N2	56.6	41.4	65	55	Commercial

<sup>36</sup> Air quality results for WTP, Site, Mundian, Kwality Chowk and Sita Nagar conducted on 26<sup>th</sup> Feb, 27<sup>th</sup> Feb, 28<sup>th</sup> Feb and 1<sup>st</sup> Mar respectively.

S. No.	Location Code	Leq Day	Leq Night	CPCB Standards		Environmental Setting
				Day	Night	
3	N3	55.9	40.0	75	70	Industrial
4	N4	56.3	39.2	50	40	Silence Area

During daytime, the noise quality levels at 2 locations exceeded the limits set by the Central Pollution Control Board (CPCB) standards, except Mundain (N2) and Kwaliti Chowk (N3). However, during nighttime, the noise levels were found to be well within the CPCB limits at all locations. Baseline laboratory reports, detailing the noise quality analysis results, are attached as **Annexure 12**.

#### 4.5. Water Environment

The water environment refers to the conditions, characteristics, and interactions of surface water bodies (such as rivers and lakes) and groundwater within a specific area. It involves assessing the quantity, quality, and ecological health of these water resources.

##### 4.5.1. Surface Water Resources

Ludhiana is sustained by various surface water resources that are integral to its agricultural and industrial prosperity. The principal source of surface water in the region is the Sutlej River, which meanders through the district, supporting the vast agricultural lands. Complementing the river are the extensive canal networks, notably the Sirhind Canal and its branches, which distribute the river's water across the farmlands, enabling the cultivation of wheat, rice, cotton, and other crops. In addition to these, Ludhiana has several ponds and lakes that serve local irrigation needs and support aquaculture. The monsoon season also plays a significant role in replenishing these surface water bodies with rainwater, which is increasingly being conserved through rainwater harvesting initiatives. Despite the abundance, Ludhiana faces challenges in managing these resources, with pollution and overuse posing threats to water quality and availability.

The Sirhind Canal originates from the Ropar head works on the Sutlej River near Rupnagar (formerly Ropar) and flows southwest through Ludhiana, Jalandhar, and Ferozpur before merging with the Bhakra Main Line Canal. It is one of the oldest and largest irrigation canal system within the Indus River system and was inaugurated in 1882 CE. The canal commences at Rupnagar and proceeds southwest to Doraha in the Ludhiana district. At Doraha, it branches into three: the Abohar, Bathinda, and Patiala branches. Each branch further subdivides to extensively irrigate the Malwa region of Punjab. Once a partially arid zone, this area is now extremely fertile due to the water distributed by the canal network. The Sidhwan Branch, which diverges from the Sirhind Canal at Doraha, flows in a northwest direction and passes through Ludhiana City. It has a total length of 88.01 km.

The 1R Distributary, originating at latitude 30°47'18.89" N and longitude 75°59'28.56" E, is a distributary of the Sidhwan Canal that offtakes from Sidhwan canal near Nawapind (Rajgarh) Village. This distributary will serve as the primary source of raw water for the Water Treatment Plant (WTP), which is situated approximately 15 meters away and has a current water capacity of ~53 cusecs. The capacity of the 1R canal is proposed to increase to 300 cusecs.

##### 4.5.2. Surface Water Quality

As per the tender document for Ludhiana bulk water supply project, surface water quality analysis for Sirhind canal was conducted by MCL. The test result suggests Sirhind water as highly turbid with turbidity ranging from 100 NTU to 244 NTU. Due to high turbid water, conventional water treatment plant is proposed capable of treating water with turbidity of 100 NTU.

To establish the baseline surface water quality, PIU has conducted surface water quality assessments both upstream and downstream of the location where the 1R canal diverges from the Sidhwan Canal. The testing was conducted by Punjab Biotechnology Incubator Lab of Department of Science, Technology & Environmental, Govt of Punjab; a Notified State Analytical Agency. The testing was conducted for 26 parameters indicating various pesticides, and Polychlorinated Biphenyls (PCB) and

Polyaromatic Hydrocarbons (PAH); the results for both the upstream and downstream samples for all these parameters were reported to be Below Detectable Limits (BDL). The testing included Potassium and Phosphorous; which were reported as 2.1 and 0.7 mg/l for upstream and 2.1 and 2.5 mg/l for downstream respectively. The testing reports are attached as **Annexure 13**.

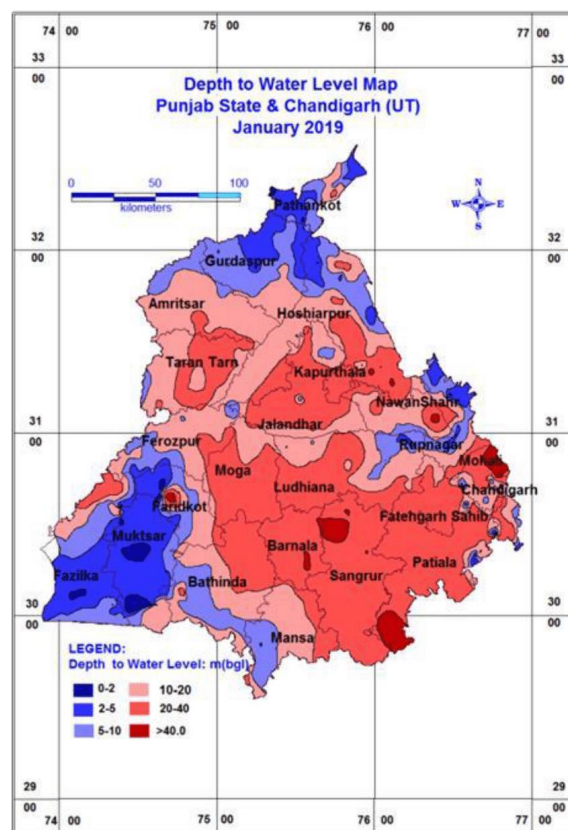
### 4.5.3. Hydrogeology & Ground Water Resources

Ludhiana's hydrogeology mostly comprises alluvial deposits of sand, clay, silt, and gravel, forming significant groundwater-bearing aquifers. Groundwater recharge is primarily from precipitation, canal seepage, and irrigation return flow, with the Sutlej River playing a crucial role. The groundwater quality varies across the region due to geological formations, human activities, and proximity to water bodies, presenting issues like high fluoride and nitrate concentrations in some areas. The heavy extraction of groundwater for irrigation is leading to a declining water table, necessitating efficient and sustainable water management. As per CGWB<sup>37</sup>, Net Area irrigated by Tubewell is 2970 sq.km and by canals is 90 sq.km.

The ground water depth in the state ranges from 4 to 30 meters below ground level (bgl). In Ludhiana, the north-eastern part of the district, particularly the Machhiwara block, experiences water depths of 5-10 meters bgl. In the north-

central part of the district, including Ludhiana city and Bhaini Raian, depths range from 10 to 20 meters bgl. In the rest of the Ludhiana district, depths typically range from 20 to 30 meters bgl. During the pre-monsoon period, the depth to the water level fluctuates between 4.32 to 31.22 meters bgl, while in the post-monsoon period, it ranges from 2.89 to 27.30 meters bgl. Long-term water level trends indicate a decline ranging from 0.11 meters to 1.34 meters per year. As per CGWB report<sup>38</sup>, annual groundwater extraction for domestic, industrial and irrigation uses in Ludhiana District are 149.37 million cubic meter (MCM), 71.04 MCM and 2,799.70 MCM respectively. Ludhiana city falls under the overexploited category due to declining water levels. The fall of ground water level is 5-10 meter during June 1984 to June 2021.

The annual extractable ground water resources of Ludhiana district have declined from 1.9 lakh ham to 1.40 lakh ham during 2016-2022. During the same period, the total ground water recharge of Ludhiana district has been declined from 2.1 lakh ham to 1.5 lakh ham. The ground water balance data is given in table below:



**Figure 11: Groundwater Level in Punjab**

<sup>37</sup> [https://www.cgwb.gov.in/old\\_website/District\\_Profile/Punjab/Ludhiana.pdf](https://www.cgwb.gov.in/old_website/District_Profile/Punjab/Ludhiana.pdf)

<sup>38</sup> [https://www.cgwb.gov.in/old\\_website/GW-Assessment/GWR-2022-Reports%20State/Punjab.pdf](https://www.cgwb.gov.in/old_website/GW-Assessment/GWR-2022-Reports%20State/Punjab.pdf)

**Table 26: Ground Water Balance**

DYNAMIC GROUND WATER RESOURCES									
LUDHIANA									
S.No	Year	Ground Water Recharge (ham)				Total Annual Ground Water Recharge	Total Natural Discharges (ham)	Annual Extractable Ground Water Resource (ham)	Stage of Ground Water Extraction (%)
		Monsoon Season		Non-Monsoon Season					
		Recharge from rainfall	Recharge from other Sources	Recharge from Rainfall	Recharge from other Sources				
1	2016-2017	47046	114523	9962	43907	215438	21544	193894	183
2	2019-2020	39571	85019	6801	51055	182446	18245	164202	211
3	2021-2022	37582	75106	5680	37499	155867	15587	140280	215

*Source: Central Ground Water Board*

#### 4.5.4. Ground Water Quality

Groundwater samples were collected from 4 locations as detailed in Table 27 and analyzed to assess groundwater quality in a NABL Accredited Laboratory. The baseline data for groundwater quality was collected in March 2023. These samples were collected from the study area, to evaluate the quality of groundwater to be used for workforce during the construction phase and establish baseline data for further environmental monitoring and analysis:

**Table 27: Ground water quality sampling locations**

S. No.	Location Code	Name of the monitoring location	Latitude and Longitude	Selection Criteria
1	GW1	WTP Site	30°48'29.42"N, 75°59'20.25"E	WTP site, Construction site
2	GW2	Government Smart Primary School, Mundian (P)	30°53'38.74"N, 75°56'18.10"E	Bore well, Sensitive area
3	GW3	Baba Deep Singh Nagar/ Kwaliti Chowk	30°51'42.42"N, 75°51'21.16"E	Bore well, Densely Populated Area
4	GW4	Sita Nagar	30°54'11.22"N, 75°50'55.65"E	Bore well, Cantonment area

Groundwater pH levels (7.07 - 7.12), total hardness (162-172 mg/L), TDS (465-587 mg/L), chloride (65-75 mg/L), and alkalinity (115-123 mg/L) were within acceptable limits. Nitrate and sulphate concentrations were also within desirable ranges. Dissolved oxygen (DO) levels ranged from 5.1 to 6.3 mg/L. Furthermore, total coliforms and E. coli were absent in the samples analyzed for groundwater quality, indicating good microbiological quality. Baseline laboratory reports detailing these findings are attached as **Annexure 14**. According to the feasibility report, ground water samples indicated the presence of E-coli and Total coliforms. This may be due to pollution of ground water by direct discharge of domestic sewage from the leach pits or short circuiting of blocked sewers. Groundwater, if used for human consumption, shall be treated to conform to the prescribed standards.

MCL has conducted groundwater quality tests for 40 tube wells. The testing was done by the NABL accredited Regional Advance Water Testing Laboratory, Department of Water Supply and Sanitation (DWSS) Phase-2, SAS Nagar during December 2019. As per the test results, Selenium, Uranium, Nitrate and Aluminum are found to be above acceptable limits at 6 (Gurudwara Nankana Sahib, Shamshan Ghaat Haibowal, Main road Pritam Nagar, Haibowal Khurd, Mandeep Nagar and Maya Nagar), 14 (Friends Colony, Aman Nagar, Ashok Nagar, Bhora Colony, Arjan Nagar, Prem Vihar, Tikona Park, Mozi Colony, Gyaspura park, Shanti Nagar, Gurudwara Nankana Shaib, New Smart Colony, Haibowal Khurd and Patel Nagar), 9 (Tikona park, Mustaq ganj, Hargobind pura, Sas Nagar, Gill Market, Mozi Colony, Shamshan Ghaat Haibowal, Patel Nagar and Sekhor bark club road), and 2

(Sas Nagar and Haibowal khurd) locations respectively. A summary of the groundwater quality testing results are attached as in **Annexure 15**.

#### 4.5.5. Soil Quality

To evaluate the potential for contamination of soil within the project vicinity, soil samples were collected and tested for their physical, chemical, and biological properties. The baseline samples were collected in March 2023. Soil quality assessments were conducted at four locations. Details of the sampling sites (Table 28) and the subsequent soil quality analysis results are presented below:

**Table 28: Soil Sampling Locations**

S. No.	Location Code	Monitoring Locations	Coordinates	Direction	Selection Criteria
1	S1	WTP Site	30°48'29.42"N, 75°59'20.25"E	SE	WTP Site and agricultural and
2	S2	Government Smart Primary School, Mundian (P)	30°53'38.74"N, 75°56'18.10"E	NE	Built-up area
3	S3	Baba Deep Singh Nagar/ Kwality Chowk	30°51'42.42"N, 75°51'21.16"E	S	Built-up area
4	S4	Sita Nagar	30°54'11.22"N, 75°50'55.65"E	NW	Built-up area

The pH levels in the four samples ranged from 7.54 to 7.98. The soils exhibit excellent Sodium Absorption Ratio (SAR) values in all samples, with SAR values being less than 1. Nitrogen levels varied from 125.68 to 263.23 mg/kg. Phosphorous concentrations ranged from 12.28 to 18.67 mg/kg. Potassium content in the soil ranged from 227.56 to 379.31 mg/kg. Baseline laboratory reports are attached as **Annexure 16**. The analysis of soil quality indicates that the soil is fertile and of a sandy loam texture.

**Table 29: Soil Quality Reports**

S. No	PARAMETERS	UNIT	WTP Site	Mundian	Kwality Chowk	Sita Nagar
1	Texture	...	Sandy clay Loam	Sandy Loam	Sandy Loam	Sandy Loam
2	Clay	%	65.2	56.7	39.5	56.6
3	Silt	%	11.1	19.1	23.3	11.9
4	Sand	%	23.7	24.2	37.2	31.9
5	Porosity	%	42.5	34.6	46.8	48.3
6	Bulk Density	g/cc	1.32	1.34	1.22	1.22
7	Water Holding Capacity	...	33.4	35.7	33.75	30.6
8	pH	...	7.65	7.57	7.54	7.98
9	Electrical Conductivity	µmhos/cm	265	262	301	325
10	Magnesium	mg/kg	173.2	138.2	119	132.2
11	Calcium	mg/kg	183.3	167.3	121.8	163.9
12	Alkalinity (as Bicarbonates)	mg/kg	176.6	78.5	84.2	67.6
13	Chlorides	mg/kg	60	64	60	71
14	Sodium	mg/kg	50	46	40	34
15	Potassium	mg/kg	294.82	227.56	251.25	379.31
16	Organic Carbon	%	0.75	0.97	0.9	0.83
17	Organic Matter	%	1.3	1.67	1.55	1.43
18	Phosphorous	mg/kg	12.28	16.31	18.67	17.92
19	SAR	Meq	0.63	0.63	0.61	0.48
20	Nitrogen (as N)	mg/kg	263.23	241.57	125.68	209.72
21	Salinity (as NaCl)	%	0.4	0.37	0.42	0.38



S. No	PARAMETERS	UNIT	WTP Site	Mundian	Kwality Chowk	Sita Nagar
22	Zinc acZn	mg/kg	11.3	12.5	15.2	12.3
23	Iron as Fe	mg/kg	9.48	10.3	11.3	2.87
24	Selenium as Se	mg/kg	<0.1	<0.1	<0.1	<0.1
25	Copper as Ca	mg/kg	153	1.43	1.43	1.34
26	Manganese as Mn	mg/kg	16.3	21.3	22.8	14.3
27	Fluoride as F	mg/kg	<0.1	<0.1	<0.1	<0.1
28	Chromium as Cr	mg/kg	8.46	9.21	11.8	12.7
29	Molybdenum	mg/kg	<0.1	<0.1	<0.1	<0.1
30	Nickel	mg/kg	<0.1	<0.1	<0.1	<0.1
31	Silicon as Si	mg/kg	<0.1	<0.1	<0.1	<0.1

#### 4.6. Forests and Biodiversity

The forest areas in Punjab are in two categories: i) Block Forests and ii) Strip Forests (along rail, road, canal, drains and bundhs). The Punjab Government owns all Block Forests except for Ladhawal, which falls under the ownership of the Railway Department. The Punjab Government also maintains ownership of Strip Forests linked to roads, canals, drains, and the Dhussi Bundh strip area, while the Railway Department owns the strips along railway lines. These strips were transferred to the Forest Department for management purposes via Punjab Government Notification No. 5002-D51/6264 dated 15.11.1951, and 6058-Ft-II-67/3305-3307 dated 31.12.1957. Later, these strips along railway lines, roads, canals, and bundhs were declared as protected forests as per Punjab Government Notification No. 1222-Ft-58/1195-97 dated 03.05.1958. The notification is attached as **Annexure 17**. The breakup of area under various type of forest in the district is given in Table 30.

**Table 30: Forest Area**

S. No.	Category of Area	Ownership	Area in Hectare
<b>Block Forest (Reserved and Protected Forest)</b>			
1.	Reserve Forests	Govt., of Punjab	79.72
2.	Protected Forest	Govt., of Punjab	1461.48
3.	Protected Forest	Govt. of India (PF, Ladhawal)	88.90
4.	Un-classed Forest	Govt., of Punjab	1944.33
<b>Total Block Forest</b>			<b>3574.43</b>
<b>Strips Forest (Protected Forest)</b>			
5.	Road Strips (P.F)	Govt., of Punjab	1312.17
6.	Railway Strips (P.F)	Govt., of India	421.945
7.	Canal Strips (P.F.)	Govt., of Punjab	2557.887
8.	Dhussi Bands (P.F.)	Govt., of Punjab	918.95
<b>Total Strips Forest (Protected Forest)</b>			<b>5210.952</b>
<b>Total Forest Area</b>			<b>8785.382</b>

*Source: District Environment Plan - Ludhiana*

##### 4.6.1. Protected Areas

No ecologically sensitive locations such as national parks, wildlife sanctuaries, or biosphere reserves are situated within a 10-kilometer radius of the project activities i.e. water intake location, WTP, laying of Transmission lines and ESRs. The nearest protected area, **Bir Dosanjh Wildlife Sanctuary**, is located at a distance of ~40 KM from the project area. Distance of ecologically sensitive locations including eco-sensitive zones from the nearest project component is attached as **Annexure 18**. The project does not fall within any protected areas, hence no adverse impacts are anticipated due to the project.

#### 4.6.2. *Wetlands*<sup>39</sup>

Punjab is home to a total of 20 wetlands, with 12 being natural and 8 artificial. Among these, six have received recognition as Ramsar Sites, including Harike Lake, Kanjli Lake, Ropar Lake, Nangal Wildlife Sanctuary, Beas Conservation Reserve, and Keshopur-Miani Community Reserve.

The nearest wetland i.e., Harike Wetland, is at a distance of ~60 KM from the project area. The Harike Wetland, known as Hari-ke-Pattan, is northern India's one of the largest wetland, created by a barrage on the Sutlej River in 1953. Spanning across the Tarn Taran Sahib and Ferozepur districts of Punjab, the total area of the wetland is 41 sq. km, this man-made wetland is fed by the confluence of the Sutlej and Beas rivers. It provides a crucial sanctuary for over 400 species of birds, including migratory flocks from Russia and the upper hemisphere, as well as endangered species like the Indus River Dolphin. Recognized for its global ecological significance, Harike Wetland has been designated as a Ramsar site.

The project is not situated within the boundaries of any Ramsar or state wetland site.

#### 4.6.3. *Ecology and Biodiversity*

The baseline study for the existing ecological environment in the study area was conducted in December 2022. The assessment included the collection of secondary data through available literature and on-site data collection for the identification of flora and fauna in the study area.

Secondary data collection entailed an extensive review of literature from various sources, including books, authenticated websites, scientific papers, and articles. This was complemented by field surveys to gather primary data.

- Flora Survey: Visually identified major plant species in different habitats.
- Fauna Survey: Recorded faunal species in the study areas based on direct sightings and indirect evidence such as dung, droppings, scats, scratch signs, burrows, nests, etc.

According to the Working Plan of the Ludhiana Forest Division (2016-2017 to 2025-2026)<sup>40</sup>, two mammalian species, one avian species, and three reptile species belonging to Schedule-I were reported within the division. These include the Blackbuck and Wolf (mammals), Peafowl (bird), and Indian Rock Python, Bengal Monitor Lizard, and Yellow Monitor Lizard (reptiles). However, no Schedule-I fauna was observed during the study period in the study area. The predominant habitats observed include modified habitats, but no critical habitats were identified. Further details of the ecology and biodiversity study are provided in **Annexure 19**.

#### 4.7. *Heritage*<sup>41</sup>

As per the Archaeological Survey of India (ASI), a total of 14 central and state protected monument sites have been identified in Ludhiana District. Details of monument sites in the vicinity of the project area are as follows:

1. Kos Minar at Sherpur: ~500m from Transmission Line Near W21-E1
2. Ancient Site Sunet: ~600 m from W72-P1
3. Kos Minar at Sanehwal: ~350m from the proposed TL
4. Maharaja Ranjit Singh War Museum: Grand Trunk Rd, Bhattian, Ludhiana, 1.2 Km from proposed alignment of TL

Since the project activities do not fall within either the prohibited or regulated areas i.e., 300m in relation to protected monuments, as per the Ancient Monuments and Archaeological Sites and Remains Act, 1958 and its amendments, it is anticipated that there will be no direct impact on the monuments.

<sup>39</sup> [https://wiienvi.nic.in/Database/ramsar\\_wetland\\_sites\\_8224.aspx](https://wiienvi.nic.in/Database/ramsar_wetland_sites_8224.aspx)

<sup>40</sup> <https://forest.punjab.gov.in/media/documents/Ludhiana.pdf>

<sup>41</sup> <https://asi.nic.in/alphabetical-list-of-monuments-punjab>



**Figure 12: Areal Distance Map**

Distance of protected monuments from the nearest project component is attached as **Annexure 18**.

#### 4.8. Social Profile

The study area for the PMSIP sub-project Ludhiana has been considered within municipal limit of Municipal Corporation of Ludhiana (MCL) and Bilga village where ~53 acres of land has been purchased for construction of WTP. As per the Census of India 2011, the Ludhiana city is divided into 75 Wards. As per the data collected during site visit, now the city has been divided into 95 wards which are also updated in the records of MCL.

##### 4.8.1. Socio-Economic profile of the State, District and Study Area

Socio-economic profile<sup>42</sup> of the study area (MCL & Bilga village), Ludhiana District and Punjab state has been analysed based on data and information provided in the Census of India 2011, official website of MCL and district portal. The details of the same is presented in Table 31.

##### 4.8.2. Demography

As per Census of India 2011, total population of the MCL is 16,18,879 in which 8,74,908 (54.04%) are males and 7,43,971 (45.96%) are females while the total population of Bilga village is 2003 in which 1060 are males and 943 are females. An average house-hold size of the MCL and Bilga village is 4.70 and 4.78 respectively. An average sex ratio of the MCL area is 850 and Bilga village is 889 females per thousand males. The share of Scheduled Caste population of MCL area and village Bilga is 14.31% and 48.53% respectively with respect to total population, while there is no scheduled tribe population in the study areas as well as in the district and State. The population density in MCL area is 10,157 and Bilga village is 535 while density of district and state is 978 and 551 respectively.

**Table 31: Demographic Profile of the State, District and Study Area**

S. No.	Particulars	Unit	Study Area		Ludhiana District	Punjab State
			Bilga Vill. <sup>43</sup>	MCL		
1	Area	Sq. Km	3.74	159.37	3,578	50,362
2	Population	Numbers	2,003	16,18,879	34,98,739	2,77,43,338
3	Male	Numbers	1,060	8,74,908	18,67,816	1,46,39,465
4	Female	Numbers	943	7,43,971	16,30,923	1,31,03,873
5	Sex Ratio	Nos. of Female /1000 Male	889	850	873.17	895
6	Average	Person/HH	4.78	4.70	4.88	5.03

<sup>42</sup> The Socio-Economic Survey cum Willingness to Pay Survey for the project area cannot be conducted at this stage.

<sup>43</sup> <https://villageinfo.in/punjab/ludhiana/ludhiana-east/bilga.html>

S.	Particulars	Unit	Study Area		Ludhiana	Punjab State
	Household Size					
7	Population Density	Per Sq. Km.	535	10,157	978	551
	Average Literacy Rate	Percentage	79.22	85.77	82.20	75.84
9	Literacy Rate Male	Percentage	83.57	88.66	85.98	80.44
	Literacy Rate Female	Percentage	74.55	82.13	77.88	70.73
10	Scheduled Caste	Number	922	2,31,754	9,23,358	88,60,179
		Percentage	48.53	14.31	26.39	31.94
11	Scheduled Tribes	Number	0	0	0	0
12	Total Working Population	Number	652	5,91,700	12,84,822	98,97,362
	Work Participation Rate	Percentage	32.55	36.55	36.72	35.67
13	Work Participation Rate Male	Percentage	53.40	57.26	56.41	55.15
	Work Participation Rate Female	Percentage	9.12	12.18	14.18	13.91
14	Main Worker	Percentage	97.55	91.01	88.62	85.39
15	Marginal Worker	Percentage	2.45	08.99	11.38	14.61

Source: Census of India, 2011

#### 4.8.3. Sex Ratio

With a sex ratio of 873 females per thousand males, Ludhiana district falls notably below the average sex ratios of both Punjab (895) and India (943).

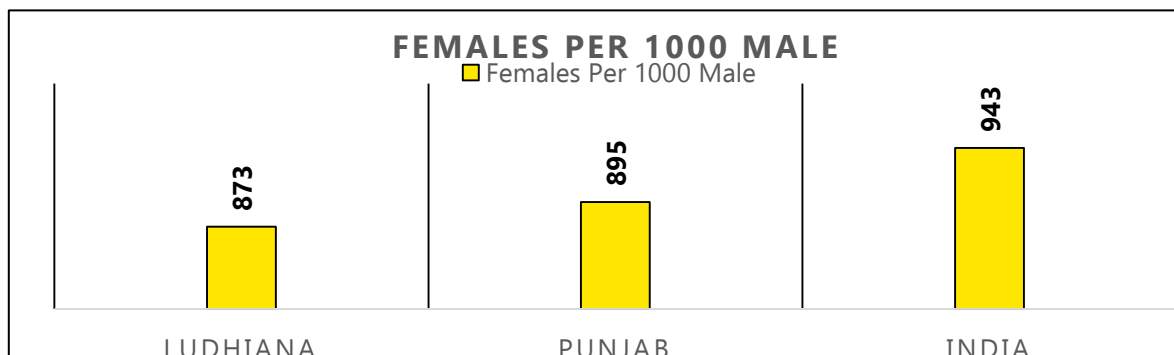
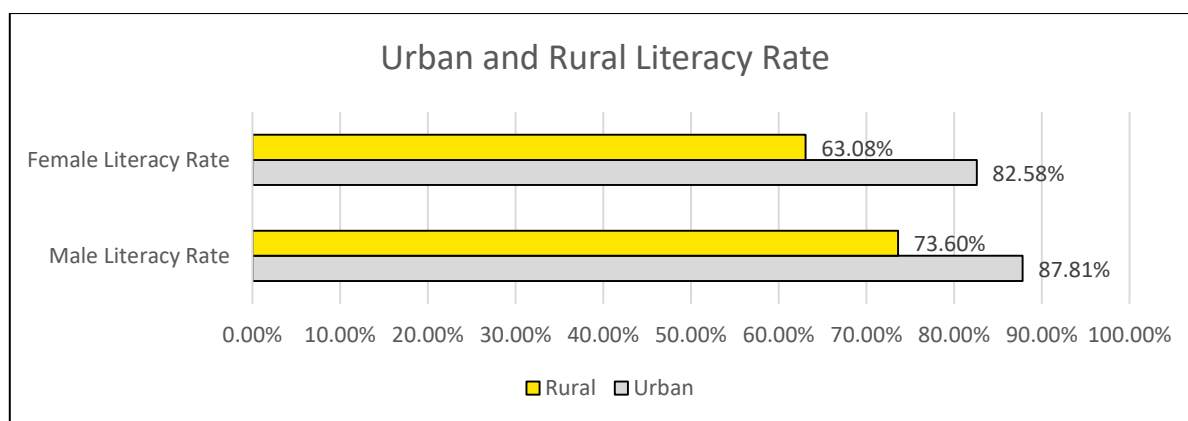


Figure 13: Sex Ratio-Ludhiana

Source: Census of India, 2011

#### 4.8.4. Literacy Profile

According to the Census of India 2011, the literacy rate in Ludhiana district stands at 82.2%. This figure surpasses the state average of 75.84% and ranks the district 7th among all districts in Punjab. However, there exists a notable 8.09% gap between male and female literacy rates. Specifically, male literacy stands at 86%, while female literacy is recorded at 77.88%.



**Figure 14: Urban and Literacy rate in Ludhiana**

*Source: Census of India, 2011*

In rural areas of Ludhiana district, the literacy rate is lower at 68.75%, with a wider gender gap of 10.52%. Male literacy in rural areas is 73.60%, while female literacy is 63.08%. In contrast, urban areas of Ludhiana district exhibit a significantly higher overall literacy rate of 85.36%, with a smaller gender gap of 5.23%. Male urban literacy is reported at 87.81%, while female urban literacy stands at 82.58%.

#### 4.8.5. Average Household Size

As per census of India 2011, Ludhiana district average household size<sup>44</sup> is 4.9 which matches with the state average household size of 5.

#### 4.8.6. Workforce Participation

According to the Census of India 2011, the total working population in the district is 1,284,822, comprising 36.72% of the total population. Among them, 1,053,600 individuals (56.41%) are male, while of 231,222 individuals (14.18%) are female.

Out of the total working population, 1,138,654 individuals (88.62%) are categorized as Main Workers, while 146,168 individuals (11.38%) are classified as Marginal Workers. Among Main Workers, 86.83% are male, while 13.17% are female. Among Marginal Workers, 69.43% are male, and 30.57% are female.

**Table 32: Details of working population.**<sup>45</sup>

Category	Total Workers	Male Workers	Female Workers	% of Total	% by Gender
Main Workers	32.57	28.11	4.46	88.62 %	86.83 %
Marginal Workers	4.15	2.87	1.28	11.38 %	69.43 %

*Source: Census of India, 2011*

And, out of the total working population, 33.74% are self-employed, 63.6% are salaried or waged employees and rest 2.66% are casual labor.

**Table 33: Classification of workers by Occupation**

Classification	Ludhiana (%)	Punjab (%)	India (%)
Legislators, senior officials, and managers	8.22	16.4	15.8
Professionals	4.80	7.9	8.8

<sup>44</sup> Household Size is No. of persons per household.

<sup>45</sup> \*All figures as % of total population.

Technicians and associate professionals	9.14	7.1	6.7
Clerks	1.19	4.4	5.0
Service workers and shop and market sales workers	14.55	14	14.7
Skilled agricultural and fishery workers	0.81	5.4	4.6
Craft and related trades workers	20.31	18.3	19.2
Plant and machine operators and assemblers	18.49	10	9.2
Elementary occupations	22.47	16.6	16.1
Workers not classified by occupation	0	0	0.1

*Source: Census of India, 2011*

#### **4.8.7. Municipal Corporation of Ludhiana Ward-wise Analysis**

##### **4.8.7.1 Population**

As per Census of India 2011, Municipal Corporation of Ludhiana has been divided into 75 Wards. Ward wise total population of MCL is 16,18,879 ranged from 6,626 (in Ward No. 52) to 58,519 (in Ward No. 07). Analysis of population distribution (ward wise) shows that ward numbers 07, 73, 64, 14, 08 and 60 are most populated while wards 52, 75, 36, 49, 17 and 34 are least populated. Detailed Ward-wise demographic analysis has been provided in **Annexure 20**.

##### **4.8.7.2 Child Population**

The Ward wise child population [0-6 years] is reported to be 1,84,239 comprising 11.38% of the total population. The child population in the wards is found to vary significantly. Highest child population (7349) found in ward 07 which is 12.56% of the total district population while ward 52 have the least number of children (501) that is 7.56% of the total district population in the Ward.

##### **4.8.7.3 Scheduled Caste Population**

The percentage of the Scheduled Caste population is 14.31% of the total population in MCL area. The lowest SC population found in wards number 29, 49, 18, 37, 68 and 23 while highest are in ward numbers 7, 14, 50, 01 64, 47 and 43.

##### **4.8.7.4 Literate Population**

The percentage of literate population are found to vary across the different wards. The highest literacy rate is found in in Ward No. 54 (96.20%), No. 37 (96.02%), No. 10 (95.77), No. 29 (95.29%) and the lowest literacy rate is observed in Ward No. 17 (61.00%), No. 16 (70.49%), No. 75 (71.68%) and No. 14 (73.10%).

##### **4.8.7.5 Slum Location, Spread and Details**

As per Census of India 2011, total population of slums in Municipal Corporation of Ludhiana is approximately 2,57,595 with 54,945 households. It is 15.91% of the total population of the city. With respect to the basic amenities in the slum area of MCL; there are 44,809 numbers of private latrines, 677 number of community toilets, 16,142 safe and protected water connections, 72,381 domestic light connections and 7,618 road lighting points. Locations of the slum area is attached as **Annexure 21**.

#### **4.8.7.6 Supply of Water<sup>46</sup>**

In Ludhiana, approximately 80.93% of households have access to tap water from treated sources within their premises, a figure lower than the national average of 84.14%, and notably higher than the Punjab state rate of 66.08%. On a positive note, nearly 89% of households in Ludhiana are connected to a wastewater outlet linked to a drainage system. This percentage surpasses the national rate of 82% while slightly trailing Punjab's rate of approximately 91%.

According to a recent Health Survey, an impressive 99% of households in Ludhiana have access to improved drinking water sources. Furthermore, data from the 2014 billing records indicates a total of 181,312 established connections.

### **4.9. Conclusion**

The land environment, characterized by its geology, topography, irrigation practices, soil characteristics, and land use patterns, reveals a landscape heavily reliant on agriculture, with significant concerns regarding groundwater depletion. Inadequate water storage infrastructure and low rainfall in the area, along with reduced forest cover and land use changes, exacerbated by the fluctuating hydrological cycles. An excessive reliance on groundwater worsens the situation, driven by the region's topography and geology. As surface water becomes scarcer, intensified groundwater withdrawal further strains the reserves.

Air quality monitoring indicates that while baseline concentrations of pollutants are within limits, seasonal fluctuations can lead to higher values, necessitating ongoing monitoring and management. The noise environment assessment shows that noise levels exceed CPCB standards in residential areas during the daytime. The water environment analysis, which covers both surface and groundwater resources and quality, Surface water quality is high in turbidity with greater than 100 NTU thus requiring a Water Treatment Plant.

The socio-economic profile provides insights into the demographics, literacy rates, workforce participation, and occupational patterns within the project area, disparities in literacy between genders and the dominance of agriculture as a primary source of income.

The project does not involve **physical or economic displacement**. A total of ~53 acres of land has been purchased for the construction of the WTP. The 137 Nos. ESRs and transmission network spanning 168 km have been proposed on MCL land, other government land and trust land. Necessary permissions shall be obtained for the construction of the WTP, ESRs, and laying of the transmission line network from respective government authorities such as PWD, NHAI, Railway, Forest Department, PPCB, etc. and trusts.

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<sup>46</sup> [https://rchiips.org/nfhs/nfhs-5\\_fcts/PB/Ludhiana.pdf](https://rchiips.org/nfhs/nfhs-5_fcts/PB/Ludhiana.pdf)

## 5. Assessment of Environmental Impacts

### 5.1. Introduction

This chapter outlines the environmental impacts identified through the examination of primary and secondary information. This examination includes a review of available project documentation, discussions with project representatives and the local community, as well as consultations with sector-specific professionals and subject matter experts. The environmental impacts expected during the pre-construction, construction, and operation and maintenance phases have been identified.

To assess these impacts comprehensively, an impact matrix has been developed, considering factors such as the extent of impact, duration, and intensity. These impacts are further categorized into pre-construction, construction, and operation and maintenance phases. This chapter evaluates the significance of each identified impact based on the collective severity of its spread, duration, and intensity.

### 5.2. Associated and Potential Environmental Impacts

The Ludhiana bulk water supply project is associated with various environmental impacts, both positive and negative. These impacts include air, water and soil pollution, water quality changes, change in land use at WTP, biodiversity effects, and workers and community health and safety concerns, among others. These impacts stem from construction activities, alterations in water flow, and infrastructure development. It is imperative to identify and address these issues, proposing mitigation measures to minimize adverse effects.

#### 5.2.1. Rating of Impacts

During the construction phase, impacts may be deemed temporary or short-term. These impacts are site-specific and associated with project activities such as the construction of WTP, ESRs and the laying of transmission line network. The impacts have been categorized as per the World Bank's Environmental and Social Standards (ESSs) applicable to the project.

#### 5.2.2. Impact Appraisal Criteria

The Criterion which has been employed to appraise impacts on various environmental components is presented in the Table 34:

**Table 34: Impact Assessment Criteria**

Criteria	Sub-Classification	Defining Limit
<b>Spread:</b> refers to area of direct influence from the impact of a particular project activity.	Within site	Impact is restricted within the Project site.
	Buffer area	Impact is spread up to 200 m from footprint boundary of the Project.
	Widespread	Impact is spread up to 500 m from the boundary of the Project.
<b>Duration:</b> based on duration of impact and the time taken by an environmental component to recover back to current state	Short Duration	Impact is likely to be restricted for less than 1 year.
	Medium Duration	Impact extends up to 3 years
	Long Duration	Impact extends beyond 3 years
<b>Intensity:</b> defines the magnitude of Impact	Low intensity	Changes in the baseline conditions up to 15%
	Moderate intensity	Changes in the baseline conditions for up to 30%
	High intensity	Change resulting in the baseline conditions beyond 30%

#### 5.2.3. Determining the Magnitude of Impact

Significance assessment matrix has been developed to assess the impacts based on the appraisal criteria, shown the table below:



**Table 35: Impact Significance Criteria**

Spread	Duration	Intensity	Impact Significance
Within site	Short	Low	Low
Within site	Short	Medium	Low
Within site	Medium	Low	Low
Within site	Medium	Medium	Low
Within site	Long	Low	Low
Buffer	Short	Low	Low
Buffer	Medium	Low	Low
Widespread	Short	Low	Low
Within site	Long	Medium	Moderate
Buffer	Short	Medium	Moderate
Buffer	Long	Low	Moderate
Widespread	Medium	Low	Moderate
Widespread	Short	Medium	Moderate
Widespread	Long	Low	Moderate
Widespread	Medium	Medium	Moderate
Within site	Short	High	Substantial
Within site	Medium	High	Substantial
Buffer	Short	High	Substantial
Buffer	Medium	Medium	Substantial
Buffer	Medium	High	Substantial
Buffer	Long	Medium	Substantial
Widespread	Long	Medium	Substantial
Within site	Long	High	High
Buffer	Long	High	High
Widespread	Short	High	High
Widespread	Medium	High	High
Widespread	Long	High	High
			No Impact
			Positive Impact

#### 5.2.4. Land Environment

The construction and operation of 580 MLD Water Treatment Plant (WTP), laying of 168 kilometres of transmission line, and construction/ rehabilitation of 137 Elevated Service Reservoirs (ESRs), will result in several environmental impacts. These activities may involve tree felling, land excavation, road cutting, temporary disruption of the existing utilities etc. Additionally, construction activities are likely to contribute to air pollution through dust emissions, exhaust fumes, and particulate matter. Noise pollution is another concern, operations and transportation of heavy machinery generating significant noise levels that could impact local communities. Furthermore, alterations to the visual landscape are expected, impacting aesthetic values and scenic beauty. Construction activities will also lead to traffic congestion, road closures, and safety risks for pedestrians and motorists, particularly in congested areas. Waste generation from construction activities will require proper management and disposal to prevent environmental pollution.

These impacts highlight the importance of implementing appropriate mitigation measures, such as topsoil control measures, dust suppression techniques, noise barriers, waste management practices, environmental monitoring programs, etc, to minimize these adverse effects and ensure sustainable development of the project. Additionally, effective stakeholder engagement and consultation processes should be in place to address community concerns and incorporate local perspectives into project planning and decision-making.

**Site Clearance:** Prior to start of construction of WTP, ESRs and Laying of transmission pipeline infrastructure, site clearance in terms of removal of weeds, shrubs, levelling of earth is required. This could lead to air pollution and impact on natural soil environment.

**Change in Land Use:** The construction of the WTP at Bilga village requires approximately 53 acres of land. The entire ~53 acre of agricultural land shift from agricultural to non-agricultural, resulting in a permanent alteration in land use. Laying of transmission line is proposed along the existing roads within the available RoW. Since the pipeline will be buried beneath the ground, it is anticipated that there will be no change in land use for laying of transmission pipeline.

**Topsoil:** For the construction of WTP, substantial removal of topsoil shall be required. The amount of topsoil removal is expected to be 29,000 cum.<sup>47</sup> The contractor shall ensure the preservation of topsoil excavated during the construction phase. PIU/MCL shall auction<sup>48</sup> the excess topsoil and sell it to the highest bidder.

**Earthwork:** It is anticipated that at the WTP, along the transmission main, and at the ESRs, there will be excavation volumes of approximately 4,37,061 cum,<sup>49</sup> 543,583 cum, and 53,012 cum, respectively, totalling the total excavation to 10,33,657 cum.<sup>50</sup> These earthwork activities will be localized and will have temporary impacts on the area's topography.

**Construction and Demolition Waste:** Due to the demolition of 2 ESRs, it is likely that 806 cum of C&D waste will be generated. This waste will be processed for reuse for the existing C&D waste processing plant at Dhandari Kalan.

**Land requirement for Labour Camp and Storage Yard:** It is expected that the total required land for all labour camps (approx. 10 nos) accommodating about 1500 labours will be about 11,000 sq. m.<sup>51</sup> and storage yard of 2,000 sq. m. will be required.

### 5.2.5. Ecological Resources

The proposed project involves the diversion of 6.836 hectares<sup>52</sup> of forest land for the laying of the transmission pipeline. Based on the rapid survey<sup>53</sup> by PIU along with Forest Department, it was found that approximately 459 trees and 895 poles will be required to fell, primarily along the alignment of transmission pipeline. The girth and species wise detail of trees and poles are provided in **Annexure 22**. Prior to the start of civil works permission from forest department is required. For according the permission from forest department, a joint inspection of PIU/ MCL with the forest officials will be conducted, which will detail the exact area of forest land to be used, and exact number of the trees to be felled.

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<sup>47</sup> Of the 53 Acres of WTP Land, nearly 36 Acres of land is proposed for construction and remaining 17 Acres is proposed to be green area/ non-construction area where topsoil removal is not required. The data is sourced from the WTP site layout plan and KML file prepared for the project. The approximate areas are calculated from the KML. Considering 20cm of topsoil, nearly 29,000 cum of topsoil will be removed.

<sup>48</sup> As per consultation with PIU

<sup>49</sup> Assumed 3m of average depth of excavation, spread over 36 acres

<sup>50</sup> Feasibility Report

<sup>51</sup> Assuming 5sq. m. per person for accommodation, 0.35 sq. m. per person for sanitary, and 10sq. m. per 20 people for cooking spaces and additional 20% as open area.

<sup>52</sup> A total of 13,466m of forest land is required, of which 9,322m is 6m width and remaining 7,226m is of 3m width, totaling the forest area required to 68,364 sq. m. or 6.836 ha. The area required for forest clearance shall be updated after infrastructure and topographical survey

<sup>53</sup> The survey was conducted by MCL during the field survey conducted in June 2024.



**Figure 15: Snapshot of trees from KML file**

**Sludge generation:** During the operation of 580 MLD capacity WTP. 5916 kg or nearly 6 tonnes of settled waste as sludge is estimated to be generated per day as per the water quality parameters.<sup>54</sup>

### 5.2.6. *Water Environment*

The proposed alignment of the transmission line follows existing roads and canal strips, minimizing the potential for pollution in surface water bodies within the city. Therefore, no significant impacts on surface water quality are anticipated due to the proposed alignment. However, there is a possibility of contamination in low-lying areas and surface water bodies due to sediment runoff from construction activities and wastewater disposal from labour camps.

Construction works during rainy season may cause eroded silt and soil flowing into the surface water bodies. Chemical contamination from fuels and lubricants during construction works can contaminate the nearby surface water bodies.

Due to the operation of the WTP, the reliance of residents on groundwater extraction will be reduced, ultimately aiding in improving the groundwater table of the affected area.

**Impact on Downstream users:** Water will be extracted from the 1R canal for both construction and operational purposes. Downstream users of the canal may experience turbid water during construction of intake structure (WRD works). The present demand of downstream users is 50 cusecs, whereas the new water demand is of 250 cusecs. It is proposed to enhance the capacity of the canal to 300 cusecs (250 cusecs + 50 cusecs). Therefore, this will not impact irrigation demand for agriculture downstream.

### 5.2.7. *Climate and Air Environment*

The impact of LBWS project on climate encompasses various factors. Energy consumption during water treatment and distribution processes can contribute to greenhouse gas emissions. Land use changes at WTP for infrastructure construction and raw material extraction for project components may affect the ecosystem and contribute to carbon emissions.

Fugitive dust emissions (PM10, PM2.5) and gaseous pollution (SO<sub>x</sub>, NO<sub>x</sub>, CO), resulting from the operation of construction machinery such as drilling, welding, concrete mixers, dumpers, operation of batching plant etc., during civil works, will contribute to air pollution. On-site air quality impacts during construction at the WTP, Transmission line and ESRs could be higher during the construction phase. The transportation and lifting machinery required for handling materials may contribute to air quality deterioration. However, no significant air quality impacts are anticipated during the operational phase of the project.

<sup>54</sup> As per the water quality report at canal, only TSS needs to be removed (10.2 mg/l).

Sludge = WTP Capacity \* TSS Quantity = (580 \*10<sup>6</sup>) \* (10.2/10<sup>6</sup>) =5916 KG per day. Water quality report is annexed as Annexure 14.

### 5.2.8. *Noise Environment*

**During Construction:** The movement of construction vehicles and the execution of noise-generating activities at the construction site are the significant contributors to noise pollution. Activities such as material movement and laying of pipeline are prominent sources of noise generation throughout the construction phase.

Activities involving the dismantling and construction of reservoirs in close proximity to residential areas, may exacerbate noise pollution. However, these impacts are temporary and confined to the construction phase. As a result, the project will result in temporary noise pollution during its construction phase. The selection of appropriate construction equipment and strategic timing of activities are expected to mitigate the impact of noise pollution.

**During Operation:** Apart from routine maintenance operations, no noise-generating activities are anticipated. The only exception to this is the pumping stations, which may generate noise levels of 80 decibels or more. However, these stations will be situated away from the nearest road and inhabited areas, mitigating potential noise impacts during operation.

### 5.2.9. *Archaeological /Cultural Properties*

**Archaeological/ Cultural properties:** Since the project activities do not fall within either the prohibited area (100 m) or regulated area (300 m) in respect of the protected monuments as per the Ancient Monuments and Archaeological Sites and Remains Act, 1958, and its amendments, no impacts are envisaged on archaeological/ cultural properties.

### 5.2.10. *Shifting of Utilities*<sup>55</sup>

During site visits, it was observed that at various places the proposed alignment for the transmission main coincides with the alignment of sewerage network, optical fibre lines, IGL gas pipeline, telephone lines etc. This may lead to temporary disruption of services, which will impact the community. As part of this project, the DBOT Contractor is required to conduct a study on the existing utilities around and along the proposed components and integrate the mitigation measures during pre-construction phase of the project.

### 5.2.11. *Other Issues*

**Construction & Demolition Waste**<sup>56</sup>: The project may involve the demolition of the existing ESRs as per the conditional assessment conducted by the DBOT contractor. The contractor shall dispose the C&D waste to the C&D waste treatment plant site at Dhandhari Kalan of MCL or to the low-lying areas as directed by the PIU/MCL.

**Biomedical waste:** During the construction activities it is expected that injuries/ accidents will generate the biomedical waste of amount less than 1kg<sup>57</sup> per day, The biomedical waste generated would be insignificant. Hence, DBOT contractor shall arrange a third party for safe disposal of biomedical waste.

**Hazardous waste**<sup>58</sup>: It is expected that during construction and operation phase hazardous waste such as Paint, Enamels, Diesel, lubricant oil, Chlorine etc. shall be generated, contractor shall comply with hazardous waste management plan. The hazardous waste shall be stored in leak-proof containers resistant to punctures and secure with lids to prevent spills and exposure. Thereafter, a third party

<sup>55</sup> The quantification of utility relocation cannot be performed for the ESIA study due to the absence of a comprehensive survey or study during the preparation of the Detailed Feasibility Report.

<sup>56</sup> At this stage, the exact amount of C&D waste can't be calculated. This information may be updated after conditional assessment of all ESRs by the DBO contractor.

<sup>57</sup> It is anticipated that on an average 50g of biomedical waste is generated for 1% of the total workforce/day.  
 $1500/100*50/1000 = 0.75 \text{ KG per day.}$

<sup>58</sup> At this stage, the exact amount of Hazardous waste can't be calculated.

(Authorized for hazardous waste handling & disposal) shall be hired for safe disposal of hazardous waste generated from the labour camps.

### 5.3. Preconstruction, Construction and Operation Phase Specific Impacts and their Rating

The potential impacts during the different phases of the project are provided in Table No. 36.

**Table 36: Preconstruction, Construction and Operation Phase Impacts**

S. No.	Project Activity	ESS triggered	Environmental Impact
<b>Pre-Construction Phase</b>			
1.	Site Clearance and tree cutting	ESS 1, ESS 3, ESS 4, ESS 6, ESS 10	<ul style="list-style-type: none"> <li>Laying of transmission line and construction of ESRs may involve diversion of total 6.836 ha of forest land impacting 459 trees and 895 poles, due to the laying transmission line. This tree cutting poses a threat to flora and avi-faunal species.</li> </ul>
2	Statutory Clearances	ESS 1, ESS 3, ESS 6	<ul style="list-style-type: none"> <li>CTE and CTO needs to be obtained from PPCB before establishment of Ready-Mix Concrete (RMC) Plant.</li> <li>For laying of transmission line and construction of ESRs, permission is required from Forest department, MCL, PWD, NHAI, Railway, Ludhiana Improvement Trust etc. Transmission line is crossing railways at 4 locations, National highway at 15 locations, State highway at 23 locations and canal at 8 locations.</li> </ul>
3	Utility Shifting	ESS1, ESS2, ESS3, ESS4, ESS10	<ul style="list-style-type: none"> <li>Proposed alignment for the transmission main coincides with the alignment of sewerage network, optical fibre lines, IGL gas pipeline, telephone lines, etc. DBOT Contractor is required to map the existing utilities around and along the proposed components and integrate the mitigation measures during the pre-construction phase of the project.</li> </ul>
4	Selection of Disposal Site	ESS1	<ul style="list-style-type: none"> <li>The project involves approximately 10,33,657 cum<sup>59</sup> of earthwork (WTP, ESRs and Transmission Line), 6,11,440 cum of earthwork can be utilized for backfilling and embankment and remaining 4,22,217 cum needs to be disposed. The excess earthwork shall be disposed off<sup>60</sup> at low lying areas within the campus of the WTP or as directed by PIU/ MCL and excess earthwork shall be auctioned and sell to the highest bidder.</li> <li>~375 KG per day of solid waste is estimated to be generated from camp site, which shall be disposed off in MCL Jamalpur dumpsite of area 52 acres.</li> <li>C&amp;D waste shall be disposed at C&amp;D waste treatment facility at Dhandhari Kalan<sup>61</sup>, Plant capacity is 100 TPD</li> </ul>
5	Sources identification for construction materials	-	<ul style="list-style-type: none"> <li>Impact associated with natural environment such as air pollution due to excavation at queries.</li> <li>Impact associated with transportation of construction material such as air, noise pollution, impact on other road</li> </ul>

<sup>59</sup> Source: Earth work for WTP, ESRs and Transmission Line as per Feasibility Report.

<sup>60</sup> As per consultation with PIU

<sup>61</sup> C&D Waste treatment facility at Dhandhari Kalan shall be operation by 31<sup>st</sup> Dec 2024, in the meantime C&D waste shall be disposed off as per the direction of PIU/MCL.

S. No.	Project Activity	ESS triggered	Environmental Impact
			users.
<b>Construction Phase</b>			
1.	Construction of WTP at Bilga of capacity 580 MLD	ESS 1, ESS 2, ESS 3, ESS 4, ESS 6, ESS 10	<ul style="list-style-type: none"> <li>Noise, dust, and air pollution from construction vehicles, equipment, and machinery, increase in pollutants such as CO<sub>2</sub>, CO, SO<sub>x</sub>, PM, NO<sub>x</sub>, Hydrocarbons may impact health issues including respiratory problems for nearby residents and construction workers.</li> <li>Risk of accidents particularly during construction of WTP, while working at height and depth.</li> <li>Due to earth work activities at WTP site, approximately 4,37,061 cum<sup>62</sup> of soil will be generated, out of which 2,14,159 cum will be backfilled at site. However, disposal of balance 2,22,901 cum soil will lead to air water and soil pollution. The excess earthwork shall be disposed off<sup>63</sup> at low lying areas within the campus of the WTP or as directed by PIU/ MCL and excess earthwork shall be auctioned and sell to the highest bidder.</li> <li>The WTP site is situated in proximity of 1R canal, run-off from stockpiled materials and chemical contaminants from fuels and lubricants during construction works can contaminate the drainage system of area.</li> <li>Chemical, Lubricants and Oil leakages may impact groundwater/ soil.</li> <li>Ludhiana falls under over exploited area as per Punjab Water Regulation and Development Authority (PWRDA). Extraction of ground water for construction and labor camps will impact the ground water.</li> <li>Working at night may create light pollution; therefore, light-absorbing measures are required.</li> <li>Increase in noise and vibration levels due to earth-moving and excavation and transportation of equipment, material, and people.</li> <li>Potential environmental impacts due to poor handling of construction debris and waste, including plastic, concrete, and metal.</li> <li>Wastewater disposal from labour camps may contaminate the ground water as well as soil.</li> </ul>
2.	Laying of Clear Water Transmission Mains from WTPs to different Service Reservoirs (168km of 150mm to 2000mm)	ESS1, ESS2, ESS3, ESS4, ESS5, ESS6, ESS10	<ul style="list-style-type: none"> <li>TL route passes through urban zones and inhabited areas, along roads, where tertiary types of ecosystems are already dominant, it is unlikely to expect significant negative impacts on flora and fauna from this project. There could be a temporary loss of habitat for the avi-fauna due to tree cutting along the canal road. Compensatory plantation at 1:10 could offset this impact.</li> <li>Laying of transmission line will generate 5,43,583 cum of earthwork, out of which, 3,60,191 cum will be backfilled at</li> </ul>

<sup>62</sup> Considering 36 Acres of Built-Up area of WTP, requiring an average depth of 3m.

<sup>63</sup> As per consultation with PIU

S. No.	Project Activity	ESS triggered	Environmental Impact
			<p>site and balance 1,83,392 cum earthwork shall be disposed off<sup>64</sup> at low lying areas as directed by PIU/ MCL and excess earthwork shall be auctioned and sell to the highest bidder.</p> <ul style="list-style-type: none"> <li>• Risk of accidents particularly during welding of pipeline, while working inside the pipeline.</li> <li>• Traffic Congestion on narrow streets due to the excavation activity for the laying of transmission line and movement of construction machineries.</li> <li>• Increase in noise and vibration levels due to earth-moving and excavation and transportation of equipment, material, and people.</li> <li>• Occupational health and safety and community health and safety risks due to excavation. Thus, hard barricading of the work site and necessary signages is mandatory.</li> <li>• Accessibility to hospitals, schools, places of worship, old age homes, and dharmshalas will be temporarily restricted, as the roads leading to these locations may be temporarily blocked during pipe laying.</li> <li>• Working at night may create light pollution; therefore, light-absorbing measures are required.</li> <li>• Laying of pipeline at heavy traffic flow junctions will require traffic diversion/traffic management plan.</li> <li>• Contamination of groundwater due to uses of hazardous substance such as such oils, fuels etc. and liquid wastes from construction activities.</li> <li>• Runoff from the work sites into the 1R canal can impact the water quality of the canal downstream.</li> </ul>
3.	Construction and Rehabilitation of ESRs	ESS1, ESS2, ESS3, ESS4, ESS6, ESS10	<ul style="list-style-type: none"> <li>• The proposed construction of ESR will lead to dust and noise emissions due to the use of heavy machinery and construction material. This will impact the health of nearby residents and workers.</li> <li>• Construction of 70 ESRs will generate the 53,012 cum<sup>65</sup> of earth work out of which, 42,410 cum will be backfilled, balanced 10,602 cum earthwork shall be disposed off<sup>66</sup> at low lying areas as directed by PIU/ MCL and excess earthwork shall be auctioned and sell to the highest bidder.</li> <li>• Construction of ESRs in the residential areas, Municipal Park will affect the aesthetic value, property value, view of the resident. This will also cause a shadow effect on the nearby residents. In addition to this, the construction of ESRs will take up space that people use for walking and recreation.</li> <li>• Reduction in green area of parks and community spaces.</li> <li>• Working at heights is an occupational risk to the workers.</li> <li>• Traffic issues and disruptions to utilities.</li> </ul>
4.	Demolishing of existing ESRs*	ESS1, ESS2, ESS3,	<ul style="list-style-type: none"> <li>• Presently, the PIU has provisionally identified 2 ESRs for demolition. The Contractor is required to conduct conditional assessment of the existing 51 ESRs and identify no. of ESRs</li> </ul>

<sup>64</sup> As per consultation with PIU

<sup>65</sup> Feasibility Report

<sup>66</sup> As per consultation with PIU

S. No.	Project Activity	ESS triggered	Environmental Impact
		ESS4, ESS6, ESS10	<p>to be demolished. The PIU will finalize the no. of ESRs to be demolished.</p> <ul style="list-style-type: none"> <li>Both manual and controlled blasting demolition activities will generate dust and particulate matter, adversely impacting air quality in the surrounding area.</li> <li>The ground vibration from controlled blasting may affect the surrounding structures. In comparison to the blasting method, the manual process is generally quieter.</li> <li>Risk of accidents during dismantling of ESRs.</li> <li>Controlled blasting requires strict safety measures, including establishing safety zones to protect workers and the public.</li> <li>Controlled blasting can result in the generation of debris, posing risks to nearby structures and the environment.</li> <li>Surface and ground water contamination due to improper disposal of C&amp;D Waste.</li> </ul>
<b>Operation Phase</b>			
1.	Impact on environment attributes	ESS1, ESS2, ESS3, ESS6	<ul style="list-style-type: none"> <li>Contamination of groundwater and land due to leakages from storage of chlorine and oils &amp; fuels.</li> <li>The operation of pumping machinery may generate noise pollution, which may disturb residents.</li> <li>Greenhouse gases emission due to high energy consumption in WTP and ESRs Pumping.</li> <li>Reduction in surface runoff infiltration into the ground due to land use change.</li> <li>Pipe leakages, especially near low-lying areas, could result in water stagnation and thereby mosquito breeding may impact health of the nearby communities.</li> </ul>
2.	Sludge Generation	ESS1, ESS3, ESS6	<ul style="list-style-type: none"> <li>5916 kg per day of settled waste is estimated to be generated as sludge at the Water Treatment Plant (WTP).<sup>67</sup></li> <li>Health and Safety risk due to sludge handling.</li> </ul>
3.	Filter Backwash Water	ESS1, ESS3	<ul style="list-style-type: none"> <li>Wastewater such as Filter Back Wash Water (FBWW) and Clarified Sludge Water (CSW) will be generated during WTP operation. This water after settling needs to be fed back to inlet to avoid wastage of water.</li> </ul>
4.	Health Hazard	ESS1, ESS2, ESS3, ESS4, ESS6, ESS10	<ul style="list-style-type: none"> <li>The operation, and maintenance of pumping machinery can generate various types of waste, including, equipment components, and hazardous materials such as lubricants, oils, waste cotton, etc.</li> <li>Overdosing of chlorine due to mechanical/ manual failures may cause chlorine contamination, during the water treatment.</li> <li>Bursting or breakage of transmission pipelines due to pressure surges.</li> <li>Provision of adequate fire detection and firefighting systems at the site like extinguishers, sand buckets, fire blankets, usage of fire-resistant materials/cables, etc.</li> </ul>

<sup>67</sup> Based on water quality report of the canal, where TSS is 10.2 mg/l.



#### 5.4. Risk Classification:

Risk classification was conducted for the entire length of the transmission line and for all ESRs under the sub-project Ludhiana. Risks were classified as Low, Moderate, Substantial and High. The risk criteria for both ESRs and transmission line are attached as **Annexure-23 and 24**.

For conducting the risk classification of transmission line, the transmission line was divided into 191 sections and specific environmental and social risk ratings for each section were computed. Further the higher of the environmental and social risk rating respectively was designated as the overall risk rating for that section. An analysis was carried out section by section to determine the Environmental and Social risk factors across the entire 168km stretch. The specific Environmental and Social risk ratings for each section were computed, and the greater of the two was designated as the overall risk rating for that section. A similar exercise was performed at all 136 ESRs to identify the overall risk rating for the ESRs. Risk classification for transmission main and ESRs are provided in **Annexure-23 and 24**.

**Table 37: Summary of Risk Rating of Transmission Lines and ESRs**

Risk Rating of Transmission Lines	No. of Sections
High Risk	26
Substantial Risk	121
Moderate Risk	24
Low Risk	20
No Risk	0
Total	191
Risk Rating of ESRs	No. of ESRs
High Risk	69
Substantial Risk	45
Moderate Risk	20
Low Risk	3
No Risk	0
Total	137

#### 5.5. Activity Specific Impacts in Sensitive Areas

While the impacts specific to each phase of the project have been detailed previously, it is important to highlight that the construction phase will have particularly significant impacts in sensitive areas. Sensitivity is determined based on the presence of critical social, cultural, and religious services provided in these locations. Critical or sensitive locations encompass establishments such as hospitals, educational institutions, crematoriums, historic sites, tourist destinations, marketplaces, major residential complexes, and significant road junctions. The nature of impacts resulting from construction activities in these critical locations within the city are outlined in Table 38.

**Table 38: Activity based Impacts**

S. No.	Activity	Identified Locations which will be affected	Nature of Impact
1	Laying of pipeline in sensitive institutional locations	87 Schools 4 Universities 8 Coaching/Tuitions Centres 11 Colleges	<ul style="list-style-type: none"> <li>There will be disruption to the movement of vehicles and, blockage for accessing institutions for students / staff.</li> <li>Increase in dust levels due to earthwork, laying of pipeline, movement of heavy vehicles.</li> <li>There will be noise pollution during the day, hampering classes and lectures.</li> </ul>
2	Laying of pipeline near	72 Hospitals	<ul style="list-style-type: none"> <li>The staff/ patients may face problems in terms of accessing the medical facility.</li> </ul>

S. No.	Activity	Identified Locations which will be affected	Nature of Impact
	hospitals		<ul style="list-style-type: none"> <li>There may be disruption of utilities such as power, water, etc. to the hospitals during the construction.</li> <li>Access blockage may hamper the entry into hospitals.</li> <li>Air and Noise pollution may impact the health of the patients.</li> </ul>
3	Laying of pipeline and construction of ESRs in commercial areas	44 Commercial areas, Markets	<ul style="list-style-type: none"> <li>Temporary loss of livelihood of businesses and vendors.</li> <li>Traffic congestion at marketplace due to construction.</li> <li>Inconvenience to buyers due to limited accessibility and diverted roads</li> <li>Increase dust and noise levels due to movement of heavy vehicles and construction equipment.</li> </ul>
4	Construction of ESR near temples, tourist attractions, religious places	67 Temples 47 Gurudwaras 15 Dargahs 6 Churches	<ul style="list-style-type: none"> <li>Tourism may be affected temporarily because of disruptions in connectivity and commuting.</li> <li>Regular devotees will face problems in commuting.</li> <li>Disruption in the practice of free food to needy ones 'langar', due to lack of accessing the facility.</li> <li>Increase dust and noise levels due to movement of heavy vehicles and construction equipment.</li> <li>Increase in noise levels from construction would disturb devotees during prayers.</li> </ul>
5	Laying of pipeline through Intersections and Main City Roads, Narrow Lanes, Densely populated areas and construction of ESR close to residential colonies	9 Parks, 16 Police Station, Major Road junctions and other locations	<ul style="list-style-type: none"> <li>There will be disruption to the movement of vehicles and pedestrian. Traffic congestions on major roads will lead to delay in commuting for regular commuters.</li> <li>Increase dust and noise levels due to movement of heavy vehicles and construction equipment. This may affect the tranquillity of the parks.</li> </ul>

### 5.6. Environmental Impact Matrix

The impacts resulting from construction activities in these critical locations within the city are outlined in Table 39.

**Table 39: Ratings for Impacts**

S. No.	Main Activities	Environmental Impact												
		Land Use	Ambient Air	Ambient Noise	Vibration	Ground Water	Surface Water	Soil Resources	Ecology	Traffic	Cultural Heritage	Topography	Aesthetic and Visual impact	OHS & CHS
<b>1</b>	<b>Pre-Construction Phase</b>													
a	Vegetation Clearance	L	L					L	S	L			L	L
b	Utility Shifting	M	L	L	L	L		M	L	M				
<b>2</b>	<b>Construction Phase</b>													
a	Site Clearance and levelling	M	M	L	L			M	L			L	L	L
b	Strengthening of access road	L	L			L		L		L				L
c	Transportation of const. material		M	L			L			M				M
d	Storage & handling of const. materials	M	L	L		L		M	L			L		M
e	Establishment of Labour camp	L				M		L						M
f	Construction of WTP	H	S	M	M	M	M	S	M	L	L	H	M	H
g	Laying of Transmission Line	L	S	M	M		M	M	H	H	M	L	L	H
h	Construction of new ESRs	M	S	S	M	L		M	S	S	L		S	H
i	Dismantling of existing ESRs	L	H	H	S			S	S	M	L		M	H
j	Rehabilitation of ERRs	L	M	M	L			L	L	L			L	M
k	Operation of DG sets		M	L	L			L						L
l	Operation of const. machinery		S	S	M	M	M	S	S	M				S
m	Generation and handling of muck	S	M					M	S	M	M		S	M

S. No.	Main Activities	Environmental Impact												
		Land Use	Ambient Air	Ambient Noise	Vibration	Ground Water	Surface Water	Soil Resources	Ecology	Traffic	Cultural Heritage	Topography	Aesthetic and Visual impact	OHS & CHS
n	Waste and Sewage Generation					M	M	M	M				S	M
3	Operation Phase													
a	Sludge generation from WTP							M					L	M
b	Withdrawal of Surface water					P	L		L					L
c	Vehicular movement		L	L							L			L
d	Periodic monitoring/ Maintenance of project component	L	L	L			L	L		L				L
e	Operation of WTP and Pumping Machinery		L	L	L			L						M
Low:	L	Moderate:	M	Substantial:	S	High:	H	Positive:	P					

**Positive Impact:** The project aims to mitigate the over-exploitation of groundwater, yielding positive environmental implications. It also targets enhancing water supply reliability in the city. Additionally, the project is anticipated to boost annual revenue for the city through enhance service delivery and efficient tariff collection. Access to potable drinking water will help residents of Ludhiana in safeguarding themselves against water-borne diseases and the challenges associated with consuming contaminated water.

### 5.7. Conclusion

The project is not situated within any eco-sensitive areas nor in proximity to cultural heritage sites. However, the project is expected to have environmental impacts, particularly impacting soil, air, noise, surface-water, groundwater, aesthetics of the area, muck, and traffic during the construction phase. Although impacts on water quality and hydrology are anticipated to be minimal and temporary, the operation of construction machinery on-site is foreseen to significantly impact air and noise quality, mainly due to activities such as trench digging, construction, and demolition. Based on the above environmental impact analysis, the project is categorized as “Substantial Risk” which will be reduced to “Moderate Risk” after implementing the mitigation measures described in Environmental Social Management Plan (ESMP).

## 6. Assessment of Social Impacts

### 6.1. Introduction

This chapter identifies the social impacts through the pre-construction, construction, and operation phases of the project. The identification of impacts stems from experts' site visits including rapid surveys by PIU and PMU, review of available project information, discussions with the local communities and other key stakeholders. The anticipated social impacts are categorized into pre-construction, construction, and Operation phases.

Many of these impacts will be beneficial, particularly the improvement in the availability of potable water in the city, a reduction in waterborne diseases, and the establishment of an environmentally sound, safe, and sustainable water supply. However, the assessment identified some negative impacts including temporary inconveniences during the construction which will be managed through proper implementation of mitigation measures.

### 6.2. Social Impacts by Project Components

In accordance with the project's requirements and evident from the design, the major components of the project include construction of WTP, construction/rehabilitation of ESRs and laying of the transmission line network. The section below outlines the impacts specific to each project component, namely WTP, ESRs, and the transmission line network.

**Water Treatment Plant:** The WTP site is located near Bilga village, near the 1R canal which serves as the water source for the project. A total of ~53 acres of land for WTP has been purchased through negotiated settlements with 50 landowners. It's important to note that beyond these 50 affected landowners, construction of WTP does not impact any private residential, commercial, government, religious, or community structures. Currently the WTP land is vacant and free of any encumbrance.

**Transmission Network:** This project involves laying of transmission lines of 168 Km in Ludhiana within the ROW of public roads such as National Highways, PWD roads, Railways, Forest area, MCL roads, Irrigation roads, etc. Construction activities, particularly in urban residential areas, have the potential to disrupt the daily lives of residents. The construction-related traffic could lead to road congestion and these delays may cause public nuisance and social unrest if not managed properly. Importantly, no permanent displacement has been envisaged, except temporary loss of livelihood of 874 PAPs (744 business and 130 vendors).<sup>68</sup>

**Elevated Service Reservoirs:** This project will distribute water to the Ludhiana city from 137 ESRs, of which 70 ESRs are proposed and remaining 67 ESRs are existing. Specifically, the 67 existing ESRs are on the land parcels already under the possession of MCL. The No Objection Certificates for all the existing ESRs have been obtained from the concerned departments. For the proposed 70 ESRs, there are 58 land parcels which are under MCL possession available for construction of 58 ESRs. For the remaining 12 proposed ESRs, the proposed land parcels include 3 land parcels each under the possession of GLADA and LIT, and 1 parcel owned by the Loh Langar Trust; there are also 3 disputed land parcels which are under MCL and 2 land parcels which are in use by a school, which may require alternate land parcels. During site survey, it was noted that no physical or economic displacement will be caused by construction of new ESRs. There will be impacts on neighbouring communities such as disruptions related to construction, particularly affecting parks and recreational areas. The proposed construction of ESRs within parks has raised concerns among residents who regularly use these spaces for recreational and leisure activities. The potential loss of park areas may deprive the community of valuable spaces for relaxation and exercise, leading to social stress and dissatisfaction among residents, impacting their overall well-being. The locations details of ESRs is shown in **Annexure 25**.

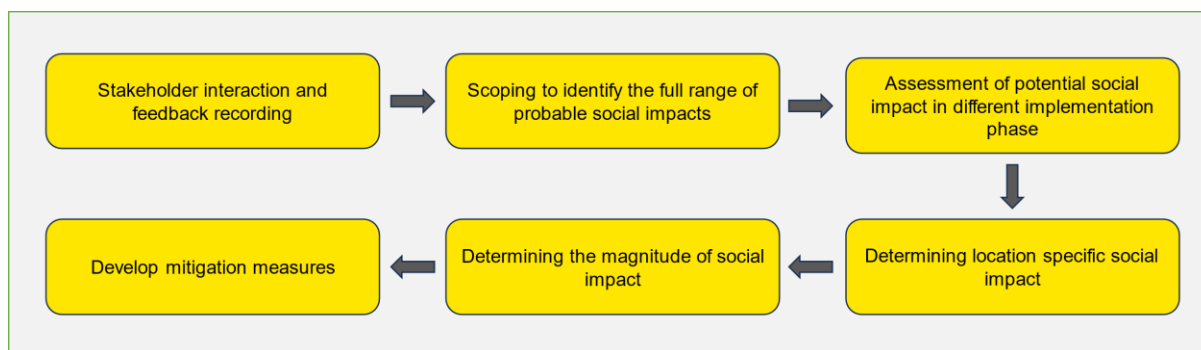
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<sup>68</sup> Business and Street Vendors identified on Transmission Line.

Moreover, the project will provide construction related jobs to the local community members during the construction phase. However, the resentment among the residents who are apprehensive about the visual impact of the ESRs such as shadow effects and nearness to the residences, and potential impact on property values is noticeable.<sup>69</sup>

### 6.3. Process for Social Impact Assessment

The Social Impact Assessment process is presented below:



**Figure 16: Social Assessment Process**

To ascertain social impacts and risks arising from the construction of WTP, ESRs, and transmission lines network a rapid survey was conducted by PIU and PMU to assess the size and scope of impacts. Further, to gather baseline information of the study area, relevant data from secondary sources have also been collected and analyzed. Simultaneously, a thorough process of stakeholder identification and consultation has also been carried out. After review of all the information collected through primary and secondary sources, social risks & impacts have been identified and analyzed.

**Table 40: Impact Identification Matrix**

S. N.	Main Activities	Social Components							
		Land Use	Livelihood	Cultural Heritage & Historical Places	Occupational Health and Safety	Community health and Safety	Labour and working condition	Grievance Redressal Mechanism (GRM)	Gender Based Violence (GBV)
<b>1</b>	<b>Pre-construction Stage</b>								
a	Requirement of Land	✓						✓	
b	Right of way and working space	✓						✓	
<b>2</b>	<b>Project Construction Stage</b>								
a	Influx of Labour	✓	✓		✓	✓		✓	✓
b	Impacts due to labour camp	✓			✓	✓	✓	✓	✓
c	Impact on Cultural Heritage			✓					
d	Impact at WTP location	✓			✓	✓	✓	✓	✓
e	Impact due to laying of transmission main		✓	✓	✓	✓	✓	✓	✓

<sup>69</sup> No objection certificates from 16 Nos of Residential Welfare Associations (RWA) have been obtained from PIU Ludhiana.

S. N.	Main Activities	Social Components							
		Land Use	Livelihood	Cultural Heritage & Historical Places	Occupational Health and Safety	Community health and Safety	Labour and working condition	Grievance Redressal Mechanism (GRM)	Gender Based Violence (GBV)
f	Impact at ESRs	✓			✓	✓	✓	✓	✓
<b>3</b>	<b>Project Operation Stage</b>								
a	Labour Engagement		✓		✓	✓	✓	✓	✓
b	Community Health					✓		✓	✓

### 6.3.1. Stakeholder interaction and feedback

#### Positive feedback:

- Potential of job opportunities due to the project, thus acknowledging the project's economic benefit.
- Potential improvement in access to potable clean and safe water.
- Perception that the project might improve living standards.

#### Negative feedback:

- Issues related to loss of recreational space in the residential colonies.
- Concerns about the aesthetics and potential impact on property values.
- Concerns about the public safety during construction phase.
- Concern about the likelihood of utility disruption during the construction phase.

### 6.4. Potential Social Impacts during implementation

The identified social impacts will mostly occur during construction. It is anticipated that during the operational phase, social impacts will be minimal. Effective implementation of mitigation measures along with clear communication strategies at the local level by the PIU/ MCL would address the impacts effectively.

**Table 41: Potential Social Impacts**

S. No.	Social Attributes	Project Component	Potential Impacts
<b>A. Pre-Construction Phase</b>			
1	<b>Land Acquisition, Restrictions on Land use and Involuntary Resettlement (ESS-5)</b>	WTP, ESRs and Transmission line	<b>Positive Impact</b> <ul style="list-style-type: none"> <li>• The private land purchase has been done through mutual negotiation. Hence, the risk of forceful acquisition or eviction of affected people for project construction is not involved.</li> <li>• The project does not involve involuntary resettlement, restrictions on land use, access to natural resources, common property resources and access to livelihood.</li> </ul>
2	<b>Stakeholder's Engagement and Information Disclosure (ESS-</b>	WTP, ESRs and Transmission line	<b>Positive Impacts</b> <ul style="list-style-type: none"> <li>• Carryout stakeholders/ public consultations exercise to sensitize the inhabitants of project on the social safeguard's</li> </ul>

S. No.	Social Attributes	Project Component	Potential Impacts
	10)		<p>components of the project. It is important to consider the views and opinions of the stakeholders for site selection, design and implementation.</p> <p><b>Negative Impacts</b></p> <ul style="list-style-type: none"> <li>• Failure to engage stakeholders can result in public nuisance and grievances, leading to delays and potential legal issues.</li> <li>• Concerns about accessibility of road, disruption to local businesses and issues of residents for the use of park.</li> <li>• Limited participation and representation of women in project planning and decision-making processes.</li> </ul>
<b>B. Construction Phase</b>			
1	<b>Labor and Working Conditions (ESS-2)</b>	WTP ESRs and Transmission line	<p><b>Influx of Labor Positive</b></p> <ul style="list-style-type: none"> <li>• It is anticipated that once the construction work starts then locals (labours) will be involved in formal &amp; informal jobs at construction site; this will provide job opportunities to the local inhabitants. Approximately 1500 workforce will be required (i.e. skilled, unskilled, and semi-skilled) for construction of WTP, ESRs and laying of transmission pipeline.</li> <li>• Employment of local skilled and unskilled labour will be promoted.</li> </ul> <p><b>Negative</b></p> <ul style="list-style-type: none"> <li>• Estimated labour workforce for the project is 1500 which may vary as per requirement. Majority of labour is migrant labour, which is to be involved in the construction. The sudden increase in population can strain local resources, including housing, healthcare, education, and public services.</li> <li>• An influx of labour may result in tensions and conflicts with the local community.</li> <li>• Discrimination in employment (e.g., abrupt termination of the employment, working conditions, wages or benefits etc.)</li> <li>• Inadequate accommodation, water facility, sanitation, cooking facilities and health facilities at labour camps, especially for female labours at the labour camps.</li> <li>• Non-payment, disparity of wages and/ or denial of benefits (compensation, bonus, maternity benefits etc.)</li> <li>• Engagement of child labour and trafficking of labour.</li> <li>• Safety, security of women workforce at work sites and within workforce camps.</li> <li>• Lack/ inadequate facilities for pregnant women and lactating mothers and children at camp sites.</li> <li>• Absence of a grievance mechanism for labour to seek redressal of their grievances/issues.</li> <li>• Absence or inadequate or non-responsive emergency response mechanism for rescue of workforce, during natural calamities like cloud bursts, caving in/ landslides, disasters due to earthquake/floods/fire outbreak etc. at operational sites and/or workforce camps.</li> </ul> <p><b>Occupational Health and Safety Hazards</b></p>



S. No.	Social Attributes	Project Component	Potential Impacts
			<ul style="list-style-type: none"> <li>Mishandling of construction materials can lead to injuries.</li> <li>Construction activities may result in physical injuries from road accidents, construction accidents, and other hazards.</li> <li>Elevated risks of accidents and injuries during construction activities.</li> <li>Overexertion injuries and illnesses are common due to the physical demands of construction work.</li> <li>Poor housekeeping, such as debris and liquid spills, can cause slips and falls, resulting in injuries and work disruptions.</li> <li>Lack of proper training, toolbox talks/PEP Talks Transportation and vehicle movement pose risks of road accidents and related injuries.</li> <li>Lack of/inadequate facilities for pregnant women and lactating mothers and children at camp sites.</li> <li>Sexual harassment and Gender Based Violence (GBV) issues within workforce camps or at work sites.</li> <li>Health risks of labour relating to HIV/AIDS and other sexually transmitted diseases.</li> </ul>
2	<b>Gender Based Violence (GBV) (ESS-1 and 2)</b>	WTP, ESRs and Transmission line	<ul style="list-style-type: none"> <li>Sexual harassment such as SEA/SH and Gender Based Violence (GBV) issues within workforce camps.</li> </ul>
3	<b>Community Health and Safety (ESS-4)</b>	WTP, ESRs and Transmission line	<p><b>Health Risks:</b></p> <ul style="list-style-type: none"> <li>Noise, dust, and ambient air pollution due to traffic congestion.</li> <li>Influx of migrant workers and interactions with the local population may lead to the spread of health issues, including STIs, HIV/AIDS, Hepatitis B &amp; C, tobacco chewing, tuberculosis and substance abuse.</li> <li>Gender-Sensitive Health &amp; Safety issues.</li> </ul> <p><b>Likelihood of increased accidents:</b></p> <ul style="list-style-type: none"> <li>Traffic disruption and diversion.</li> <li>The diversion or closure of roads can disrupt the normal flow of traffic in the affected areas. This may lead to delays, congestion, and increased travel times for commuters. This can also affect both residents and through-traffic, potentially causing confusion and inconvenience.</li> <li>Emergency services, such as ambulances, school buses and fire tenders, may experience delays in response times due to altered traffic patterns. This could have implications for public safety.</li> <li>Pedestrians and cyclists may also be affected, especially if sidewalks or dedicated pathways are closed or altered. Safety concerns may arise, particularly if construction zones are not adequately marked.</li> <li>Proper communication about road closures, detours, and construction schedules is crucial. Inadequate communication may lead to confusion among residents and</li> </ul>

S. No.	Social Attributes	Project Component	Potential Impacts
			<p>commuters.</p> <ul style="list-style-type: none"> <li>Accidents due to over-speeding of construction vehicles.</li> </ul> <p><b>Demolition of 02 ESRs (this will vary, based on the DBOT contractor's conditional assessment)</b></p> <ul style="list-style-type: none"> <li>Increase in dust level due to dismantling.</li> <li>Accumulation of demolished waste.</li> <li>Risk of damage to nearby existing property and human life.</li> <li>Impacts on Community health &amp; safety of the surrounding.</li> <li>Impacts on occupational health &amp; safety of workers.</li> </ul>
5	<b>Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS-5)</b>	ESRs and Transmission line	<ul style="list-style-type: none"> <li>As per the preliminary survey 874 business and vendors will be temporarily impacted during laying of the transmission line. This requires re-verification by the PIU and DBOT contractor during DMS.</li> <li>Construction activities may cause damage to private property, common property, roads, buildings, and religious sites.</li> </ul>
7	<b>Cultural-Heritage (ESS-8)</b>	WTP, ESRs and Transmission line	<ul style="list-style-type: none"> <li>Ludhiana has a rich history and cultural heritage sites, which are far away from the work site. However, there is a possibility of Chance Finds during excavation activities.</li> </ul>
8	<b>Stakeholder Engagement and Information Disclosure (ESS-10)</b>	WTP, ESRs and Transmission line	<p><b>Positive</b></p> <ul style="list-style-type: none"> <li>Frequent consultation will minimize potential opposition or resistance from the community towards the project.</li> </ul> <p><b>Negative</b></p> <ul style="list-style-type: none"> <li>Lack of effective communication between project and stakeholders will affect project execution.</li> </ul>
<b>C. Operation Phase</b>			
1	<b>Labor and Working Conditions (ESS-2)</b>	WTP, ESRs and Transmission line	<p><b>Positive</b></p> <ul style="list-style-type: none"> <li>Generate local job opportunities aligned with skills and education levels.</li> <li>Increase tax revenue for the project region, contributing to long-term economic growth and revenue generation.</li> </ul> <p><b>Negative</b></p> <ul style="list-style-type: none"> <li>Workers may be exposed to chemicals and hazardous materials such as chlorine during the water treatment process, posing risks to their health.</li> <li>The critical nature of water treatment services may result in stress levels for workers, especially during emergency situations or equipment failures.</li> </ul>
2	<b>Community Health and Safety (ESS-4)</b>	WTP, ESRs and Transmission line	<p><b>Positive</b></p> <ul style="list-style-type: none"> <li>The implementation of the project will directly contribute to improved public health.</li> <li>An improved water supply system will lead to an improvement in public order and governance.</li> </ul> <p><b>Negative</b></p> <ul style="list-style-type: none"> <li>Negative impact may arise from occurrence of chlorine contamination, if water is over chlorinated during treatment.</li> </ul>
4	<b>Stakeholder</b>	WTP,	<ul style="list-style-type: none"> <li>Meaningful consultation is a continuous process throughout</li> </ul>

S. No.	Social Attributes	Project Component	Potential Impacts
	Engagement and Information Disclosure (ESS-10)	ESRs and Transmission line	the project cycle for the information dissemination among the project proponent and other stakeholders to know the status of project development.

## 6.5. Resettlement and Rehabilitation (R&R)

### 6.5.1. Scope of R&R

The identified social impacts, as assessed above, are temporary in nature and limited to the project construction phase. The project involves minimal land requirements (~53 acres), which have already been purchased through mutual negotiation. The process of mutually negotiated settlement started during 2016. It also does not directly impact community structures, except for minimal temporary livelihood loss during project construction, especially during the laying of pipelines.

The scope of R&R is identified based on the field visits to each of the project component locations and transect walk along the proposed transmission line routes. There will be no private land acquisition undertaken for any of the project components; the entire civil works for the project will be done within the RoW of government land/ trust land. However, 874 business/vendors will be temporally impacted due to lying of Transmission Line. Efforts will be made by PIU and DBOT contractor to minimize impact to the extent possible. However, all the identified impacts will be mitigated through payment of compensation for the period of disruption/ income loss.

Component wise summary of resettlement impacts under the project are consolidated in Table 42 below and subsequently elaborated in the sub sections below:

**Table 42: Component Wise Summary of Resettlement Impacts**

S.No.	Component	Description	Location	Ownership	Resettlement Impacts
1	Water Treatment Plant	Capacity: 580 MLD Required Area: ~53 Acres	Village Bilga	Municipal Corporation of Ludhiana	<ul style="list-style-type: none"> <li>No Impact as land has already been purchased by direct negotiations at market rate by MCL.</li> <li>Presence of an access road (250m length) within the WTP owned by MCL, which will be relocated during construction of WTP. No significant impact is envisaged.</li> <li>Land parcel is vacant, unused, and free of encumbrance.</li> </ul>
2	Transmission Network	Length: 168 KM Diameter: 150mm to 2000mm.	Entire Project Area	NHAI, PWD, Railways, Forest, WRD, MCL, GLADA and LIT	<ul style="list-style-type: none"> <li>No Land acquisition or resettlement is envisaged.</li> <li>Temporary impacts during laying of pipeline identified on the livelihood of roadside businesses and vendors</li> </ul>
3	Elevated Service	Total 137 ESRs (Proposed +	Various Locations	MCL, GLADA, Loh	<ul style="list-style-type: none"> <li>No land acquisition or resettlement impact</li> </ul>

S.No.	Component	Description	Location	Ownership	Resettlement Impacts
	Reservoirs	Existing) Proposed/ Greenfield: 70 Nos. Existing: 67 Nos.		Langar Trust, and LIT	envisaged.  Land use: Details are provided in <b>Annexure 1</b> .

### 6.5.2. Budget for Mitigation of Social Impacts

This Budget estimate includes compensation for loss of livelihood to roadside business and vendors, detail survey cost, public consultation and awareness generation cost.

All the affected persons will be eligible for compensation as per the project RPF. The affected persons will be entitled to receive compensation for income loss for the period of disruption.

A Socio-economic survey will be conducted after the detailed DMS and finalization of alignment, at least 3 months before taking up the Transmission Line work. The E&S Unit of PIU, Ludhiana will conduct this survey under the supervision of the PMU. The survey will assess and collect details of affected people and actual size and scope of impacts. Once survey is done compensation for any land loss and loss of structures will be compensated as per the RPF. Any temporary loss of income of business people and vendors will be compensated as per their income levels and duration of impacts. For temporary loss of businesses and vendors actual loss is to be computed and paid subject to a minimum amount of INR 10,000/-, considering the temporary impacts will be for about 10 days on the businesses and vendors. Any damage to structures due to construction activities will be paid by contractor as estimated by PIU. Any removal of structures for want of working space or for accommodating pipeline will be paid for by the PIU as per the RPF. For construction activities involving disruption for a period of more than a month, provision of alternative sites for vendor and business owner for continued economic activities may be provided. If not possible, transitional allowance for the affected persons should be provided as per the RPF up to the actual period of disruption.

Cut-off date shall be announced prior to the start of DMS and socio-economic survey, PAPs identified during the socio-economic survey shall be eligible for the compensation. Identity cards will be prepared and distributed after the completion of socio-economic survey by PIU Ludhiana. PIU may establish separate cut-off dates for different sections of the alignment. PIU will document and disseminate the cut-off-date information throughout the project area.

Affected persons can raise their grievances using GRM for LBWS which is accessible through phone calls on toll free number (1800 1800 0172), and mSeva portal (<https://mseva.lgpunjab.gov.in/>). The project is in the process for allotting a dedicated WhatsApp number for receiving messages/grievances.

The GoP will bear all costs related to compensation payments and will be responsible for releasing the funds in a timely manner. This budget is prepared according to the provisions given under the Resettlement Policy Framework for the PMSIP. The PIU will facilitate meetings and camps to streamline the disbursement process and will also assist in educating those affected about the procedures for opening bank accounts, in cases where they do not currently have one. These costs are conservative estimates and will be reaffirmed during the socio-economic surveys.

The estimated cost for mitigation of social impacts is ₹ **7.5 Crores**. PIU will issue order for release of payment to affected persons, which shall be released through electronic clearance service/ National Electronic Fund Transfer (ECS/NEFT) transaction from bank, through concerned treasury of the state/district administration. All the compensation and loss of business income will be paid prior to the start of work.

Details of estimated budget are as follows:

**Table 43: Budgetary Provision for Mitigation of Social Impacts**

S.No.	Item Description	Nos and Unit	Rate (₹)	Total Amount (₹)
1	Temporary Loss of Livelihood PAP (Business & Vendors)	1000*	10,000	1,00,00,000
2	Compensation for structures i.e. staircases, compound wall, ramp, removed for facilitating pipeline laying	LS	-	2,00,00,000
3	Relocation of CPRs such as park facilities, graveyard infrastructure, handpumps, sitting arrangements etc.	LS	-	1,00,00,000
4	Construction of alternate approach road of length 2 KM	2 Km	1,00,00,000/ Km	2,00,00,000
5	Updating of draft Resettlement Plan, ID card preparation, Documentation etc.	LS	-	10,00,000
6	Surveys costs	LS	-	10,00,000
7	Public Consultation, Awareness Generation and Capacity Building	LS	-	20,00,000
<b>Sub-total</b>				<b>6,40,00,000</b>
<b>Unforeseen items @ 15%</b>				<b>96,00,000</b>
<b>Grand total</b>				<b>7,36,00,000</b>
				<b>Say 7.5 Crores</b>
*The rapid assessment indicated about 874 impacted business and vendors.				

## 6.6. Conclusion

The identified social impacts, as assessed above, are temporary in nature and limited to the project construction phase. The project involves minimal land requirements (~53 acres), which have already been purchased through mutual negotiation. The estimated impacts are temporary livelihood loss for 874 businesses and vendors during project construction, especially during the laying of pipelines. Construction phases may result in labor influx, occupational health and safety (OHS), and community health and safety (CHS) risks, during the construction. The above suggested mitigation measures will offset the adverse impacts.

The project stakeholders endorse the project and are confident that the water supply project will improve the quality of life, including health benefits. Impact assessment has been conducted in line with the World Bank ESF and ESS, and accordingly, the project is categorized as "Moderate Risk" category.

## 7. Stakeholders Assessment and Information Disclosure

The purpose of stakeholder assessment, their engagement and information disclosure is to gather insights and perspectives of stakeholders and their feedback on the assessment of impacts and mitigation measures proposed regarding social and environmental aspects related to the project. This section presents an analysis of the perceptions and suggestions of stakeholders across all three project components Water Treatment Plant (WTP), Elevated Service Reservoir (ESR), and Transmission Line.

### 7.1. Stakeholder Consultations

#### 7.1.1. Stakeholder consultations with 50 previous landowners (16th Feb 2023)

- The MCL purchased ~53 Acres of land by through direct negotiations for the construction of WTP. The 50 landowners, from whom the land was purchased, expressed worries over issues like access to farmlands (the approach road from Bilga village to the farmlands is going through the proposed WTP site; hence an alternative approach road is proposed as suggested by the community), road closures, and disruptions to the utilities (water supply and sewerage, power supply, internet cables etc.) during consultations. However, MCL assured that these concerns will be addressed.
- Consultations with residents close to the WTP revealed concerns about the anticipated pollution caused by the WTP, increase traffic and labor influx. However, MCL assured that these concerns will be addressed. The people were hopeful of some temporary job opportunities at the worksites.

#### 7.1.2. Stakeholder consultations with Ward Councilors, Mayor and MLAs (12th Feb 2023 to 18th Feb 2023)

- Consultations were held with twelve Ward Councilors, the Senior Deputy Mayor, and the Mayor of Ludhiana City. Their feedback emphasized on the importance of careful planning and the need for regular maintenance of existing water resources. The councilors suggested that construction work schedule needs to be announced in advance and MCL should ensure adequately skilled workers are available to ensure completion of works as per schedule.
- The MLAs suggested that the construction schedule should be revised per social functions or ceremonies in the respective areas and roads should be restored immediately after pipeline laying. They also suggested that tree cutting should be minimized and water sprinkling should be provided for dust suppression.

#### 7.1.3. Stakeholder consultation with community (15th Feb 2023 to 18th Feb 2023)

- Community consultations were conducted at 7 location Consultation with including slum areas, Park visitors and at residential areas. Community had awareness of the project, however, lacks project details such as ESR capacity, WTP location, Transmission Line alignment, etc. Community showed support for the project despite potential disruptions from construction activities. The community showed willingness to pay more for improved water services after the project's completion.

Details of the consultation with line departments are attached in **Annexure 26** and **Annexure 27**.

#### 7.1.4. Stakeholder consultations with Line departments

Consultations with the line departments were conducted to inform about the project scope and understand the point of view of the departments for timely implementation. Details of the consultations with line departments are provided in the table below.

**Table 44: Consultations with Line Departments**

S. No.	Consultation Date	Department Consulted	Consultation Location	No. of Participant
1	23-01-2024	Punjab Pollution Control Board	Punjab Pollution Control Board, Ludhiana	5
2	24-01-2024	Bharat Sanchar Nigam Limited	Bharat Sanchar Nigam Limited, Ludhiana	5
3	25-01-2024	Forest Department	Meeting with Forest Department Ludhiana	3
4	25-01-2024	Indian Railway	Indian Railway, Ludhiana Office	4
5	24-01-2024	Greater Ludhiana Area Development Authority (GLADA)	Greater Ludhiana Area Development Authority (GLADA) Official at GLADA Office, near MBD Mall, Ludhiana	4
6	23-01-2024	Ludhiana Improvement Trust	Office of Executive Engineer, LIT, Firoz Gandhi Market, Ludhiana	4
7	24-01-2024	Gas Authority of India Limited (GAIL)	Office of GAIL, Urban Estate, Phase-III, Dugri, Ludhiana	4
8	25-01-2024	Think Gas Ludhiana Pvt. Ltd.	Office of Think Gas, Dhanraj Complex, Opposite Gate No. 1 of PAU, Ludhiana.	4
9	24-01-2024	Traffic Police	Office of Traffic Police, Police Line, Civil Line, Ludhiana	5
10	25-01-2024	Labour Department	Office of Labour Department, Gill Road, Murad Pura Road, Ludhiana,	3
11	24-01-2024	Public Works Department	Office of PWD, Civil Line Ludhiana	5
12	24-01-2024	Punjab State Power Corporation Limited	Office of Punjab State Power Corporation Limited, Ludhiana	5
13	08-02-2024	District Forest Department	Office of the District Forest Department	4
14	09-02-2024	Archaeological Survey of India	Archaeological Survey of India	3
15	06-11-2023	Superintending Engineer, O&M, MCL	Zone-D, Municipal Corporation Ludhiana	4
16	06-11-2023	Joint Commissioner, MCL	Zone-D, Municipal Corporation Ludhiana	1
17	17-11-2023	NHAI	Office of PIU- NHAI, Janipur, Ludhiana	4
18	18-11-2023	Punjab Police	Police Station, Division No. 8, Civil Lines Ludhiana	3
19	20-11-2023	Forest Department	Office of DFO, Ludhiana	3
<b>GRAND TOTAL</b>				<b>72</b>

The summary of the consultations is as follows:

- Bharat Sanchar Nigam Limited (BSNL): This consultation explored guidelines and regulations regarding excavation around existing network lines.
- Indian Railway: Consultation with railway officials conveyed guidelines on project alignment with railway lines and submission procedures for online applications through the Rail Bhoomi Crossing Sewa portal.
- Ludhiana Improvement Trust (LIT): Discussions clarified the existing NoC granted to MCL for the construction of ESRs and the responsibilities that MCL would shoulder during construction, operation, and maintenance of the ESRs.
- Greater Ludhiana Area Development Authority (GLADA): GLADA officials outlined the NoC's implications for the construction or rehabilitation of ESRs, clarifying the share of responsibilities between GLADA and the MCL.
- Gas Authority of India Limited (GAIL): The consultation identified a minimum safe distance from existing gas pipelines and advised protocols for executing projects near gas pipeline networks.
- Think Gas: The consultation with Think Gas officials emphasized the importance of consultation to finalize the transmission line route.
- Traffic Police: The officials provided guidance on construction schedules and traffic management strategies for minimizing disruptions in congested areas.
- Labor Department: Discussion focused on acquiring labor licenses and adherence to protocols before and during labor deployment for project construction.
- PWD: Consultation emphasized procedures for acquiring necessary approvals for the laying of the transmission line on PWD roads; it was highlighted that a detailed layout of the proposed transmission line should be submitted along with the application.
- Punjab State Power Corporation Limited: The consultation delved into protocols for shifting high-tension and low-tension lines near the WTP site and proposed ESRs.
- Forest Department: In the consultation with the Forest Department, it was emphasized that permission under the Forest Conservation Act was required for the project, due to the Protected Forest Area along the I-R canal. The need for MCL to plant ten saplings for every felled tree was discussed, encouraging positive environmental impact. Stakeholders demonstrated readiness to cooperate throughout the project process.
- Archaeological Survey of India (ASI): During discussions with the Archaeological Survey of India, it was confirmed that all project components were at a safe distance from protected monuments/sites. Specific guidelines were provided for any construction near these sites, highlighting the need for strict observance of heritage laws. Stakeholders showed willingness for future cooperation.
- Superintending Engineer, PIU Ludhiana: E&S Consultant updated on ESIA progress, site visit objectives, S.E. O&M, instructed SDOs to assist E&S Consultant, request information for muck disposal site details, and technical project discussions.
- Joint Commissioner, PIU Ludhiana: E&S Consultant updated progress of ESIA study, site visit objectives, JC provided support, and directive MCL Staff to gather essential data requested by E&S Consultant for ESIA report.
- National Highway Authority of India: NH roads were Identified and discussed with NHAI officials; they recommended HDD method for transmission line crossing, further NoC checklist and guidelines were provided.
- Punjab Police: E&S Consultant briefed on the project and potential GBV risks, inquiry about GBV hotspots and cases.
- Forest Department, Ludhiana: DFO provided flora and fauna list, fees for the project, compensatory measures for tree cutting, request for forest map, and procedure for obtaining forest land information post site inspection.

Details of the consultation with line departments are attached in **Annexure 26A** and **Annexure 26B**.



**7.1.5. Stakeholder consultations with Sensitive Receptors and community:**

Additional Stakeholder consultations were conducted with community and sensitive receptors, such as Temples, Gurudwaras, Schools, Hospitals, clinic, etc. Details of the consultation with sensitive receptors are provided in the table below.

**Table 45: Consultations with Sensitive receptors**

S. N.	Consultation Location	No. of Consultation	Location	Consultation Date	No. of Participants
1.	Temples	3	<ul style="list-style-type: none"> <li>• Maa Vaishno Dham, Sector 32, Jamapur</li> <li>• Durga Mata Mandir (Geeta Bhawan)</li> <li>• Division-3 Mandir</li> </ul>	7-02-2024	23
2.	Gurudwara	3	<ul style="list-style-type: none"> <li>• New Subhas Nagar, Gurudwara</li> <li>• Gurudwara Nanak</li> <li>• Shri Guru Ravidas Gurudwara</li> </ul>	7-02-2024 to 08-02-2024	25
3.	Schools	7	<ul style="list-style-type: none"> <li>• S.O.E. Indira Puri School,</li> <li>• Narayna Techno e-School</li> <li>• Gurunanak Public School</li> <li>• Govt. Primary Smart School Jodhewal Chowk</li> <li>• GMT Public School, Grant Trunk Road</li> <li>• Govt. Primary School, Bilga,</li> <li>• Sant Baba Wariam Singh Senior Secondary School, Rajgarh</li> </ul>	7-02-2024 to 09-02-2024	68
4.	Hospitals	4	<ul style="list-style-type: none"> <li>• Shri Durga Mata Mandir Trust Hospital</li> <li>• Deepak Hospital</li> <li>• CMC Hospital brown Road</li> <li>• ESIC Hospital, Bharat Nagar</li> </ul>	7-02-2024 to 09-02-2024	24
5.	Diagnostic Centre	1	<ul style="list-style-type: none"> <li>• Navya Diagnostic Doogri</li> </ul>	08-02-2024	4
6.	Clinic	1	<ul style="list-style-type: none"> <li>• Passi Clinic, Subhas Nagar</li> </ul>	7-02-2024	7
7.	Market Shops	4	<ul style="list-style-type: none"> <li>• Main road New Subha Nagar, Sarabha Nagar Market, Doogri Road</li> </ul>	7-02-2024 to 08-02-2024	41
8.	Medical Store	1	<ul style="list-style-type: none"> <li>• New Subhash Nagar</li> </ul>	7-02-2024	6
9.	Street Vendors	4	<ul style="list-style-type: none"> <li>• Rahon Road Basti Chowk,</li> <li>• Gill Chowk</li> <li>• Sita Mata Mandir</li> <li>• Clock Tower Ghanta Nagar</li> </ul>	7-02-2024 to 09-02-2024	41
10	Village	3	<ul style="list-style-type: none"> <li>• Bilga Village,</li> <li>• Dhour Village</li> <li>• Jaspal Bangar Village</li> </ul>	09-02-2024 to 21-02-2024	13

S. N.	Consultation Location	No. of Consultation	Location	Consultation Date	No. of Participants
<b>Grand Total</b>		<b>30</b>			<b>252</b>

The Summary of the consultations are as follows.

- Both Shopkeepers and service providers including medical stores, diagnostic centers, etc expressed concern about potential disruptions to their business operations due to construction noise, dust, and reduced accessibility for customers.
- Schools, temples and shopkeepers raised concerns about the timing of construction. They suggested construction be carried out during off-peak hours or at night to minimize disruption.
- Worries were raised by the temple and hospital officials about potential damage to the structures and the safety of staff, worshippers, and patients.
- There was a shared expectation from the project team to provide regular updates about construction progress and potential disruptions.
- Some stakeholders viewed the construction phase as an opportunity for local employment.
- Some stakeholders, particularly from hospitals and diagnostic centers, expressed concerns about the potential health risks linked to construction, such as noise pollution and the spread of dust and debris.
- Concerns were raised about potential disturbances to public services like school transportation and ambulance services due to traffic diversions or blockages.
- Temple and Gurudwara officials raised concerns about the potential disruptions to religious practices and social service activities such as free meals ("langar").
- There were concerns about interference with existing utilities and infrastructure, including the possibilities of damage or a halt in services.
- Stakeholders, particularly shopkeepers, were concerned about the potential economic repercussions due to reduced customer footfall and interruption in normal sales.
- There were concerns about the management and disposal of construction waste and maintaining cleanliness in the vicinity.
- Concern was raised about elderly and physically challenged individuals' accessibility during construction for centers like hospitals and temples.
- Despite these concerns, most stakeholders expressed their overall support for the project, understanding its long-term benefits.

For detailed Consultations with the Community and Community Representatives refer **Annexure 27A** and **Annexure 27B**.

## 7.2. GBV Risk Mitigation Strategy/Action Plan

Although no incidents of Gender-Based Violence (GBV) were reported during the consultations, measures to mitigate GBV risks are imperative. These measures are to be implemented near all GBV hotspots and closely monitored throughout the entire project cycle. The PIU with the assistance of the E&S unit identifies all GBV hotspots near worksites and workers camps, prepare a GBV action plan and implement the same. Migrant women laborers may be vulnerable without adequate safety and security measures at work sites and within labor camps. Ensuring suitable working conditions for women's participation involves addressing various aspects, such as gender-equal wage rates, safety, and security considerations through a Grievance Redress Mechanism (GRM), provision of child-care facilities, adherence to health and sanitary requirements, availability of separate accommodation and toilets for female workers during construction at the workers camps. Additionally, stringent adherence to child labor norms is crucial.

To facilitate monitoring and control of GBV action plan, a Gender-Based Violence Toolkit has been prepared and is enclosed in **Annexure 10**.

### **7.3. Information Disclosure**

The final environmental and social impact assessment report, approved by the World Bank, will be disclosed on the PMIDC and PIU Ludhiana websites before project implementation. The World Bank would also disclose this ESIA. Construction schedules will be communicated to the concerned communities in advance. PIU Ludhiana will conduct continuous stakeholder consultations and information disclosure during construction phase.

## 8. Environmental and Social Management Plan

### 8.1. Environmental and Social Mitigation Measures

The Environmental and Social Management Plan (ESMP) is prepared based on the assessment of Environmental and Social Impacts concerning location impacts, construction related impacts, and operation and maintenance related impacts. The potential impacts due to the project are described in Table 46. This section contains a detailed schedule for implementing each recommended mitigation measure, along with specifying primary responsibility for the implementation which is detailed out in Table 47. Additionally, this section covers the monitoring plan, capacity building and training schedule, Implementation arrangement, Grievance Redressal Mechanism and budget for implementing the ESMP.

**Table 46: Environmental and Social Impacts**

S. No.	Impacts	Reference
<b>Environment:</b>		
1.	Impact on Land Environment; Change in Land use, land/soil pollution, Soil erosion	E1
2.	Impact on Ecological Resources; Diversion of Forest land (6.836 ha.), Tree felling (495 trees and 895 poles)	E2
3.	Impact on Water Environment; Impact on Surface water, Ground water, Water Pollution	E3
4.	Impact on Air Environment; Dust Pollution, Air Pollution, bright light during Nighttime	E4
5.	Impact on Noise Environment; During construction and operation phase	E5
6.	Statutory Clearances, NoCs and Reporting Requirements	E6
7.	Impact on Natural Resources and other material- use of aggregate (1,30,000 cum), sand (83,000cum), cement (60,000MT) and steel (15000MT) etc.	E7
8.	Risk of Accidents/incidents including risks associated with working at height and depth, use of heavy equipment, Accident from different project activities & natural disasters	E8
9.	Traffic Management during construction activities, movement of machineries, Materials carrying vehicles and construction vehicles (truck etc.)	E9
10.	Electrical Hazards risks/ Fire risk hazard	E10
11.	Impacts associated with the Waste generation {Solid (approx. 375kg/day) and hazardous waste}; C&D waste (approx. 806 Cum), Muck disposal, Sludge generation (5916 kg/day), sewerage waste, chemical spillages, biomedical waste (.75kg/day), paint, oil/grease, diesel etc.	E11
12.	Impacts associated with bursting or breakage of pipe, vibrations caused by construction work, etc.	E12
<b>Social:</b>		
1.	Impact on land; Purchase of ~53 acres of private land with 50 landowners on negotiation basis, Opposition of community at certain OHSR locations, Change of Land use (4 sites having dispute)	S1
2.	Impacts like damage to residential buildings, establishments, and common property/ public utilities due to road-cutting and trenching operations for laying pipelines, disruption to access to the houses and businesses may occur. (A provisional budget is provided in the ESIA for mitigation of these impacts and size and scope of this impact will be known once the alignment is marked on the ground)	S2
3.	Impact on livelihood; Temporary or permanent loss of livelihood/ relocation of place of 874 business/ livelihood for petty shop owners, hawkers and street	S3

S. No.	Impacts	Reference
	vendors, impacts on squatters along transmission pipeline, disruption to access to roadside shops. Temporary lease of private land for laying of transmission line due to limited availability of RoW/ Working space.	
4.	Occupational Health and Safety of Workers/labors; Accidents and Incidents, Poor housekeeping, Lack of/Inadequate facilities at labor camp sites, Health risks of labor related to HIV/AIDS and other sexually transmitted diseases, Work at heights/ depths/ confined spaces, risk during OHSRs construction Labours are expected to be approx. 1500.	S4
5.	Labor and working conditions; high reliance on migrant labor for meeting labor requirements may lead to labor Influx affecting project areas- especially WTP and OHSR sites, adverse impacts in the form of additional burden on public infrastructure such as health services, utilities (i.e. water and electricity), sanitation facilities/ housing and social conflicts are likely to occur, increased risk of communicable diseases, increased cases of Gender Based Violence (GBV) and risks of SEA-H of workers and locals, especially females and those with intersectionalities.	S5
6.	Community Health and Safety; Heavy machinery and materials will generate dust and noise, affecting nearby residents and workers, impacts of the WTP construction and operation on adjoining communities	S6
7.	Direct and Indirect impacts on cultural heritage	S7
8.	Disruption to utilities/ services such as existing water supply, sewerage, power, internet, etc. due to trenching and laying of pipeline, Utility shifting for transmission line laying may affect respective services.	S8
9.	Risk of GBV on local community arising from influx of migrant laborer's, Risk of sexual exploitation and abuse and sexual harassment (SEA & SH) workers and locals, especially female, who are intersectional disadvantaged groups	S9
10.	Stakeholder's Engagement and Information Disclosure; Failure to engage stakeholders can result in public nuisance and grievances, disruption to local businesses and issues of local residents	S10
11.	Security; conflicts with local community at site, Risk of materials theft by local community, Conflicts within workers at workmen camps, Illegal entry of unauthorized persons at site, etc.	S11
12.	Impact to sensitive receptors, such as schools, hospitals, places of worship, parks, other common property resources (CPR) etc.	S12

## 8.2. Proposed Environmental and Social Management Plan (ESMP)

The ESMP has been prepared for the project listing out the potential adverse impacts associated with different project activities, mitigation measures, implementation responsibility and monitoring. This management plan is prepared for all key components of this project including WTP, OHSRs and Transmission Line, except for the Intake and canal remodelling works to be executed by WRD. The ESMP is given in the Table 47.

**Table 47: Environmental and Social Management Plan**

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
<b>Pre-Construction Phase</b>				
Statutory Clearances/ NOCs	E6	List of all the statutory clearances and NOCs to be obtained are given in the Table No. 49 under Section 8.3.	Contractor, PIU	PIU & PMU
C-ESMP and Reporting requirements	E6	<ul style="list-style-type: none"> <li>▪ The contractor shall prepare site specific C-ESMP for all works and submit the same for employer’s approval. Contractor shall not proceed with works without approval of site-specific plans.</li> <li>▪ The C-ESMP shall include but not limited to the following plans: <ul style="list-style-type: none"> <li>• Noise Monitoring and Control Plan</li> <li>• Water Resource Protection Plan</li> <li>• Hazardous Materials Management Plan</li> <li>• Pollution Prevention and Control Plan</li> <li>• C&amp;D, Domestic Waste and Wastewater Management Plan</li> <li>• OHSR Demolition Methodology and Strategy</li> <li>• Earthwork management plan</li> <li>• Hazardous Waste Management Plan</li> <li>• Bio-medical Waste Management Plan</li> <li>• Tree Cutting, Transplantation and Translocation Action Plan</li> <li>• Boundary Marking and Protection Plan</li> <li>• Worksites Management Plan</li> <li>• Plan for barricading</li> <li>• Sensitive Receptors Identification and Protection Plan</li> <li>• Traffic Management Plan</li> <li>• Emergency Action Plan</li> <li>• Demolition Plan</li> <li>• Worker Accommodation and Welfare Plan</li> <li>• Occupational Health and Safety Plan</li> <li>• Community Interaction plan</li> <li>• ESHS Monitoring Plan</li> </ul> </li> </ul>	Contractor	PIU & PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>• Fire Safety Plan</li> <li>• Any other plan as required by the contract works.</li> <li>• Monthly and Quarterly Environmental and Social Progress Monitoring Reports (MPR &amp; QPRs) shall be submitted to the Employer.</li> <li>• The contractor will review the C-ESMP at least once every six months from the commencement of the contract, till it's completion. If and as necessary, the contractor is also expected to revise the C-ESMP as appropriate. Any revisions to the C-ESMP will be scrutinized by the PIU and approved by the PMU for implementation.</li> </ul>		
Testing of Environmental Parameters	E6	<ul style="list-style-type: none"> <li>• The contractor shall test all the environmental parameters as indicated in the environmental monitoring plan, before the start of any construction activity, to establish a baseline and incorporate these testing results into the C-ESMP.</li> <li>• Thereafter the contractor shall test the environmental parameters on a regular basis as indicated in the environmental monitoring plan and incorporate the results into monthly and quarterly Environmental and Social Progress Monitoring Reports.</li> </ul>	Contractor	PIU & PMU
<b>Construction Phase</b>				
Site Clearance	E1, E4, E5 and E9	<ul style="list-style-type: none"> <li>• Excavated earth/ stockpiles shall not be piled at construction site and shall regularly be removed. They shall be stored in a covered condition to prevent erosion due to wind and water action. High and very close stockpiles shall be avoided.</li> <li>• Drainage facilities shall be provided in the stockpile area to prevent erosion / washing away of stockpiles.</li> <li>• Topsoil from the WTP site shall be removed up to the depth of 20 cm and shall be stored for later usage for landscaping and dressing of the temporarily affected areas at the time of restoration. PIU/MCL shall auction<sup>70</sup> the excess topsoil and sell it to the highest bidder after completion of construction.</li> <li>• Topsoil shall be stored in the form of stockpiles. The slope and height of the stockpile</li> </ul>	Contractor	PIU and PMU

<sup>70</sup> As per the consultation with PIU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>shall be maintained as per the angle of repose of the material. A minimum distance of 250 m shall be maintained between two stockpiles to allow for proper access. These stockpiles shall be sprinkled with water to minimize the erosion.</p> <ul style="list-style-type: none"> <li>• Site clearance only where it is required.</li> </ul>		
Establishment of Batch mix plant for Concrete	E6 and S6, S12	<p>The project will require approximately 165,000 cum. of concrete. The contractor shall establish a Ready-Mix Concrete Plant.</p> <ul style="list-style-type: none"> <li>• Consent to Establish (CTE) shall be obtained before establishment and Consent to Operate (CTO) shall be obtained before start of for operation from the Punjab Pollution Control Board (PPCB). The Contractor shall obtain permissions from PPCB before shifting of the Batching Plant.</li> <li>• If contractor procures any material (such as ready-mix concrete, asphalt/macadam, aggregates etc.) from third party agencies, contractor shall ensure that such agencies have all necessary clearances / permissions as required under the law; these include CTE/CTO from PPCB, environmental clearance, etc.; contractor shall collect the copy of these certificates and submit to PIU as part of the compliance; PIU will approve the source only after all the certificates are submitted. The same shall be presented during yearly environmental audit.</li> <li>• Compliance with relevant emission control legislation at the state level must be ensured for all equipment, machines, engines, generators, and vehicles which are involved in the crushers, and concrete batching plants and material transfer.</li> <li>• At least 500 m, distance must be maintained between these plants and the human settlements/ sensitive receptors/ forest land/ water bodies in the downwind direction.</li> <li>• All suggested mitigation measures for air and dust pollution, noise pollution, water pollution etc. shall be strictly implemented.</li> <li>• Compliance report to the condition of these consents shall be prepared and submitted to the PPCB.</li> <li>• For the establishment of the labour camps, storage yard, garages, site offices, etc. permissions shall be obtained from PPCB and Municipal Corporation of Ludhiana (MCL).</li> </ul>	Contractor	PIU and PMU
Labor Camp	E10 and S5	It is anticipated that around 1500 workers will be deployed by the contractor for the civil	Contractor	PIU and



Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
Management		<p>works at WTP, OHSRs and transmission line.</p> <ul style="list-style-type: none"> <li>• Camps sites shall preferably be established on unused and barren land so as the vegetation removal and tree cutting can be minimized. Camp locations should be carefully selected to avoid the land use categories: residential, sensitive and Eco sensitive areas. Distance of minimum 500 m shall be maintained between the said land use and labour camp locations.</li> <li>• Camps shall also be established at approx. 500 m distance from the water bodies to prevent any impact on the water body.</li> <li>• The Agreement of Lease and NOC shall be obtained from the landowner and the concerned authority prior establishment of the labour camp. All lease agreements made for the labour camps and other facilities with landowners need to be submitted to the employer. At WTP nearly 16 acres of land is vacant and is kept for future expansion. If the contractor so desires and MCL agrees, the same can be used for the labour camps and as storage yard. In this case, the landowner will be MCL itself.</li> <li>• Land shall be restored back to its original condition immediately after the completion of construction works and prior handing over the land back to the landowner. All waste materials, temporary/ permanent structures, etc. shall be removed from the camp site and the site shall be re-vegetated with the native species of trees.</li> <li>• Training and awareness shall be provided to the labour to not indulge in conflicts/ quarrels with surrounding communities and in any unfair practices/acts.</li> <li>• The labour camp should be enclosed with boundary wall/ fencing and guards must be employed to control access only to the authorized.</li> <li>• The movement of the workers should be monitored by providing adequate security checks, CCTV Cameras and all the workers shall be checked for the availability of valid ID cards issued by the contractor.</li> <li>• According to the Indian Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act of 1996 and the Central Rules of 1998, Adequate area for labour accommodation shall be provided at WTP and for labour camps for ESRs works will be located at a distance from the community.</li> <li>• A cooked food canteen on a moderate scale shall be provided for workers so that they</li> </ul>		PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>can have their meal at a definite place. All the waste generated from the canteen shall be treated/ disposed of as detailed in the other sections of the waste disposal. The labour need not to depend on the nearby facilities for food and so interaction with the nearby community will be minimized.</p> <ul style="list-style-type: none"> <li>• Firewood and other conventional fuels like dung cakes, paper, waste materials, etc. shall not be used for cooking and campfires. Contractors must provide only clean fuel for cooking like LPG gas.</li> <li>• Health problems of the workers should be taken care of by providing basic health care facilities through a health center at the construction camps. The health center will have at least a doctor, nurses, duty staff, medicines, and minimum medical facilities to tackle first-aid requirements for minor accidental cases and other illnesses. Some arrangements need to be made with the nearest hospital to refer patients with major illnesses or critical cases. The health center will carry out a quarterly awareness programme of HIV-AIDS with the help of AIDS control society. Posters will be exhibited in the health care clinic for awareness. This will not only be beneficial for the labours/ workers health but also very significant to protect the health of the nearby communities especially against the contagious diseases. Similarly, COVID-19 and other such infectious diseases awareness will also be provided to the workers. The biomedical waste generated from the medical center shall be disposed off in a proper manner. Contractor shall hire a third party for safe disposal of biomedical waste.</li> <li>• Facilities at the camp sites shall be provided as per BOCWA, 1996 and BOCWA Rules 2023 so as to establish proper sanitation facility and waste management system at the site to prevent impact on air, water, and soil quality of the area. Details are presented below: <ul style="list-style-type: none"> <li>• Labour camp shall be provided with a minimum of 11,000sq. m. of carpet area for accommodating 1500 workers.</li> <li>• The contractor must arrange for separate accommodation for female workers with separate latrines and bathrooms marked as “For Female Only”, in the languages of the workers and pictorially.</li> <li>• Labor camps shall be provided with all the facilities as per BOCWA, BOCWR including drinking water facility, sanitation facility, waste management facility,</li> </ul> </li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<p>bedding, ventilation, lighting, drainage, toilets etc.</p> <ul style="list-style-type: none"> <li>• All the workers shall be provided with proper beds with adequate space in properly ventilated rooms and adequate private storage space with locks. The rooms shall have provision for charging points for each of the workers.</li> <li>• Construction camps shall be provided with sanitary latrines and urinals with water facilities. Closed drainage systems and the proper on-site treatment system according to the local conditions should be provided for proper disposal meeting the standards as prescribed by CPCB. If sewage generation is more than 10 KLD then STP shall be provided if less than 10 KLD then sewage can be disposed through septic tank / soak pit. Soak pits shall not be provided within 100 m of the water body or any water source to prevent impact on water quality. As there are several work locations spread over the city, the contractor will be established above 10 labour camps accommodating about 100-150 workers in each. Hence the sewage generation from each camp will be less than 10KLD. (Approx. less than 5KLD). The Contractor will opt for soak pits/septic tanks/temporary connection to existing sewage network, depending upon the sewage generation from that labour camp.</li> <li>• The DBOT contractor will inform nearby piggeries to collect the food waste; when they do not collect, it the contractor will transport the waste to existing windrow composting plant of the MCL. All the municipal waste shall be disposed of through the authorized local waste management agencies only if any in-house treatment facility is not available.</li> <li>• A waste disposal and management plan will be prepared by the contractor before start of construction works and submitted to employer for their review and approval.</li> <li>• There must be proper sewage and solid waste handling and management for the labour camps. The drainage must be proper in the camp area with no stagnancy of the water. Also, the drainage from the camps must not affect the domestic supply of public water.</li> <li>• Labor camps shall be inspected regularly, and reports shall be submitted to employer.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<ul style="list-style-type: none"> <li>All the non-compliances pointed out during the inspections shall be closed at the earliest.</li> <li>The Contractor must establish a Worker GRM (shall include worker representatives and Employer representatives) for redressal of grievances.</li> </ul>		
Occupational Health and Safety	S4	<p>Contractor shall have Occupational Health and Safety Management system for all the construction activities to control and prevent any OHS related issues and accidents as per the Indian Labor Acts and Codes, and EHS Guidelines of the World Bank Group/ IFC and ILO Labor Standards.</p> <p>Health Related Measures:</p> <ul style="list-style-type: none"> <li>Contractor shall implement workers health awareness and surveillance program including health check-ups, regular health monitoring systems for the workers, vaccination drives for prevention of diseases and awareness programs.</li> <li>Contractor shall establish occupational health clinics and ensure availability of adequate first aid kits, first aiders, nurses, doctors on 24X7 basis.</li> <li>Workers shall be provided with hydrating drinks like ORS as required to prevent heat stress / exhaustion.</li> <li>Provision of covered rest areas at regular intervals with proper facilities like resting desks, drinking water facility, toilets etc. at construction site. These rest shelters shall be inspected monthly, and the non-compliances shall be monitored regularly.</li> <li>Ambulance with all the required facilities as per BOCWA, 1996, should be provided at all work sites to take injured persons to hospitals.</li> <li>Full-time medical facility should be provided at each labour camp with first aid kits &amp; first aider. Emergency contact details (including nearest hospitals and health centres) should be displayed at appropriate locations at construction sites &amp; labour camps. The Contractor shall have tie-up arrangements with these for any emergencies and serious incidents.</li> <li>Workers shall be provided with proper training to handle any health-related emergency, if any.</li> <li>Contractor shall provide all the facilities such as potable drinking water, toilets with water facility, kitchen area, clean cooking fuel, proper bedding, adequate number of</li> </ul>	Contractor	PIU and PMU

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		<p>toilets and bathing areas, maintenance of cleanliness and sanitation, etc. at the labour camp site. Labor camp establishment shall strictly follow the BOCWA, 1996 and the WGB EHS Guidelines.</p> <ul style="list-style-type: none"> <li>• A sufficient supply of potable water should be ensured for all workers and employees on-site. Conducting regular monitoring of drinking water quality at site and labour camps,</li> <li>• Provision of dust and noise shields and maintenance of adequate distance between the workers and noise/dust generation activities as applicable.</li> <li>• Drinking water quality, air quality and noise level shall regularly be monitored at all the labour camps sites as per CPCB guidelines in regular intervals.</li> <li>• Contractor shall implement administrative controls like practicing job rotation, maintaining work hours of labour, implementing work permit system, implementing LOTO, for the workers to prevent continuous exposure to dust, noise, heat, etc.</li> <li>• All workers and staff should be provided with Personal Protective Equipment (PPE) appropriate to their job on site to minimize exposure to the dust and noise like masks, ear plugs etc.</li> <li>• Environmental Management Plan for dust and noise control shall strictly be followed as suggested.</li> <li>• Framing and implementation of a drugs/ intoxicants prohibition policy by contractor during the entire contract is needed.</li> <li>• Ensuring availability of snake charmers at the site for catching the snakes and contacts details of the snake catching organizations shall be provided at the site to handle the situation in case of sighting of a snake. Anti-venoms shall be kept at the nearest hospitals/ PHCs to treat snake bites if any.</li> </ul> <p><b>Safety Related Measures:</b></p> <ul style="list-style-type: none"> <li>• A safe work method statement including Hazardous Identification Risk Assessment shall be prepared and implemented for all the construction activities. This should be approved by the employer,</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<ul style="list-style-type: none"> <li>● Provision of adequate fire detection and firefighting systems at the site like extinguishers, sand buckets, fire blankets, usage of fire-resistant materials/wires, etc.</li> <li>● Contractor shall prepare emergency preparedness plan to handle any contingency due to construction accidents and natural or man-made disasters like earthquakes, floods, cyclones, dust storms, etc.</li> <li>● Contractor shall develop traffic management plan to prevent any traffic related accidents at or outside the site. Contractor shall provide defensive training to the drivers to minimize the accidents.</li> <li>● Contractor shall fence all electric equipment, and other areas to minimize electrocution risk and shall also provide proper earthing, proper warning signs and conduct security patrols.</li> <li>● Contractor shall ensure provision of safe work environment, provision of competent supervision, provision of safe equipment &amp; machinery and provision of proper training to ensure safety at work site.</li> <li>● Contractor should appoint an agency to provide awareness about the prevention of STDs among the workers. The agency shall work in close coordination with NACO and SACS for organizing the awareness campaigns. Workers shall be provided with condoms and diaphragms as required for minimizing the spread of STDs.</li> <li>● Regular home visit holidays shall be given to the workers to ensure their proper mental health.</li> <li>● All workers shall be provided with job specific training, behavioural based safety training and awareness for ensuring safety.</li> <li>● Smoking shall be prohibited at the site to prevent health and fire hazards. If required, a dedicated zone shall be provided away from the construction site.</li> <li>● All construction sites should be barricaded with proper tamper proof fencing &amp; security lighting and conduct regular security patrols and other security measures. All the construction activities and storage of material shall be strictly within the work site premises/ stores/ yards. All hazardous chemicals &amp; waste and explosives (if any) shall be stored as per the guidelines in the respective laws.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>• Avoiding usage of the chemicals or paints which may impact the health of the workers or community and shall encourage use of the VOC free paints, etc. No banned material like asbestos shall be used at the construction site.</li> <li>• All workers and staff should be provided with Personal Protective Equipment (PPE) like safety jackets, helmets, gloves, goggles, life jackets, in case of work on/near water body appropriate to their job on site to minimize exposure to the hazards.</li> <li>• Coordination with local police to curb anti-social activities and usage of drugs &amp; narcotics is needed.</li> <li>• Contractor shall do regular monitoring and perform audits/ inspection system for ensuring effective implementation of safety management system and shall ensure continuous improvement of its safety management system.</li> <li>• All the workers shall be tested for vertigo prior to assigning working at heights. Workers working at height shall be provided with adequate PPEs like harness with lifelines, safety jackets, goggles and helmets.</li> <li>• A proper safe and wide working platform with railing shall be provided for the workers working at heights. These working platforms shall be anti-slipping type. At OHSRs, workers shall be required to work at heights ranging from 32-35m, hence proper safety precautions needs to be taken.</li> <li>• A safety expert shall always be available at the site to supervise works being carried out at height.</li> <li>• All the ladders and platforms shall be inspected prior to installation and shall regularly be inspected for fitness.</li> <li>• Manlifts shall be avoided and if required all precautions shall be taken to ensure safety.</li> <li>• Electrical safety inspections shall be conducted on daily, weekly and monthly basis. Scores for the monthly electrical audits shall be checked and improved every month to achieve the higher safety score. External electrical safety audits shall be conducted half-yearly to ensure electrical safety. Findings of all the inspections and audits shall be closed with satisfactory requirements within given time frames by auditors/safety experts/electrical engineers. Follow up audits/inspections for electrical and general</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<p>safety shall be performed for verification of closure of the findings of inspections and audits.</p> <ul style="list-style-type: none"> <li>All workers and staff should be provided with Personal Protective Equipment (PPE) to work in disinfected unit to minimize exposure of chemicals.</li> <li>Ensure regular maintenance and inspection of equipment and machinery to keep them in safe working condition.</li> </ul>		
Work at Heights, Depths and Confined spaces	E8 and S4	<ul style="list-style-type: none"> <li>The project involves working at heights of about 32 metres (on OHSRs) and at depths of about 10 metres. The work also involves working in confined spaces during transmission pipe laying.</li> <li>The Contractor shall conduct HIRA of the activities to be carried out at heights, depths, and confined spaces. The HIRA needs to be approved by the employer. The Contractor needs to take the following precautions, wherever the works are at height/ depth.</li> <li>Develop a working plan: Plan work to minimize the time spent at heights and ensure safe access and egress.</li> <li>Installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area.</li> <li>Proper use of ladders and scaffolds by trained employees</li> <li>Use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal lifelines.</li> <li>Appropriate training in use, serviceability, and integrity of the necessary PPE.</li> <li>Inclusion of rescue and/or recovery plans, and equipment to respond to workers after an arrested fall.</li> <li>Prior to initiating work, the equipment and location must be verified for safety and appropriateness.</li> <li>For all work of more than 1 day in duration, a systematic verification of the satisfactory implementation of this procedure must be carried out by a Competent Person, at a frequency appropriate the duration and risk of the task.</li> </ul>	Contractor	PIU and PMU



Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<ul style="list-style-type: none"> <li>● On completion of the work, it must be formally verified by a competent person, that the workplace has been left in a satisfactory condition and that all persons have safely returned from the workplace.</li> <li>● Records to be maintained at site offices. PPEs and Tools associated with the procedures to be stored at site offices.</li> <li>● Fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of falling more than two meters; into operating machinery; into water or other liquid; into hazardous substances; or through an opening in a work surface.</li> <li>● Fall prevention / protection measures may also be warranted on a case-specific basis when there are risks of falling from lesser heights.</li> <li>● Emergency preparedness and Response should include the following:               <ul style="list-style-type: none"> <li>a) Install fall protection devices such as full body harnesses,</li> <li>b) Usage of the approved (type and rating) fall protection equipment is mandatory,</li> <li>c) Fall Protection Equipment must be inspected by the user &amp; trained person daily,</li> <li>d) Double hook full body Safety harnesses that have been used in a fall arrest situation must be withdrawn from service and not reused/issued until after a full examination - Records of the results of thorough examinations must be kept on site,</li> <li>e) Lifelines fall arrestor used for the attachment of Double hook full body Safety harnesses must be i) Horizontal lifelines must be made of steel rope 12 mm diameter (min), ii) Installed at waist height or above, iii) Tensioned by use of a turnbuckle or similar, iv) Designed to support the maximum number of workers, v) Securely anchored at both ends with triplicate wire rope clamps at points able to withstand the dynamic load generated by a fall, vi) All lanyards must be made of flame-resistant materials. Inertia reels may be used to enable more safe movement around certain areas, and vii) Emergency response plan, emergency information and signal types and meaning, emergency response and control provisions on site.</li> </ul> </li> <li>● The contractor must conduct monthly safety audits at all project sites.</li> <li>● The contractor must encourage and practice buddy system for working at heights/ depths.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<ul style="list-style-type: none"> <li>• Signages for workers and the public during the work and maintenance should be strictly maintained.</li> <li>• Training to site staff and environment personnel on Inspection Procedures, Discussions &amp; format instructions for Contractors Personnel, Safety procedures for working at confined spaces/ heights/ depths, safety procedures for handling of hazardous materials.</li> <li>• Use of suitable masks for reducing exposure to dust emissions and toxic fumes on site.</li> <li>• When working in confined spaces, the contractor shall arrange for measuring oxygen content in the air and provide for air blowers, if required.</li> <li>• Providing training to the workers for handling hazardous material and exposure to toxic gases.</li> <li>• The inspection of procedures, PPEs, Usage and Trainings on site to be conducted weekly and daily where required.</li> <li>• Incident Reporting Records, Event Logs, PPE inventory, Work plan, Manpower details need to be maintained by the contractor's safety officer.</li> <li>• Good housekeeping: Many accidents occur because floor gratings have been removed and not replaced, or superfluous materials are left in elevated positions causing slip, trip and fall hazards. The Contractor shall clean all areas of site and structure (exterior and interior) involved in its respective contract work immediately before final inspection. The contractors shall take Protection and Control measures through a) risk areas demarcation, and b) follow the safe work procedures and close out.</li> <li>• The contractor needs engage sufficient supervisors as observers during the work at heights/ depths/ confined spaces.</li> <li>• Encourage the reporting of all incidents and near-misses, and conduct investigations to prevent future occurrences.</li> </ul>		
Housekeeping	S4, S5 and E10	The project has work sites at WTP, 137 ESRs (67 existing, 70 proposed), approximately 168 KM of transmission lines, about 10 labour camps will be established at different locations for WTP works, TL works and ESR works. The contractor may establish a RCC batching plant. The contractor will also establish a material storage yard and a vehicle yard at	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<p>convenient locations. These shall be kept in good condition through proper housekeeping. Housekeeping is the act of keeping the working environment clear of all unnecessary waste, thereby providing a first line of defence against accidents and injuries.</p> <ul style="list-style-type: none"> <li>• The Contractor shall understand and accept that improper housekeeping is the primary hazard in any construction site and ensure that a high degree of housekeeping is always maintained.</li> <li>• Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.</li> <li>• General Housekeeping shall be carried out by the Contractor and ensured at all times at all work sites. Towards this the contractor shall constitute a special group of housekeeping personnel. This group shall ensure daily cleaning at work sites and surrounding areas and maintain a register as per the approved format by the Employer.</li> <li>• Adequate time shall be assigned to ensure that good housekeeping is maintained. This shall be carried out by a team of housekeeping squads.</li> <li>• The Contractor shall be responsible for providing segregated containers for disposal of debris at required places and regular cleaning of the same.</li> <li>• Full height fence, barriers, hard barricades etc. shall be erected around the work sites in order to prevent the surrounding area from excavated soil, rubbish etc., which may cause inconvenience to and endanger the public. The hard barricade, especially those exposed to public shall be aesthetically maintained by regular cleaning and painting as directed by the Employer. These shall be maintained in one line and level.</li> <li>• The structure dimensions of the hard barricade, material and composition, its colour scheme, project logo and other details shall be in accordance with specifications laid down in tender documents.</li> <li>• All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, firefighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.</li> <li>• Lumber with protruding nails shall be either bent / removed and properly stacked.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<ul style="list-style-type: none"> <li>• All surplus earth and debris are removed / disposed of from the working areas to officially designated dumpsites. Trucks carrying sand, earth, and any pulverized materials etc. to avoid dust or odor impact shall be covered while moving. The tyres of the trucks leaving the site shall be cleaned with water, wherever the possibility of spillage on carriageways meant for regular road traffic exists.</li> <li>• No parking of trucks / trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.</li> <li>• Roads shall be kept clear and materials including pipes, steel, sand boulders, concrete, chips and brick etc. shall not be allowed on the roads to obstruct free movement of road traffic.</li> <li>• Water logging or bentonite spillage on roads shall not be allowed. If bentonite spillage is observed on roads endangering the safety of road users, the Contractor shall be penalized as per relevant clause.</li> <li>• Proper and safe stacking of material are of paramount importance at yards, stores, and such locations where material would be unloaded for future use. The storage area shall be well laid out with easy access and material stored / stacked in an orderly and safe manner.</li> <li>• Flammable chemicals / compressed gas cylinders shall be safely stored.</li> <li>• Unused/ surplus cables, steel items and steel scrap lying scattered at different places within the working areas shall be removed to identified location (s).</li> <li>• All wooden scrap, and other combustible packing materials, shall be removed from workplace to identified location (s). Empty cement bags and other packaging material shall be properly stacked and removed.</li> <li>• The Contractor shall ensure that all his sub-contractors maintain the site reasonably clean through provisions related to housekeeping.</li> <li>• Ensure adequate lighting in all work areas to improve visibility and reduce the risk of accidents.</li> <li>• Keep power cords and hoses organized and out of walkways to prevent tripping. Use cord covers or cable management systems where necessary.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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Gender Based Violence (GBV)	S9	<p>The contractor shall prepare a GBV risk mitigation strategy plan and implement, which include identifying potential risks; mitigation measures; prevention and responses strategy; key actions / SOPs to receive complaints, maintaining confidentiality, handling procedure of complaints, resolution of complaints with survivor centric approach, commensurate to different construction phases of project. Some of the generic measures, which shall be included in the risk mitigation and key action plan are summarized hereunder:</p> <ul style="list-style-type: none"> <li>• Creating awareness about GBV related issues among workers during engagement and/or during Induction.</li> <li>• Mandatory consent, signing of Code of Conduct (CoC) by all workforces.</li> <li>• Create awareness to labor supply contractor about labor laws as well as GBV risks and mitigation strategy as part of contractor's C-ESMP.</li> <li>• Provision of separate rest areas and toilets for both men and women with adequate privacy, lighting, water, and sanitation facilities.</li> <li>• Sensitization of workforce to avoid any type of potential conflicts with local communities, particularly women at market areas, settlement areas, grocery shops, liquor vend and eateries, community water source points etc. at all times during project implementation phase.</li> <li>• Establishing a committee for grievance redressal mechanism especially for matters related to sexual harassment and GBV matters.</li> <li>• Woman workers will be informed of helpline numbers such as Women Cell in Ludhiana (0161-2610111- Deputy Commissioner), Punjab Women Helpline No. 181, and the National Commission for Women helpline (011-26942369) and women helpline no. 1090.</li> <li>• GBV shall be integrated into the existing strategy, Grievance Redressal Mechanism (GRM), safety talks, toolbox meetings, and regular worker training.</li> <li>• GBV focal points shall be identified through community consultations.</li> <li>• Training and awareness programme shall be organised at periodic intervals (at least once in quarter) through external specialized NGOs/ social workers about Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Acts,</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<p>2013” and consequences of violations.</p> <ul style="list-style-type: none"> <li>Integrate briefings on GBV into existing project IEC strategy.</li> <li>The GBV risk mitigation and key action plan shall also include institutional linkages with Women and Child Welfare Department (WCD), and other various schemes of GoP/GoI.</li> <li>Linkages with the Police Department for any such cases if related to the project.</li> <li>Identify hotspots for GBV within the project, including construction sites, labor camps, local communities, schools, vocational training centres etc.</li> </ul>		
Security	S11	<ul style="list-style-type: none"> <li>To prevent unauthorized entry a security system shall be established at work site, storage area and labour camp site.</li> <li>Contractor shall maintain detailed record of all persons that enter the sites.</li> <li>Movement of the workers should be monitored by providing adequate security checks, CCTV Cameras and all the workers shall be checked for availability of valid ID cards issued by contractor.</li> <li>GBV training to be provided to all workers &amp; staff.</li> <li>The Contractor shall deploy round the clock security personnel at entrance of premises and in the compound for the safety.</li> <li>The contractor shall maintain a grievance register for each site as prescribed by the employer. The contractor shall submit a list of total grievances received and redressed on a weekly basis as prescribed by the employer.</li> <li>The contractor shall form an internal committee for addressing Gender Based Violence-Sexual Exploitation Abuse and Harassment, as required by the POSH Act, 2013. The contractor shall submit Monthly reports on grievances and redressal related to GBV-SEA&amp;H.</li> <li>The contractor shall ensure minimum involvement of labor with local community.</li> <li>The contractor must establish a Worker GRM (shall include worker representatives and Employer representatives) for redressal of grievances</li> </ul>	Contractor	PIU and PMU
Material Sourcing and	E6 and E7	<ul style="list-style-type: none"> <li>Material such as aggregates, and sand are sourced from authorized suppliers having</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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Transportation		<p>valid licenses only.</p> <ul style="list-style-type: none"> <li>All quarries and crushers from which construction material are sourced need to have necessary permissions and approvals (EIAs conducted under CTE and CTO obtained and in force; the contractor shall submit these documents to client on a regular basis).</li> <li>All sand and aggregates transported to be watered and covered with tarpaulin to avoid spillage of material.</li> <li>Where required some moisture content may be increased adequately in the material to reduce dust during loading and unloading.</li> </ul>		
Storage and Handling of Hazardous Material	E11 and S4	<p>Project is likely to use fuel such as diesel, petrol, lubricating oils, grease, paints including anti-corrosive, bitumastic, synthetic enamel paint, batteries, and chlorine.</p> <ul style="list-style-type: none"> <li>Fuel and all hazardous materials and hazardous waste on-site should be stored on paved surfaces having the provisions of containments.</li> <li>Permission should be obtained for handling and use of the POLs under Hazardous and Other Waste (Management and Transboundary Movement) Rules 2016 and Petroleum Rules 2002.</li> <li>Any spillage of oil and lubricant must be immediately cleared.</li> <li>Oil spill kits shall be provided at the site and the staff shall be trained to use these kits during emergency.</li> <li>Any hazardous materials to be used will also need to be stored and handled correctly to prevent spills and pollution. Hazardous material shall be stored in covered conditions only in confined locations and shall be provided with adequate containment facilities for any risk of spillage. Hazardous waste containers shall properly be marked and kept in isolated locations only. Hazardous waste transportation shall be carried out only through the authorized transporters and Transport Emergency Card shall be maintained for the whole duration of transportation.</li> <li>Hazardous waste shall be sold only to authorized vendors.</li> <li>Fuel/ waste oil shall be stored in covered HDPE containers only on paved surface having provision of containment of spillage. Oil interceptors shall be provided with the drains near the fuel/ waste oil storage. Oil spill management kits shall be available at</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
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		<p>the site to manage the spill, if any.</p> <ul style="list-style-type: none"> <li>• All the workers engaged in waste management shall be provided with adequate PPEs like jackets, gloves, masks, face shield etc.</li> <li>• The Contractor should ensure that the chlorine storage and handling area in the water treatment plant must have chlorine neutralization facility; neutralization pit as well as scrubber system. The neutralization pit should be constructed close to chlorination site and chlorine storage area.</li> <li>• In addition, the following personal protective clothing should be worn by the operators; full face shield and non-ventilated chemical goggles, chemically resistant rubber gloves, apron or jacket, long sleeves, long pants, and closed-toe shoes.</li> <li>• Never store chlorine near flammable materials. Chlorine is especially dangerous to place next to gasoline or other combustibles. It can spontaneously explode and create a toxic fire.</li> <li>• Install safety wash stations nearby. Ensure emergency showers and eyewash stations are located near chlorine equipment.</li> <li>• Use at least two people when handling chlorine. It is wise to use a buddy system when handling chlorine. If one operator falls victim to hazardous vapours, the other can call for help.</li> <li>• Avoid spraying water on leaking chlorine containers.</li> <li>• Water and chlorine can create hydrochloric and hypochlorous acids. This mixture is corrosive and potentially oxidizing, which can make the leak worse.</li> <li>• When exposed to, the workers and those exposed shall take shallow breaths. When entering an equipment area, breathe shallow breaths around the containers until sure a chlorine leak is not present.</li> <li>• During the construction activities it is expected that injuries/ accidents will generate the biomedical waste, however the biomedical waste generation would be insignificant. DBO Contractor shall engage a third party for the collection, transportation, and disposal of the biomedical waste by a licensed medical waste disposal agency.</li> <li>• Use colour coded bags or containers for identifying and segregating biomedical waste</li> </ul>		



Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		from other wastes, update a daily register for management of biomedical waste.		
Utility shifting	S2, S8 and E9	<p>The project may need to shift existing utilities such as existing water supply, sewerage, drainage, gas pipelines, electric poles, underground cables, etc. There is a possibility of utility disruptions during the project work including damage to properties.</p> <ul style="list-style-type: none"> <li>• The contractor shall conduct an Underground Utilities Mapping and prepare a Plan. The contractor shall map all the utilities including all the underground and hidden utilities using utility detectors.</li> <li>• Plan for shifting and reconstruction of utilities to be impacted shall be prepared prior start of construction. The plan shall be discussed and agreed upon with all the concerned agency and employer.</li> <li>• Utility shifting shall preferably be carried out through the concerned agency only and the compensation amount shall be paid as requested for the same. This compensation amount shall also be included in the project cost to prevent any impact.</li> <li>• Disturbance to the community during utility relocation should be minimized as much as possible. A new facility should be provided before the old one is dismantled. If this is not possible, the community should be notified in advance about the discontinuation of the utility, the timeline for restoration, and alternatives should be provided for the interim. All these tasks should be performed in consultation with the employer and the community.</li> <li>• With the prior approval of relevant agencies, affected utilities such as electricity poles and water pipelines should be relocated.</li> <li>• Affected utilities like electric poles, water pipelines, hand pumps, etc. shall be relocated with prior approval of the concerned agencies.</li> <li>• Any private, government or property of any party got damaged during construction shall be repaired/restored to its original condition.</li> <li>• The Contractor shall protect structures, utilities, pavements roads and other facilities from disfiguration and damage as a result of his activities. Where this is not possible, the Contractor shall restore the structures, utilities, pavements, roads and other facilities to their original or better, failing which the rectification/restoration work shall be carried out at the risk and cost of the Contractor.</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>If any vendors are affected due to and during utility shifting, utility disruptions and damages to properties, they shall be compensated adequately after due consultations with them. Such compensation needs to be provided by the employer.</li> <li>Grievances related to utility shifting utility disruption and damages to properties need to be redressed by the contractor using the Grievance Redress Management system in place.</li> </ul>		
Earth Works	E1, E4, E5, E9 and S4	<p>It is anticipated that at the WTP, along the transmission main, and at the OHSRs, there will be excavation volumes of approximately 4,37,061 cum, 543,583 cum, and 53,012 cum, respectively, totalling the total excavation to 10,33,657 cum.</p> <ul style="list-style-type: none"> <li>Before any excavation work, the area to be excavated shall be watered to prevent dust pollution.</li> <li>Excavated pits/trenches shall be provided with proper strutting/ sheeting/ shoring to prevent collapse of soil from the sides. Where required the contractor shall provide for dewatering.</li> <li>The contractor will identify the site for temporary storage of surplus earth. Also, if required, necessary permission shall be obtained from the authority.</li> <li>The excess earthwork shall be disposed off<sup>71</sup> at low lying area within the campus of the WTP or as directed by PIU/ MCL and excess earthwork shall be auctioned and sell to the highest bidder.</li> <li>The contractor shall provide cut slopes to a safer angle to prevent slips/ slides of soil. Workers working in trenches should be under supervision and be provided with safety harnesses.</li> <li>All the excavated earth to be stockpiled away from the excavation site and shall be barricaded properly with hard barricading.</li> <li>Excavation activities shall not be undertaken during monsoon season. All excavated pits and borrow area sites shall be covered with tarpaulins during rains. Garland drains shall be provided around the excavated pits and borrow sites to prevent entry of run-off</li> </ul>	Contractor	PIU and PMU

<sup>71</sup> As per consultation with PIU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>from surroundings into the excavated pits.</p> <ul style="list-style-type: none"> <li>• Stockpiled soil and other loose material should be stored in covered areas or shall be covered with tarpaulin. Drains with sedimentation tanks shall be provided in these areas to facilitate drainage of run-off and arresting the silt from run-off.</li> <li>• The contractor should, depending upon the height of the stockpile, provide protection to the stockpiled earth from slipping.</li> <li>• Sufficient slope/gradient shall be given to the sides of excavations to prevent them from slides and slips.</li> <li>• The contractor shall regularly spray water on the earthwork to prevent any dust pollution.</li> <li>• Stockpile earth if not used shall be removed regularly to disposal sites, to prevent heavy stock piling.</li> <li>• Stockpile should be covered to prevent erosion due to wind and water action. Heights of stockpiles to be maintained to avoid slips.</li> <li>• Apply water or other dust suppressants, enforce speed limits for construction vehicles, and use equipment that meets emissions standards.</li> <li>• Use Best management for stormwater management, including proper disposal of hazardous materials and the use of spill prevention plans. Drainage facilities shall be provided in the stockpile area to prevent any erosion or washing away off stockpile left.</li> <li>• As for as possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accidents due to it.</li> </ul>		
Water Consumption	E3	<p>Municipal Corporation of Ludhiana conducted groundwater testing across 40 locations:</p> <ul style="list-style-type: none"> <li>• Selenium was detected above acceptable limit at 6 sites: Gurudwara Nankana Sahib ST-12, Shamshanghat Haibhowal, Main Road Pritam Nagar, Haibhowal Khurd, Mandeep Nagar, and Maya Nagar.</li> <li>• Uranium was found above acceptable limit as per WHO in 14 samples: Friends Colony, Aman Nagar, Ashok nagar (Shamshanghat), Bhora colony, Arjan colony, Prem Vihar, Tikona Park, Mozi Colony, Gyaspura park, Shanti Nagar, Gurudwara Nankana Sahib ST-12, New Smart Colony, Haibhowal Khurd, Patel Nagar near</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>cemetery road.</p> <ul style="list-style-type: none"> <li>Nitrate was found above permissible limit at Tikona Park, Mustaq Ganj, Hargobind Pura, SAS Nagar ST-3, Gill Market ST-1, Mozi Colony, Shamshanghat Haibhowal, Patel Nagar near cemetery road, and Sekhor Bark Club Road.</li> <li>Aluminium was detected in 2 samples above permissible limit i.e. at SAS Nagar ST-3 and Haibowal Khurd.</li> </ul> <p>As per the above test results, the groundwater is not fit for human consumption, hence it is advised to go for treated surface water for workers, especially for drinking and cooking purposes. The Contractor needs to make this arrangement.</p> <p>After examining the test results, if ground water can be used for other purposes, it may be used with approval of PIU.</p> <p>For construction purposes the PIU needs to certify the water to be used by contractor.</p> <p>Presently the water requirement is about a) 150,000liters per day for construction purposes and b) 75,000liters per day for labour and staff use including drinking, cooking, washing/bathing (c) 2,000,000 liters for water sprinkling, vehicle cleaning and other uses.</p> <ul style="list-style-type: none"> <li>The priority shall be given to use surface water wherever surface water source is available.</li> <li>Ground and Surface water may be used only after obtaining necessary permissions from the respective Government authorities. Any drilling of borewells require permissions to be obtained from Punjab Water Regulation and Development Authority (PWRDA), as any groundwater extraction with an existing borewell or digging a fresh borewell for use by industries and other establishments will need permission from PWRDA. The extraction needs to be metered and charges paid as per Punjab Guidelines for Groundwater Extraction and Conservation, 2020 regulations. All groundwater, when used for labour and staff, shall be tested for potability; and used only when fit for drinking. All water used for construction purposes shall be tested and used only if fit for the intended use.</li> <li>The contractor shall obtain permission from Water Resources Department for any surface water extraction and pay according to their regulations.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>• Rainwater harvesting provisions shall be incorporated into the design of all permanent and temporary structures.</li> <li>• The Contractor will opt for soak pits/septic tanks/temporary connection to existing sewage network, depending upon the sewage generation from that labour camp as the waste water generation will be less than 10KLD (ref. section Labour Camp Management of this Table above). If the sewage is carted to MCL's Sewage Treatment Plan (STP) for treatment, proper log books shall be maintained and both contractor and MCL level.</li> <li>• Minimizing water requirement by using water conservation measures such as covering the water tanks, providing visual notice for water conservation, low flow taps in toilets, etc.</li> <li>• Regular inspection to detect leakage in water pipelines and water tanks shall be conducted by the contractor.</li> </ul>		
Water Pollution (surface water and groundwater)	E3	<ul style="list-style-type: none"> <li>• No water from the construction sites/ labour camps/ site office be discharged into any surface water body without adequate treatment and obtaining prior approval from the employer and concerned agency.</li> <li>• STP treated water shall be procured from nearby STPs and shall be used preferably for sprinkling and landscaping. This should be done after testing the treated water quality and if in allowable limits for spraying.</li> </ul> <p>There are 6 nos. of STPs in Ludhiana located at three different locations namely;</p> <ol style="list-style-type: none"> <li>a) Bhattian (2 No.)</li> <li>(b) Balloke (3 No.), and;</li> <li>(c) Jamalpur (1 No)</li> </ol> <ul style="list-style-type: none"> <li>• According to the water quality reports, pH, TSS, BOD and Total Kjeldahl Nitrogen (TKN) of the treated wastewater ranges from 7.1 to 8.3, 10 mg/l to 26 mg/l, 5 mg/l to 18mg/l, and 1.56 mg/l to 31 mg/l respectively, which indicates that treated wastewater is within the prescribed limits for use in horticulture purpose. The detail is given in Chapter 2, section 2.2.7 of ESIA Report. , Labour camps, plant sites, casting yards, parking area, workshops, material, and fuel storage areas should be located at minimum 500 m distance from the water bodies.</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>All applicable water quality standards should be complied with at all construction sites along the proposed alignment route during the entire period of construction activity.</li> <li>It should be ensured that no liquid is discharged from any construction site/ activity/ labour camp without treatment.</li> <li>Site drainage should be retained in purpose-built lagoons for enough time to allow most sediment to settle out before discharge to natural or urban drains.</li> <li>Suitable drainage at construction site/camp should be provided to avoid formation of stagnant pool of water that leads to water logging and breeding of mosquitoes.</li> <li>Sewage from toilets at labour camp and construction sites shall be disposed of complying to the guideline of CPHEEO. Sewage shall be disposed of through septic tanks and soak pits. Septic tanks shall be evacuated through authorized agencies only. Soak pits shall not be provided anywhere within 100 m from any water body or where ground water table is less than 4 m. If sewage generation at one site is more than 10 KLD, then preferably STP shall be provided. Sewage shall be treated up to tertiary level and shall meet the discharge standards as specified by CPCB. Treated water shall be used at the site for water sprinkling and landscaping.</li> <li>Proper sanitation facilities (toilet with water facility) at the construction sites and labor camps shall be provided as per BOCWA norms and A guidance note by IFC and the EBRD. Link is as follows: Workers' accommodation : processes and standards - a guidance note by IFC and the EBRD (worldbank.org). Oil and grease interceptors shall be provided with the drains at construction site, material storage area, parking sites and workshops</li> </ul>		
Solid waste generation, collection, and disposal	E11, S4	<p>The Contractor shall follow and comply with all the rules pertaining to the management and disposal of wastes as per Solid Waste Management Rules 2016, and Punjab Solid Waste Management Policy 2018.</p> <ul style="list-style-type: none"> <li>It is anticipated that around 1500 persons will be working on the project (Labor and</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>Staff). The solid waste generated by these persons would be approx. around 375 Kg per day<sup>72</sup>. The municipal solid waste will be collected daily or alternate days and shall be transported to Jamalpur disposal site for further processing.</p> <ul style="list-style-type: none"> <li>• Contractor is responsible for management and disposal of all kinds of waste generated to identified sites given by PIU.</li> <li>• The demolition of 02 nos OHSRs (2MLD) would generate approx. 806 Cum demolition waste. However, the contractor will conduct conditional survey of all existing OHSRs (67 nos) and accordingly the rehabilitation measures or demolition will be proposed. The contractor will assess the quantity of C&amp;D waste and steel from the demolition sites. The contractor should hand over all the steel recovered from demolition to the PIU; in turn the PIU would sell this to rebar rolling mills. The contractor should make use of the concrete waste, after obtaining approval from PIU, as blocks, paving material, metal for concrete, etc. The contractor should handover any balanced concrete waste to C&amp;D Waste processing plant of MCL at Dhandhari Kalan. If any concrete waste is remaining after this, the contractor should dispose this at the designated waste disposal sites, approved by PIU. The PIU should conduct an Environmental Assessment of these disposal sites before approval.</li> <li>• The Contractor shall prepare C-ESMP of each individual site where OHSR will be dismantled. This will be approved by PIU&amp;PMU prior to the execution of work. No OHSR dismantling shall be commence without approval of C-ESMP for each OHSR. However, considering the densely populated areas around some of these OHSRs, suitable safe demolition techniques may be adopted for all OHSRs which are proposed for demolition as per the structural stability and serviceability assessment.</li> <li>• If agencies/ facilities for waste collection and disposal are not available for municipal and C&amp;D waste in the project area, then contractor shall identify the sites for waste/ construction debris disposal in consultation with the employer. Necessary permissions shall be obtained from PPCB by the contractor before disposal. Effort shall be made to re-use C&amp;D waste to the possible extent such as filling material for excavations, filling</li> </ul>		

<sup>72</sup> Assuming an average of 250 g per person per day of solid waste.

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>low lying areas (only with approval of PMIDC) or can be given to other local construction projects. Surplus shall be sent for recycling to the C&amp;D plant of MCL at Dhandhari Kalan or for disposal at MCL approved sites.</p> <ul style="list-style-type: none"> <li>• Excavated soil shall be used for backfilling excavations and surplus shall be given to the other construction projects in vicinity or disposed of to the C&amp;D waste disposal sites of MCL.</li> <li>• No dumping should be carried out outside the work sites, including private and government land, roadside, low lying areas, wetlands, water bodies, forest area, ecologically sensitive areas, etc.</li> <li>• Waste generation shall be minimized by providing adequate material storage and covering facility and providing training to the workers for proper handling of the material and machinery.</li> <li>• Any hazardous materials to be used will also need to be stored and handled correctly to prevent spills and pollution. Hazardous material shall be stored in covered conditions only in confined locations and shall be provided with adequate containment facilities for any risk of spillage. Hazardous waste containers shall properly be marked and kept in isolated locations only. Hazardous waste transportation shall be carried out only through the authorized transporters and Transport Emergency Card (TREM) shall be maintained for the whole duration of transportation.</li> <li>• Hazardous waste shall be sold only to authorized vendors.</li> <li>• Fuel/ waste oil shall be stored in covered HDPE containers only on paved surfaces having provision of containment of spillage. Oil interceptors shall be provided with the drains near the fuel/ waste oil storage. Oil spill management kits shall be available at the site to manage the spill, if any.</li> <li>• Bio-medical waste shall also be generated such as expired or discarded medicines, vials etc., Chemical Waste, discarded linen, mattresses, beddings contaminated with blood or body fluids, Absorbent compress dressings, Antibiotic ointment packets, Antiseptic wipe packets and used bandages etc.</li> <li>• It is anticipated that on an average 50grams of bio-medical waste is generated for 1% of the total workforce per day that comes around 0.75 kg/day.</li> </ul>		



Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>Bio-medical waste shall be stored in leak-proof containers resistant to punctures and secure with lids to prevent spills and exposure. Thereafter, a third party (Authorized for bio-medical waste handling &amp; disposal) shall be hired for safe disposal of biomedical waste generated from the labour camps. The hired agency will collect the bio-medical waste from the labour camps at regular intervals as required.</li> <li>Contractor shall prepare a Bio-Medical Waste Management Plan including its types, storage/handling, and disposal.</li> <li>All the workers engaged in waste management shall be provided with the adequate PPEs like jackets, gloves, masks, face shield etc.</li> </ul>		
Construction Vehicles, machinery and Equipment	E4, E5 and E6	<ul style="list-style-type: none"> <li>All construction machinery shall be provided with drip trays and collected fuel shall be disposed of through authorized vendors only.</li> <li>All the construction vehicles and machinery shall regularly be serviced and maintained.</li> <li>PUC shall be procured for each of the construction vehicles. Construction vehicles shall be inspected on a regular basis.</li> <li>All construction vehicles shall be parked only in designated locations.</li> <li>Wheel washing facility shall be provided at the exit point at site and the water from the wheel washing facility shall be channelized into sedimentation tank through proper leak proof drainage system. This water shall be re-used for sprinkling purposes as required.</li> <li>All the heavy machinery shall be inspected prior installation and shall be inspected on a regular basis. The heavy machinery shall be inspected internally as well as through a third party.</li> <li>Cranes and other lifting machinery must abide by appropriate color-coding protocols and safe load indicator (SLI) regulations.</li> <li>The operator, helpers, riggers and the support staff shall properly be trained for handling heavy machinery.</li> <li>All the operations with heavy machinery shall be undertaken in the presence of qualified supervisor and safety expert.</li> <li>All drivers shall be provided induction training, defensive driving training, training for</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		providing first aid and handling fire in vehicle. Drivers shall be instructed to follow the traffic rules, respect the designated speed limit, and follow the designate routes.		
Bright Light during Night hours	E4	<p>The contractor should ensure that the sites are provided with proper lighting and well lit. the contractor should take the following measures to mitigate bright light during night time works, by taking following actions:</p> <ul style="list-style-type: none"> <li>• Develop a plan that minimizes light spillage and glare. Use directional lighting and shielded fixtures to focus light on work areas.</li> <li>• Limit the use of bright lights to essential night-time operations and avoid work during sensitive periods for wildlife.</li> <li>• Employ low-impact lighting technology such as LED lights with adjustable intensity.</li> <li>• Use natural or artificial barriers to shield light from sensitive areas.</li> <li>• Inform local communities about the construction schedule and lighting management practices.</li> </ul>	Contractor	PIU and PMU
Air Pollution	E4	<p>According to ESIA report four locations were tested for Ambient Air quality: WTP Site, Mundian, Kquality Chowk and Sita Nagar. All locations were found to have concentration of PM10 and PM2.5 within the National Ambient Air Quality (NAAQ) permissible limits.</p> <p>The contractor must ensure that air quality within permissible limits is maintained at all sites throughout the pre-construction, construction and O&amp;M period. For any compliance concern at any of the sites, the contractor would need to investigate the reason, mitigate and report the same to the employer.</p> <ul style="list-style-type: none"> <li>• Environmental clearances shall be obtained from authorities for establishing new quarries and crushers. Contractor shall strictly comply to all the conditions in the clearances. When quarries are not established, the contractor will source the materials from approved and authorized quarries/ vendors.</li> <li>• Construction materials shall be stored in a covered condition to prevent the fugitive emissions. Construction materials and debris shall be transported in the covered conditions.</li> <li>• Proper and prior planning and appropriate sequencing and scheduling of all major</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>construction activities will be done, and timely availability of infrastructural supports needed for construction will be ensured to shorten the construction period vis a vis reduce pollution.</p> <ul style="list-style-type: none"> <li>• If after commencement of construction activity, employer believes that the Contractor's equipment or methods of working are causing unacceptable air pollution impacts then these shall be inspected and remedial proposals shall be drawn up by the Contractor, submitted for review to the Employer and implemented.</li> <li>• In developing these remedial measures, the Contractor shall inspect and review all dust sources that may be contributing to air pollution. Remedial measures include use of additional/ alternative equipment by the Contractor or maintenance/ modification of existing equipment of the Contractor.</li> <li>• In the event that approved remedial measures are not being implemented and serious impacts persist, the Employer may direct the Contractor to suspend work until the measures are implemented, as required under the Contract.</li> <li>• The Contractor shall take all necessary precautions to minimize fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Employer.</li> <li>• During construction period, all applicable clearances for air quality management and approvals such as 'Consent to Establish' and 'Consent to Operate' for batching plant, stone crushers area, stone quarry shall be obtained from the PPCB and complying all the conditions. All vehicles operating for the Contractor shall obtain Pollution under Control (PUC) certificate and other fitness certificates. It shall be ensured that all the construction equipment &amp; vehicles are in good working condition and maintained to keep emissions within the permissible limits. Idling of the vehicles shall be minimized and engines should be turned off when not in use to reduce pollution. Provision of wheel wash facility will be installed to contain project site dust within the site.</li> <li>• Adequate dust suppression measures such as regular water sprinkling on unpaved haul</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>roads, stone quarry, batching plant and stone crushers sites &amp; fugitive dust during material handling, loading/unloading &amp; other activities at haul road particularly at vulnerable areas near habitation shall be controlled especially in the dry seasons.</p> <ul style="list-style-type: none"> <li>• Dust during loading and unloading will be controlled with careful handling and by following measures, a) Increasing moisture content: In some cases, slight moisture may be added to the material to reduce dust during loading, b) Reducing falling distance: Shortening the falling distance between the material discharge point and the material pile will slow material velocity and reduce particle impacts, lessening dust generation, and c) Adding physical barriers at the loading point: Create walls or areas where personnel are removed from the affected area to avoid dust exposure could occur.</li> <li>• DG sets shall be provided with stack of adequate height as per CPCB norms (<math>H = h + 0.2\sqrt{KVA}</math>, where H= total height of the stack, h=height of the building in meters, KVA=total generator capacity of the set in KVA).</li> <li>• Only clean fuel shall be utilized for all cooking purposes at labour camps.</li> <li>• Raw materials shall be procured from nearest local sources.</li> <li>• Recycled construction materials like fly-ash and sludge from cement plant for construction purpose may be utilized, if approved by employer.</li> <li>• Temporary electricity connections at the sites will be obtained to minimize usage of DG sets, etc.</li> <li>• Siting of batching plant, should be done in down wind direction.</li> <li>• When required and permitted, the Contractor shall design and implement his blasting techniques so as to minimize dust, noise, vibration generation and prevent fly rock. If the contractor is permitted to use blasting technique, it should be consistent not only with nature and quantity of rock to be blasted but also the location of blasting. The Contractor shall give preference to explosives with better environmental characteristics.</li> <li>• The Contractor shall submit to the Employer an Air Monitoring and Control Plan (AMCP) prepare specific Site Environmental Plan to guide construction activity insofar as it relates to monitoring, controlling and mitigating air pollution. Testing will be done on monthly basis.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
Noise Pollution	E5	<p>Noise levels at WTP Site and Sita Nagar are above the permissible limits (due to tractors playing loud music in the vicinity) of CPCB during daytime. The following mitigation measures are suggested for above locations and at any other locations where noise levels are exceeding the CPCB permissible limits.</p> <p><b>For Workers:</b></p> <ul style="list-style-type: none"> <li>• For all the workers, the hearing shall be tested before deployment and thereafter every six months.</li> <li>• Ear plugs/muffs etc. to be provided to all workers.</li> <li>• Workers working with the high noise equipment will be rotated, and not exposed to noise for long.</li> <li>• All construction equipment be maintained in good condition and regularly checked for noise levels; if excessive noise levels are found, then the equipment will be serviced/ repaired/ replaced.</li> <li>• Stationery noise generating equipment such as DG sets shall be provided with acoustic enclosures.</li> <li>• All noise causing equipment to be fitted with silencers/noise mufflers etc. to minimize operational noise.</li> </ul> <p><b>For Community:</b></p> <ul style="list-style-type: none"> <li>• Temporary hard barricading shall be provided at the construction site to minimize noise levels outside the boundary.</li> <li>• The contractor shall manage the construction traffic to minimize noise.</li> <li>• The contractor shall place restrictions on honking at construction sites.</li> <li>• Heavy noise generating activities shall not be carried out at the above sites and at sensitive areas during night time (10PM-6AM).</li> <li>• Noise barriers shall be installed at sensitive receptors such as hospitals, schools, places of worship, libraries, Baby care centre/crèches etc.</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
Community Health and Safety	S6, S12	<ul style="list-style-type: none"> <li>All construction sites should be surrounded with secure tamper proof fence, with security lighting, regular security patrols and other security measures to prevent trespassing. Only authorized person shall be allowed to enter into the construction camps/sites.</li> <li>Contractors shall have a health and safety management plan/ system to effectively prevent any accidents happening at construction sites.</li> <li>All materials and components should be stored and stacked safely in dedicated secure areas inside of the sites/ stores.</li> <li>Avoid use of any paints containing lead or its compounds as well as high VoCs and any banned material like CFC, asbestos etc.</li> <li>Public health system capacity relies on detecting, testing, contact tracing, and isolating those who are or might be sick, or have been exposed to known or suspected communicable diseases. It is important to stop broader community transmission and prevent communities from having to implement or strengthen further community mitigation efforts. This can be done by organizing regular community health check-ups. Awareness program and vaccination camps will be organized in the nearby settlements/villages.</li> <li>Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned.</li> <li>Survey the surrounding vulnerable buildings for likely issues in structural stability / differential settlement during the excavation works.</li> <li>Provide prior information to the local people about the planned routes to avoid times of peak-pedestrian activities.</li> <li>DBO contractor to liaise with PIU/ULB in identifying high-risk areas on route cards/maps.</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>• Regularly maintain the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</li> <li>• Provide road signs and flag persons to warn of on-going trenching activities.</li> <li>• Ensure that first aid kits are available in all working areas, supplied with adequate material and medicine as per the BOCWA 1996. The facility of ambulance needs to be ensured.</li> <li>• Records of all nearest hospitals and health centers should be kept at each construction sites.</li> <li>• The Environment Management Plan for dust and noise control shall strictly be followed as suggested.</li> <li>• Labor camps shall preferably be established at minimum distance of 500m from the residential/institutional areas.</li> <li>• Framing and implementation of drugs/intoxicants prohibition policy by contractor during the entire contract duration.</li> <li>• Minimize interruptions to utility services through proper planning and scheduling of activities and inter-departmental co-ordination. Construction of temporary road/access and diversion of traffic.</li> <li>• Aesthetic enhancement through proper housekeeping of construction sites. Disposal of construction wastes at the approved disposal sites. Immediate closure of the trenches after pipe laying/ completion of work. Complete construction activity by removing all temporary structures, restoring the sub-project and surrounding areas as near as possible to the pre-construction condition.</li> <li>• Unpaved haul roads near/passing through residential and commercial areas to be watered thrice a day. Trucks carrying construction material to be adequately covered. All earthwork will be protected in a manner acceptable to the Client to minimize generation of dust. The contractor will take every precaution to reduce the level of dust along construction sites involving earthworks, by frequent application of water.</li> <li>• Noisy construction operations in residential and sensitive areas (hospitals, schools and religious places) should be restricted between 7.30 a.m. to 6.00 p.m. Preventive</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>maintenance of construction equipment, and vehicles would be done to meet emission standards and to keep them with low noise. Provision of ear plugs to operators of heavy machinery and workers in near vicinity. During the night, material transport should be uniformly distributed to minimize noise impacts.</p> <ul style="list-style-type: none"> <li>The contractor shall have in place a Grievance Redress Mechanism for workers and community which addresses the community related grievances.</li> </ul>		
Traffic Management	E9	<ul style="list-style-type: none"> <li>The Contractor shall prepare a Traffic management plan and submit the same to the employer for approval. The traffic management plan shall also consist of HIRA for traffic diversion. Site specific traffic management plans shall be prepared detailing about the traffic diversions measures required at various locations.</li> <li>An adequate number of traffic marshals shall be deputed at diversion sites, construction yards and construction sites for management of traffic.</li> <li>Traffic control measures like signages, cautionary notices, etc. shall be provided for managing the traffic and diversion as required.</li> <li>Plan transportation routes so that heavy vehicles do not use narrow local roads, except nearby delivery sites.</li> <li>Schedule transport and hauling activities during non-peak hours.</li> <li>Locate entry and exit points in areas where there is low potential for traffic congestion.</li> <li>Keep the site free from all unnecessary obstructions.</li> <li>Drive vehicles in a considerate manner.</li> <li>Provide free access to households and businesses/ shops during the construction phase.</li> <li>Parking of transportation/ construction vehicles/ machinery on road shall not be allowed on public roads.</li> <li>All activities including stockpiling of materials/debris, etc., shall be exclusively undertaken within the work sites.</li> <li>Proper traffic safety measures like provision of adequate hard barricading and safety signages shall be provided at all the roads to be blocked/diverted to prevent any accident. Site specific traffic diversion/management shall be prepared.</li> </ul>	Contractor	PIU and PMU



Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>Drivers shall be instructed to take only designated route for transportation of material and shall avoid peak traffic hours.</li> </ul>		
Tree cutting	E2 and E9	<ul style="list-style-type: none"> <li>Total 495 trees and 895 to be felled. Necessary permissions from forest and other departments such as MCL, improvement trust, PMIDC, PUDA, PSPCL, for tree felling to be obtained.</li> <li>Species of trees have been identified (Ref. Chapter-5, Section 5.2.5 of ESIA Report) there are total of 16 species of trees which are common to the area and need not to be translocated.</li> <li>Laying of transmission line and construction of OHSRs involve diversion of 6.836 ha of forest land.<sup>73</sup> Compensatory afforestation for the forest land diverted needs to be done by the forest department as per the Forest Conservation Act, 1980.</li> <li>For trees in the forest area, the Forest department is responsible for cutting and auctioning. For other government areas, the DBO Contractor is responsible for cutting and the respective department is responsible for auctioning.</li> </ul> <p>To mitigate the impact, due to felling of trees (if Any) located on non-forest land, it is recommended to plant the saplings in 1:10 ratio after discussion with the DFO to comply with the Punjab Plantation and Maintenance of Trees Act 1974.</p>	Contractor	PIU and PMU
Cultural heritage and Chance finds	S7	<p>According to Archaeological survey of India (ASI) five Kos Minars and one ancient site at sunet has been identified.</p> <ul style="list-style-type: none"> <li>If construction works are carried out in the limits of prohibited area (within 100 meters) or regulated area (100-200 meters) of any designated heritage or archaeological sites and remains, permission should be obtained from the relevant authorities.</li> <li>Prescribed procedures for getting permission from the local authority should be done before excavation of any burial ground, graveyard or 'Idgah' if identified during construction.</li> <li>If fossils, coins, articles of value or antiquity, structures, and their remains of geologic</li> </ul>	Contractor	PIU and PMU

<sup>73</sup> A total of 13,466m of forest land is required, of which 9,322m is 6m width and remaining 7,226m is of 3m width, totaling the forest area required to 68,364 sq. m. or 6.836 ha. The area required for forest clearance shall be updated after infrastructure and topographical survey.

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>or archaeological interest are found, local government shall be immediately informed of such discovery and excavation shall be stopped until identification of cultural relics by the authorized institution (ASI) and clearance is given for proceeding with work. All the above discovered on site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.</p> <ul style="list-style-type: none"> <li>When such findings are made, then a) Work area shall be barricaded with hard barricading of appropriate height to prevent any accident in vicinity to such site, b) Adequate lighting shall be provided in the construction area during night time, c) No unauthorized entry shall be allowed within construction zone, d) No machinery shall be staged, no material or debris shall be stored and no project facility/utility shall be located outside the site especially in vicinity to buildings of heritage, cultural and historical importance, e) Noisy activities shall be scheduled during night time (when the facility is closed for visitors) to minimize disturbance to tourist or shall be done on closure day, f) The area shall be restored back to original condition after completion of construction, and g) All waste material including redundant material, debris, material, excavated muck, other waste, etc., shall be left in the area after construction is completed.</li> <li>The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall, immediately upon discovery thereof and before removal acquaint the Client of such discovery and carry out the Client's instructions for dealing with the same, awaiting which all work shall be stopped.</li> <li>The Client shall seek direction from the Archaeological Society of India (ASI) before instructing the Contractor to recommence work on the site.</li> </ul>		
<b>Operation Phase</b>				
Operation of Water Supply System	E11, E12	<p>Operation and Maintenance of the water supply system will be carried out by the DBOT contractor for initial 10 years and by MCL post completion of operation phase of DBO Contractor. The system has a design life of 15/30 years, during which major repairs or refurbishments may not require and should operate with little maintenance beyond routine actions required to keep the equipment in working order.</p> <ul style="list-style-type: none"> <li>Contractor shall ensure a residual chlorine level of 2 ppm in the distribution system to</li> </ul>	Contractor	PIU and PMU

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<p>prevent microbial re-growth.</p> <ul style="list-style-type: none"> <li>● Regular monitoring of disinfectant residuals and microbial indicators to ensure effective disinfection.</li> <li>● Adjust dosages as necessary based on inlet water quality parameters such as temperature, pH, turbidity, etc.</li> <li>● Periodically clean and disinfect water storage tanks and reservoirs to prevent biofilm formation and microbial growth.</li> <li>● Keep detailed records of disinfection practices, including dosages, maintenance activities, and monitoring results, to track performance and make informed decisions.</li> <li>● The stability and integrity of the system shall be monitored periodically to detect any problems and allow remedial action if required.</li> <li>● Any repairs involving manual, temporary, and short-term works involving regular checking shall be recorded for signs of deterioration, servicing and replacement of parts.</li> <li>● Recurrence of pipe bursting and leakage problems shall be managed by the leak detection and water auditing. The contractor/ MCL will be required to ensure that the leak detection and rectification time is minimized.</li> <li>● Repair works could cause some temporary disruption of activities at locations of social and cultural importance such as schools, hospitals, churches, tourist sites etc., so the precautions as employed during the construction period shall be adopted. Contractor/ MCL needs to: <ul style="list-style-type: none"> <li>● Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;</li> <li>● Complete work in these areas quickly;</li> <li>● Consult the custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.</li> </ul> </li> <li>● 5916 kg of sludge per day is estimated to be generated from the operation of the Water Treatment Plant.</li> </ul>		

Nature of Work/ Activity	Impacts*	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		<ul style="list-style-type: none"> <li>• Ensure the physical and chemical characteristic of the sludge to determine the disposal of sludge or reuse as soil conditioner. The sludge will be tested if it is suitable as soil conditioner, only if suitable then it will be used for soil conditioning. The sludge shall not have pH less than 5 and the percentage of dry matter, organic matter, nitrogen and phosphorus shall be tested as per procedure and limits sets out in <i>The Sludge (use in Agriculture) Regulations, 2001</i>.</li> <li>• Ensure that the sludge does not contain high levels of heavy metals or toxic chemicals that could contaminate soil or water bodies.</li> <li>• If the sludge is not suitable for use, it should be disposed of in designated sanitary landfill sites designed to prevent leachate from contaminating groundwater.</li> <li>• Keep records of sludge generation, treatment, and disposal or reuse.</li> </ul>		
Stakeholder's Engagement and Information Disclosure	S10	<p>The contractor along with the employer shall conduct consultations much in advance before start of work in any locality. During these consultations together with the employer the contractor shall explain the nature of works to be taken up, the duration and timings of the work and the likely temporary impacts/inconveniences caused to them. The stakeholder feedback shall be noted, and construction plans/schedules be revised accordingly where appropriate.</p> <p>The contractor shall erect Public Information Boards at prominent locations giving project details, start and completion dates, telephone numbers of GRM committee, etc. The contractor together with the employer shall arrange for frequent interactions with the stakeholders in the locality and provide them with information on the progress of the works. Conduct.</p>	Contractor	PIU and PMU

\*List of Impacts is provided in the Table 46.

### 8.3. Clearances and Permissions required for the Project

The list of Clearances and Permission required for the project is given in the following Table:

**Table 48: List of Clearances and Permissions required for the Project**

Sl. No.	Compliance	Compliance required from	Responsibility	Supervisory	Requirement Timeline	Current Status
23.	Permission for water extraction from Canal	Department of Water Resource	PIU	PMU	Before commencing feasibility report/ DPR	MoU signed
24.	Permission for felling of 495 trees and 895 poles on forest land	Forest Department	PIU	PMU	Before commencement of civil works	Need to obtain
25.	Permission for felling of trees (if any) on non-forest land	Concerned Department/Agency	PIU	PMU	Before commencement of civil works	Need to obtain
26.	Permission for laying of transmission line along National Highway and for crossing of transmission line across National Highway	National Highway Authority of India	PIU	PMU	Before commencement of civil works	Need to obtain
27.	Permission for laying of transmission line along State Highway, Arterial roads and for crossing of transmission line across State Highway and Arterial roads	Public Works Department	PIU	PMU	Before commencement of civil works	Need to obtain
28.	Permission for laying of transmission line across railway line	Indian Railways	PIU	PMU	Before commencement of civil works	Need to obtain
29.	Permission for laying of transmission line along Canal.	Forest Department	PIU	PMU	Before commencement of civil works	Need to obtain
30.	Permission for laying of transmission line along and across Canals.	Department of Water Resources	PIU	PMU	Before commencement of civil works	Need to obtain
31.	Permission for laying of transmission line in parks and construction of ESRs	Municipal Corporation of Ludhiana	PIU	PMU	Before commencement of civil works	Need to obtain

Sl. No.	Compliance	Compliance required from	Responsibility	Supervisory	Requirement Timeline	Current Status
32.	Permission for diversion of traffic	Ludhiana traffic police	DBOT Contractor	PIU/ PMU	Before commencement of civil works	Need to obtain
33.	Shifting of Electrical utility	Punjab State Power Corporation Limited (PSPCL)	PIU	PMU	Before commencement of civil works	Need to obtain
34.	Shifting of telecom utility	Concerned Telecommunication Company/Agency	PIU	PMU	Before commencement of civil works	Need to obtain
35.	Permission for sourcing building material such as stone and sand	Mineral Sale Management and Monitoring System, Water Recourses Department (Mining & Geology), Punjab	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
36.	Consent to Establish and Consent to Operate for the Crushers and Ready-Mix Concrete Batching Plant	Punjab Pollution Control Board	DBOT Contractor	PIU/PMU	Before the start of civil works.	Need to obtain
37.	Permission for Establishing of labour camps	PPCB and MCL	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
38.	Labour License	Labour Commissioner	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
39.	Permission for Disposal of Construction and Demolition waste	MCL	DBOT Contractor	PIU/PMU	Before commencement of civil works	Need to obtain
40.	Permission for transportation and storage of Hazardous substance	Punjab Pollution Control Board	DBOT Contractor	PIU/PMU	Before the operational phase	Need to obtain
41.	Permission for Demolition of ESRs	MCL	DBOT Contractor	PIU/PMU	Before the award of civil works	Need to obtain
42.	Permission/ NoC for Construction of ESR in GLADA Area	Greater Ludhiana Area Development Authority	PIU	PMU	Before commencement of civil works	Partially obtained

Sl. No.	Compliance	Compliance required from	Responsibility	Supervisory	Requirement Timeline	Current Status
43.	NoC for Construction of ESR from Loh Langar Trust	Loh Langar Trust	PIU	PMU	Before commencement of civil works	Need to obtain
44.	NoC for Construction of ESR in Ludhiana improvement trust area.	Ludhiana improvement trust	PIU	PMU	Before commencement of civil works	Obtained

#### 8.4. Environmental and Social Monitoring Plan

Environmental monitoring and evaluation are pivotal components of any project implementation process. These activities involve regular assessments to ensure that project activities are proceeding as planned. They provide essential feedback to project management, enabling adjustments to be made to ensure that project objectives are achieved on schedule.

The Environmental Monitoring Plan is formulated to ensure and demonstrate compliance with the regulatory and Institutional Agency's EHS requirements. Monitoring of environmental and social parameters and comparing them with benchmarks set for monitoring indicators by regulatory authorities will help to assess in the environmental performance and identify gaps or non-conformance (if any) ensuring immediate actions to bring it into compliance. To ensure the same, the following environmental parameters will be monitored. The Environment Monitoring Program is depicted in table below:

Moreover, it is crucial to adhere to existing environmental regulatory frameworks and fulfil community obligations without compromise.

**Table 49: Environmental and Social Monitoring Plan for Construction Stage**

Monitoring field	Monitoring location	Means of Monitoring	Monitoring parameters	Frequency	Responsibility	
					Implementation	Monitoring
<b>Pre-Construction Phase</b>						
Environment Monitoring (Air, Noise, Soil, Surface Water and Ground Water) (Parameters as per CPCB Standards and Frequency as per Contract Condition)	At Project site and sensitive areas nearby the project site	BY NABL accredited Lab	All relevant parameters	Once	Contractor	PIU
<b>Construction Phase</b>						

Monitoring field	Monitoring location	Means of Monitoring	Monitoring parameters	Frequency	Responsibility	
					Implementation	Monitoring
Necessary Permissions/NOCs as stated in Table 2.3.	All Necessary Permissions to be checked and ensured	By PIU	All relevant permissions	Once (to be renewed as required)	Contractor	PIU
Ambient air monitoring (Parameters as per CPCB Standards and Frequency as per Contract Condition)	At all OHSR locations, WTP, transmission line, and nearest habitation/sensitive areas where construction activities are going on.	By NABL accredited Lab	All parameters as per National Ambient Air Quality Standards, 2009 such as PM10, PM2.5, SO <sub>x</sub> , NO <sub>x</sub> , etc.	Monthly	Contractor	PIU
Ambient noise (Parameters as per CPCB Standards and Frequency as per Contract Condition)	At OHSR locations, WTP location and transmission line, and nearest habitation/sensitive areas.	By NABL accredited Lab	Day time and night time noise levels (24 hours).	Monthly <i>(Weekly for WTP Site and Sita Nagar location)</i>	Contractor	PIU
Surface water quality (Parameters as per CPCB Standards and Frequency as per Contract Condition)	Surface Water: Water source site and transmission line crossing the water body. Ground Water: Sensitive Areas around the Project Site	By NABL accredited Lab	pH, Oil & Grease, Cl, F, NO <sub>3</sub> , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity, Colour, odour, Turbidity, pH, total dissolved solids, electrical conductivity, total alkalinity, total hardness, Ammonia, Barium. Iron, calcium, chromium, zinc, manganese, Sulphate, Nitrite, Nitrate, Chloride, Fluoride, Phosphate, Total arsenic, Mercury, Cadmium, Total Chromium, Copper, Cyanide, lead, Aluminum, nickel	Monthly	Contractor	PIU
Soil Quality (Parameters as per CPCB Standards and Frequency as per Contract Condition)	At OHSR locations, WTP location and transmission line, and nearest habitation/	NY NABL accredited Lab	Texture, Clay, Silt, Sand, Porosity, Bulk density, Water holding capacity, pH, Electrical	Half-yearly	Contractor	PIU



Monitoring field	Monitoring location	Means of Monitoring	Monitoring parameters	Frequency	Responsibility	
					Implementation	Monitoring
	sensitive areas.		conductivity, Calcium, Magnesium, Sodium, Chlorides, bicarbonates, Potassium, Organic Carbon, organic matter, Phosphorous, SAR, Nitrogen, Salinity, Zinc, Iron, Selenium, Copper, Manganese, Fluorine, Chromium, Molybdenum, Nickel, Silicon.			
Vehicular Emissions	All the vehicles and machineries that are being used in the project.	Inspection of PUC Certificate	PUC certificate typically includes the following parameters: Carbon Monoxide (CO) levels, Hydrocarbons (HC) levels, Nitrogen Oxides (NOx) levels, Particulate Matter (PM) levels, Opacity of smoke for diesel vehicles.	Monthly	Contractor	PIU
Solid waste management	Construction Sites, Labor Camp, Storage yard	By Observation	Waste collection, segregation, storage, disposal, reduction, recycling, record keeping.	Monthly	Contractor	PIU
Traffic Management Plan	At all construction sites (ESRs, WTP and TL)	Contractor and PIU	Commercial Areas, congested/traffic areas, market places, nearby school (if, any). Etc.	Regularly (To be renewed as required)	Contractor	PIU
Labour Management Plan	Labour Camps	By Observations	Labour living and working conditions, welfare facilities etc.	Regularly (To be renewed as required)	Contractor	PIU
Health and Safety Plan	Community, Occupational Health and Safety of Labour	By Observations	Densely Populated areas, Labour, and other areas near to local community.	Regularly (To be renewed as required)	Contractor	PIU
Incident/Accident Reporting	All incidents/accidents occur at construction sites, nearby/or in community	By Observation of any such event	Incident, Accidents or Near misses. Root Cause analysis will be done.	Reporting to PIU Within 2 hours of	Contractor	PIU

Monitoring field	Monitoring location	Means of Monitoring	Monitoring parameters	Frequency	Responsibility	
					Implementation	Monitoring
				occurrence of such event		
Emergency Response Plan	Labour Camps, Construction sites, offices	Contractor and PIU	Emergency evacuation layout plan, assembly area, emergency contact details, quick response team, emergency equipment & vehicles.	Weekly	Contractor	PIU
Inspection of waste disposal sites	All sites	Contractor and PIU	Site condition, waste covering, leachate management, drainage control	Monthly	Contractor	PIU
Inspection of third-party vendors (Bio-medical waste, Hazardous waste, etc.)	All sites	Contractor and PIU	Transportation, segregation, disposal methods, waste minimization, recycling	Monthly	Contractor	PIU
Inspection of labor camps	All Camps	Contractor and PIU	Accommodation, drinking, sanitation, cooking, medical, waste, emergency preparedness etc	Monthly	Contractor	PIU
Inspection of Labor Records	All Camps/ sites	Contractor and PIU	Employment contract, wages, overtime record, attendance, trainings etc	Weekly	Contractor	PIU
Inspection of GRM Records	All Camps/ Sites	Contractor and PIU	Record, response time, resolution, feedback etc	Weekly	Contractor	PIU
Inspection of Vehicles/ Garages/ Yards	All Camps	Contractor and PIU	Vehicle maintenance, fuel storage and handling, PPE, vehicle inspection, spill response, record keeping, trainings	Monthly	Contractor	PIU
GRM (Grievance Redressal Mechanism)	Labour and Community Grievances	Contractor and PIU	Interactive sessions, community consultations, GRM posters, Helpline nos., and phone calls	Regularly	Contractor	PIU
<b>Operations at WTP</b>						
Water Quality (Inlet and Outfall) of WTP	At Intake Structure and WTP	By NABL accredited Lab	pH, Oil & Grease, Cl, F, NO <sub>3</sub> , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity.	Weekly	Contractor	PIU

Monitoring field	Monitoring location	Means of Monitoring	Monitoring parameters	Frequency	Responsibility	
					Implementation	Monitoring
Fire Safety	At all construction and camp sites	Contractor and PIU	Storage of fuel, availability of fire extinguishers at appropriate locations, fire hydrants, fire emergency contact numbers etc.	Weekly	Contractor	PIU
Emergency Response Plan (ERP)	At all construction and camp sites	Contractor and PIU	Emergency evacuation layout plan, assembly area, emergency contact details, quick response team, emergency equipment & vehicles.	Weekly	Contractor	PIU
GRM (Grievance Redressal Mechanism)	Worker's and Community Grievances	Contractor and PIU	GRM posters, Helpline nos., GRC contact details.	Regularly	Contractor	PIU

### 8.5. Capacity Building and Training Plan

The Project Implementation Unit (PIU) needs to ensure that each type of job-specific training and Environmental Health and Safety (EHS) Induction training are identified based on the specific requirements and existing capabilities of site and project personnel. This includes contractors and subcontractors. A specific focus should be placed on areas such as traffic management, stakeholder engagement, and grievance redressal.

There should be an emphasis on increasing general environmental awareness among the members of the project team. By doing so, the team will be encouraged to adhere to environmentally sound practices and comply with the requirements of the project activities. This effort will aid in lessening any negative environmental impacts. It will also ensure that all actions are in accordance with applicable regulations and standards. All of these efforts will contribute to achieving performance that goes above and beyond compliance. This same level of awareness and commitment needs to be communicated to the contractors and subcontractors before the project begins.

Environment and social management training programs need to be conducted to ensure effective implementation of the various management and control measures during the construction and operation of the project. The training program needs to ensure that every member of the team understands and is clear on all necessary aspects.

- Understand requirements of environmental and social action plans.
- Understand the environmentally and socially sensitive aspects of project.
- Identify potential risks posed by project activities.
- Offer necessary occupational training and specialty courses to workers.

- Provide training on risk areas and hazards to all personnel, including occasional visitors.
- Deliver targeted training to those with rescue and first-aid duties.
- Ensure service providers, contractors, and subcontractors are adequately trained via contract specifications and monitoring before they start assignments.

The following organizations can be approached (but not limited to) to conduct training sessions and seminars:

- Mahatma Gandhi State Institute of Public Administration, Chandigarh
- Punjab State Pollution Control Board
- Punjab Water Regulation and Development Authority (PWRDA)
- Punjab Water Supply and Sewerage Board
- District Disaster Management Authority, Ludhiana
- Engineering Staff College of India, Hyderabad

The primary objective of the training is to enhance general environment and social safeguard knowledge among the project team. This proactive approach is geared towards minimizing adverse environmental and social impacts and achieving performance levels. Before the project commences, contractors and subcontractors will undergo comprehensive training to ensure they share the same level of awareness and commitment. Furthermore, environment and social management training programs will be conducted to ensure the effective implementation of ESMP during both the construction and operation phases of the project. Below table presenting the different indicative training programs along with their respective details.

**Table 50: Indicative Training Program**

Sl. No.	Trainings	Purpose of the Training	Participants	Schedule	Course content
1.	<b>Training on World Bank Environmental &amp; Social Framework</b>	<ul style="list-style-type: none"> <li>• The training focuses on the World Bank Environmental &amp; Social Framework (ESF).</li> <li>• To familiarize stakeholders with ESF principles, standards, and requirements.</li> <li>• To enhances the understanding of E&amp;S considerations in project planning and implementation.</li> <li>• To ensure E&amp;S sustainability in World Bank-funded projects.</li> <li>• To provides knowledge to the stakeholders about</li> </ul>	PMU, PIU, DBO Contractor and Persons directly related to project	3 days of trainings before project effectiveness	ESF and ESS1 – ESS10

Sl. No.	Trainings	Purpose of the Training	Participants	Schedule	Course content
		policies and procedures for compliance with ESF.			
2.	<b>Legal and Regulatory requirements</b>	<ul style="list-style-type: none"> <li>To clarify roles and obligations within the legal framework.</li> <li>To Provides guidance on compliance and risk mitigation.</li> <li>To Enhances awareness of legal risks and liabilities.</li> <li>To Strengthens capacity to ensure project success.</li> </ul>	PMU, PIU and Persons directly related to project	1 day seminar	legal and institutional responsibilities
3.	<b>Implementation of ESMP</b>	<ul style="list-style-type: none"> <li>To ensure Social and Environmental impacts, risks and liabilities identified during the ESIA process are effectively managed throughout project cycle.</li> <li>Effective implementation and monitoring of Environmental and Social Management plan.</li> </ul>	PMU, PIU, and DBO Contractor	1 day Workshop, (Half yearly)	ESIA and ESMP, National and International good practices and guidelines on ESMP
4.	<b>Occupational Health and Safety and Public Health and Safety</b>	<ul style="list-style-type: none"> <li>To raise awareness, provide training, and promote a safety culture.</li> <li>To Equips participants with knowledge and skills to mitigate workplace hazards.</li> <li>To Enhances compliance with OHS/PHS regulations and reduces accidents.</li> <li>To Educates workforce on labour laws and regulations.</li> <li>To Provides training on fair treatment, safety, and conditions.</li> <li>To promote compliance and enhance worker well-being.</li> </ul>	PMU, PIU, Local NGOs and DBO Contractor	4 Workshops, each of 1 day duration	PPE, Workplace EHS, Prevention of accidents at work sites, Solid and liquid waste management, Hazardous waste management, Emergency Preparedness and Awareness campaign on HIV/AIDS National working laws and regulations, Contractor and sub-contractor codes of conduct, Worker's organizations and Child labor
5.	<b>Grievance Redress Mechanism and Module</b>	<ul style="list-style-type: none"> <li>To train participants in handling grievances effectively.</li> <li>To establishes fair and accessible processes for addressing concerns.</li> <li>To enhances understanding of grievance resolution</li> </ul>	PMU, PIU, Civil Society, Local NGOs and DBO Contractor	1 day Workshop (Half Yearly)	Registration and processing procedure, Grievance redress procedure, Documenting and processing grievances, Use of the procedure by different stakeholders

Sl. No.	Trainings	Purpose of the Training	Participants	Schedule	Course content
		<p>importance.</p> <ul style="list-style-type: none"> <li>To equips participants to implement and manage GRM effectively.</li> <li>To promote accountability, transparency, and stakeholder satisfaction.</li> </ul>			
6.	<b>Construction Waste Management</b>	<ul style="list-style-type: none"> <li>To raise awareness about environmental impacts and regulations.</li> <li>To provide guidance on waste reduction and proper disposal.</li> <li>To enhance understanding of health and safety.</li> <li>To equip participants with skills for sustainable waste management.</li> <li>To promote compliance with regulations and best practices.</li> </ul>	ES Specialists, EHS officer, PIU and DBO Contractor	1 day Workshop (quarterly)	Guidance on managing construction waste, Waste handling procedures, risk management using protective equipment, Waste sorting, Waste management, Hazardous waste handling and soil spillage management
7.	<b>GBV and SEA/SH Risk Module</b>	<ul style="list-style-type: none"> <li>To raise awareness about GBV and SEA/SH risks and impacts.</li> <li>To provide training on identifying and responding to GBV and SEA/SH incidents.</li> <li>To enhance understanding of risk management strategies.</li> <li>To equip participants with skills to create safe environments.</li> <li>To promote gender equality and human rights.</li> <li>To foster collaboration to address GBV effectively.</li> </ul>	PMU, PIU, Local NGOs, DBO Contractor, EHS Officer and Persons directly related to project	1 day Workshop (Half Yearly)	Raising awareness and measures to prevent and mitigate GBV risks
8.	<b>Stakeholders Engagement Procedures</b>	<ul style="list-style-type: none"> <li>To improve and facilitate in decision making that actively involved PAPs and other stakeholders in timely manner.</li> <li>Identify appropriate modes of engagement and prepare plans for engagement and meaningful consultation.</li> </ul>	PMU, PIU, DBO Contractor, EHS Officer and Persons directly related to the project	1 day Workshop (Half Yearly)	Stakeholders Engagement Plan

## 8.6. ESMP Cost Estimate

The environmental and social management cost estimate for the various environmental and social management measures in the ESMP is summarized in Table 51.

**Table 51: Environmental and Social Management Cost Estimate**

Sr. No.	Particulars	Stages	Unit	Quantity	Rate (INR)	Cost (INR)
<b>A.</b>	<b>Mitigation Measures</b>					
1	Statutory Approvals/ Clearance/ Permissions from various departments (Except for Forest Clearance and Land, allother clearances/permissions are to be paid by the contractor which are already included in the contract price.	Pre-construction	-	-	-	--
2	Traffic management at work sites (Markings, Channelizing Devices, Arrow Panels and Warning Flags /Lights)	Construction	Lump sum			20,00,000
3	Hard Barricading of work site @ 8,000 per barricade size (2075mm*450mm*1000mm) (Length*Base width*Height)	Construction	per meter	2000	8,000	1,60,00,000
4	Water Sprinkling for dust suppression (At five locations, twice a day, for 3 years)	Construction	Per tank	10,950	500	54,75,000
5	Health and Safety for Labour (Hand gloves, shoes, helmet, goggles, nose mask earmuff, safety belt, fall arrestor, etc. medical kit, doctor visits)	Construction	per Labour	1500 <sup>74</sup>	6,000	90,00,000
6	Provision for tree cutting	Pre-construction	Per tree	150 <sup>75</sup>	5,000	32,75,000
7	Provision for compensatory plantation	Pre-construction	Per tree	1500 <sup>76</sup>	2,000	1,31,00,000
	<b>Subtotal (A)</b>					<b>488,50,000</b>
<b>B.</b>	<b>Monitoring Measures</b>					

<sup>74</sup> Estimated no. of labour, to be updated as per the actual.

<sup>75</sup> Based on the BOQ and may vary.

<sup>76</sup> 1:10 tree plantation ratio.

Sr. No.	Particulars	Stages	Unit	Quantity	Rate (INR)	Cost (INR)
1a	Air quality monitoring a. At OHSRs & WTP (As per BoQ)	Construction	per sample	1176	8,000	9,40,8000
2a	Noise quality monitoring a. At OHSRs (As per BoQ)	Construction	Per sample	72	1,000	72,000
3	Surface water monitoring (As per BoQ)	Construction	Per sample	36	6,000	216,000
4	Ground water monitoring (As per BoQ)	Construction	Per sample	36	6,000	216,000
6a	Soil Monitoring (Quarterly) a. At OHSRs (As per BoQ)	Construction	Per Sample	18	8,000	144000
7	Solid Waste Management + Disposal sites inspection Total sites = 10 Locations 10 Nos X 36 months = 360 visits	Construction	Per Visit	36,0	1,000	3, 60,000



Sr. No.	Particulars	Stages	Unit	Quantity	Rate (INR)	Cost (INR)
8	Contractor Environmental and Social Monitoring staff for 3 years (10 years of experience) <ul style="list-style-type: none"> <li>o Environmental Specialist</li> <li>o Social Expert cum community liaison specialist</li> <li>o Health and Safety Specialist</li> </ul>	Construction	Per Person per year	9	12,00,000	1,08,00,000
9	Contractor Environmental and Social Monitoring staff for 3 years (5 years of experience)	Operation	Per Person per year	3	8,00,000	24,00,000
	<b>Subtotal (B)</b>					<b>2,36,16,000</b>
<b>C.</b>	<b>Capacity Building, Awareness/Training Camps and Housekeeping</b>					
1	Training of PIU staff, MCL officials and Contractor personnel on ESMF, ESCP, etc as per training schedule	All Phases	lump sum	-	-	20,00,000
2	Preparation of plans and protocols (Site specific Demolition waste management plan) as per ESMP	Pre-construction	Lump sum	-	-	5,00,000
3	Health and Hygiene Campaign	Construction	Lump sum	-	-	5,00,000
4	Conducting Quarterly HIV/AIDS/GBV Awareness Programme and Testing on Site for not less than 90% of all workers including migrant and local labor as well as willing persons from surrounding through approved specialised agency with approval from Engineer-in-Charge, provide and maintain condom dispenser at base camp and labour camp, provide and maintain HIV/AIDS awareness posters, etc., inclusive of direct and indirect costs.	Construction	Lump sum	12	100000	12,00,000
5	Camps for Health Check-up and Diagnostic Tests- Quarterly.	Construction		12	100,000	12,00,000
6	Training Camps- Quarterly	Construction		12	50,000	6,00,000
7	Daily Housekeeping, cleaning of residual materials and waste from the labor camps and all working	Construction	-	-		

Sr. No.	Particulars	Stages	Unit	Quantity	Rate (INR)	Cost (INR)
	sites clearance of all sites including WTP, OHSRs and TLs from any encumbrance after completion of work.					
	(i) Cleaning of Toilets at WTP site and labour camp		Per Day	1095	1000	1095000
	(ii) Cleaning of Toilets at OHSR sites		Per Day	84315	100	8431500
8	Construction and Provision of Toilets and Bathroom units with septic Tanks and Soak pit for Male and Female workers separately in the Camp Site and Offices as per specification of Swacch Bharat Abhiyaan/CPWD with proper water supply, drainage system. electric supply and proper access.					
	(i) Labour Camp sites and Offices		Per No.	10	100000	10,00,000
9	Toilets to be developed at each OHSR site to be used by the labour engage for the construction activity. They may be connected to city sewerage system and also permitted to be used by public at large. The cost includes water soap, colour wash, and maintenance at each toilets for 36 months		Per No.	77	20,000	1440,000
10	The units shall be maintained by daily cleaning six times a day for 36 months at labour camp. The Toilets at OHSR sites may be maintained by contractor's staff. Daily cleaning six times a day.		Monthly	36	10000	360000
	<b>Subtotal (C)</b>					<b>1,83,26,500</b>
<b>D.</b>	<b>Overhead costs associated with managing the ESMP, office</b>	Construction	Lump sum	-	-	<b>30,00,000</b>
<b>E.</b>	<b>Half-yearly Environmental and Social Audit</b>	Construction	Per Audit	6	20,00,000	<b>1,20,00,000</b>
<b>F.</b>	<b>Social Management Cost (Ref. Section 6.5.2 of ESIA)</b>					<b>7,50,00,000</b>
	<b>Total (A+B+C+D+E+F)</b>					<b>18,07,92,500</b>
	<b>Contingency (@5%)</b>					<b>9039625</b>
	<b>Grand Total</b>					<b>18,98,32,125 Say 19 Crores</b>

The tentative cost estimate for the Environmental and Social Management Plan (ESMP) for the project is estimated to be between 1% to 1.5% of the total project cost. This cost estimate presents indicative cost of all

the Environmental Management Actions to be performed by the contractor. Some of the Environmental Management actions indicated above are included in / budgeted for in the bills of quantities (BOQ) and / or specifications and / or contract price. Hence, the above cost estimate cannot be claimed by the contractor, unless otherwise the PIU/ PMU decides that an Environmental Management action needs to be paid for. This cost estimate does not include expenses related to land purchase, forest clearance/diversion, and associated activities. The detailed item wise budget of ESMP will be included in the Contractor’s Environment and Social Management Plan (C-ESMP).

### 8.7. Penalty Provisions

The Penalty provision has already been included in section X Clause 4 (c) of Contract Agreement.

### 8.8. Implementation Schedule

The Implementation schedule is given in the table below:

**Table 52: The Implementation scheduled for the DBOT Contract**

Sl. No.	Activity	Duration
LOA has been awarded on 10 <sup>th</sup> July 2024		
1.	Construction Period	36 months
2.	Design Period	06 Months (included in 36 months)
3.	Trail Commissioning Period	03 months (included in 36 months)
4.	Operation and Maintenance Period	10 years after completion of 36 months.

## 9. Stakeholders Consultations Strategy and Participation Framework

As per the World Bank’s Environment and Social Framework, Stakeholder Engagement needs to be carried out throughout the project cycle. Environment and Social Standard (ESS-10) lays a systematic approach and framework to identify the stakeholders and engage with them in a continuous process. Stakeholder Consultation Strategy and Participation Framework is a part of Stakeholder Engagement Plan (SEP). The SEP will be implemented throughout the project cycle duly taking into account the feedback from the stakeholders and lessons learnt. The consultation strategy is prepared based on the extensive field consultations. The following table presents the proposed strategy for stakeholder engagement and information disclosure. It also spells out the timing of the intervention, target audience of the engagement and the parties responsible for it at various stages of the project cycle.

**Table 53: Topics of Engagement with the Stakeholders**

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/ frequency	Responsibilities
<b>Stage 1: Project preparation (Project design, Scoping, ESMF/ESCP/SEP Disclosure)</b>				
<b>Project Affected People:</b> <ul style="list-style-type: none"> <li>Landowners</li> </ul>	<ul style="list-style-type: none"> <li>Project Scope and Design</li> <li>E&amp;S risks</li> <li>Land acquisition and Compensation process and timelines for completion</li> <li>Occupational Health &amp; Safety and Community Health &amp; Safety measures planned for WTP, ESR &amp; Transmission line</li> <li>GRM process</li> </ul>	<ul style="list-style-type: none"> <li>Meetings, separate meetings for women and the vulnerable group</li> <li>Disclosure of written information: brochures, posters, flyers, website Information boards or desks</li> <li>Grievance mechanism</li> <li>Local newspaper</li> <li>Project details on MCL/ PMIDC website</li> </ul>	<ul style="list-style-type: none"> <li>At least once for preliminary screening,</li> <li>Survey at least twice for household level census &amp; socio-economic survey and 2-3 round of consultations towards preparation of ESIA, RAP and other safeguard reports</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> <li>ESIA consultants</li> </ul>
<b>Project Affected People:</b> <ul style="list-style-type: none"> <li>People residing in the project area along transmission lines and proximity to ESR sites</li> </ul>	<ul style="list-style-type: none"> <li>Project Scope and Design</li> <li>Design alternatives for impact minimization</li> <li>Disruption to services and arrangement during construction</li> <li>Accidents and road safety issues, natural calamities and proneness to risks;</li> <li>Occupational Health &amp; Safety</li> </ul>	<ul style="list-style-type: none"> <li>Public meetings, separate meetings for women and the vulnerable group;</li> <li>Mass/social media communication (as needed)</li> <li>Disclosure of written information: brochures, posters, flyers, website Information boards or desks</li> <li>Grievance mechanism</li> <li>Suggestion boxes at site offices</li> </ul>	<ul style="list-style-type: none"> <li>Regular meetings at project sites and as various components are executed and put to operation,</li> <li>At least twice during pre-construction phase</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> <li>ESIA consultant</li> </ul>

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/ frequency	Responsibilities
	and Community Health & Safety measures planned for WTP, ESR & Transmission line <ul style="list-style-type: none"> <li>GRM process</li> <li>LMP</li> </ul>			
<b>Project Affected People:</b> <ul style="list-style-type: none"> <li><b>Impacted by temporary economic or physical displacement - Tenants/ Hawkers/ Vendors along alignments</b></li> </ul>	<ul style="list-style-type: none"> <li>Project design details, alignments and their impacts</li> <li>Provisions for compensating economic and physical displacement, timelines for completing rehabilitation</li> <li>Communication on final rehabilitation/ compensation approved by Government</li> <li>Grievance mechanism process</li> </ul>	<ul style="list-style-type: none"> <li>Census &amp; Socio-economic survey</li> <li>FGDs and small group consultations</li> <li>Print-Newspaper, Newsletter / leaflets/ Pamphlet</li> <li>Radio information</li> </ul>	<ul style="list-style-type: none"> <li>At least twice for census &amp; socio-economic survey</li> <li>At least twice- before &amp; after compensating</li> <li>Multiple times during alignment/ ESR works</li> <li>Weekly insertions on project website.</li> <li>Grievance mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> <li>ESIA consultant</li> </ul>
<b>Other Interested Parties:</b> <ul style="list-style-type: none"> <li><b>Resident Welfare Associations (RWAs)</b></li> <li><b>Elected Representative of Municipal Corporation</b></li> <li><b>Civil Society Organisations</b></li> <li><b>Print and Tele Media</b></li> <li><b>Staff of Line departments</b></li> <li><b>Staff of Municipal Corporations</b></li> <li><b>Community /</b></li> </ul>	<ul style="list-style-type: none"> <li>Project scope and design details, design alternatives for impact minimization;</li> <li>Land acquisition and Compensation process, Secondary baseline information on environmental and social aspects.</li> <li>Environmental and social risks of the Project.</li> <li>Impact mitigation and enhancement measures.</li> <li>Resettlement and Rehabilitation</li> <li>Grievance</li> </ul>	<ul style="list-style-type: none"> <li>Face-to-face meetings/One-to one meetings</li> </ul>	<ul style="list-style-type: none"> <li>Once during pre-construction phase</li> <li>As and when required</li> <li>as per requirement for obtaining necessary clearances/ permissions</li> </ul>	<ul style="list-style-type: none"> <li>PIU / PMIDC</li> <li>ESIA consultant</li> </ul>

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/frequency	Responsibilities
<p><b>Religious leaders</b></p> <ul style="list-style-type: none"> <li>● <b>Regulatory agencies</b></li> </ul>	<p>mechanism process</p> <ul style="list-style-type: none"> <li>● Gender related issues.</li> <li>● Involvement of women Self-help groups</li> <li>● Shifting of utility and temporary arrangement</li> <li>● Community Safety measures during WTP, ESR &amp; Transmission Line constructions- option and measures</li> </ul>			
<p><b>Other Interested Parties</b></p> <ul style="list-style-type: none"> <li>● <b>Supervision of contractors, sub-contractors, service providers, suppliers, and their workers/ labor force</b></li> </ul>	<ul style="list-style-type: none"> <li>● Training ESMF/ESMP requirements and other management plans</li> <li>● GRM process</li> <li>● E&amp;S requirements</li> <li>● Feedback on consultant/ contractor reports</li> </ul>	<ul style="list-style-type: none"> <li>● Face-to-face meetings</li> <li>● Trainings/workshops</li> <li>● Invitations to public/community meetings</li> </ul>	<ul style="list-style-type: none"> <li>● As needed</li> </ul>	<ul style="list-style-type: none"> <li>● PIU/ PMIDC</li> </ul>
<p><b>Vulnerable Groups</b></p> <ul style="list-style-type: none"> <li>● <b>Women and women households</b></li> </ul>	<ul style="list-style-type: none"> <li>● Project design details, alignments and their impacts</li> <li>● Provisions for compensating economic and physical displacement, timelines for completing rehabilitation</li> <li>● Land acquisition and Compensation process</li> <li>● Special Provisions for WHHs</li> <li>● Impact mitigation and enhancement measures</li> </ul>	<ul style="list-style-type: none"> <li>● Census &amp; Socio-economic surveys, consultations, focus group discussions</li> <li>● Wall paintings/slogans, notice boards and signage</li> <li>● Telephone helpline</li> <li>●</li> </ul>	<ul style="list-style-type: none"> <li>● Once during the pre-construction phase</li> </ul>	<ul style="list-style-type: none"> <li>● PIU/ PMIDC</li> <li>● World Bank</li> <li>● ESIA consultant</li> </ul>

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/ frequency	Responsibilities
	<ul style="list-style-type: none"> <li>Suggestions on Resettlement and Rehabilitation Provisions and conveying the final provisions to PAPs as approved by govt.</li> <li>Grievance mechanism process</li> <li>Gender related issues</li> <li>GBV related issues and LMP Implementation Procedures</li> <li>Discussions on involvement of women Self- help groups for maintenance works</li> </ul>			
<b>Stage 2: Construction Phase</b>				
<b>Project Affected People including Vulnerable community.</b> <ul style="list-style-type: none"> <li><b>Landowners</b></li> </ul>	<ul style="list-style-type: none"> <li>Land acquisition and Compensation process</li> <li>Provisions of eligible entitlements work opportunities</li> <li>Grievance mechanism process</li> </ul>	<ul style="list-style-type: none"> <li>Holding of FGDs and meetings</li> </ul>	<ul style="list-style-type: none"> <li>Continuous – till completion of all ESIA/RAP implementation activities</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> </ul>
<b>Project Affected People including Vulnerable community</b> <ul style="list-style-type: none"> <li><b>People residing in the project area along transmission lines and proximity to ESR sites</b></li> </ul>	<ul style="list-style-type: none"> <li>Project scope and design details, construction schedule if revised</li> <li>Contractor establishment details i.e. labour camps, plants area, Muck disposal locations etc.,</li> <li>Management of air and noise pollution;</li> <li>Disruption to</li> </ul>	<ul style="list-style-type: none"> <li>Consultations, Focus Group Discussions</li> <li>Meetings with communities involving police departments for safety aspects</li> <li>Safety sign boards</li> <li>GRM Helpline number through display at project locations and on flyers</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly meetings during construction phase</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> </ul>

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/ frequency	Responsibilities
	<p>services and arrangement during construction</p> <ul style="list-style-type: none"> <li>Grievance mechanism process</li> <li>Community Safety measures during construction</li> </ul>			
<p><b>Project Affected People:</b></p> <ul style="list-style-type: none"> <li><b>Impacted by temporary economic or physical displacement - Tenants/ Hawkers/ Vendors along alignments</b></li> </ul>	<ul style="list-style-type: none"> <li>Provisions for compensating economic and physical displacement, timelines for completing rehabilitation</li> <li>Grievance mechanism process</li> </ul>	<ul style="list-style-type: none"> <li>Holding of FGDs and meetings</li> </ul>	<ul style="list-style-type: none"> <li>Continuous – till completion of all ESIA/RAP implementation activities</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> </ul>
<p><b>Project Affected People:</b></p> <ul style="list-style-type: none"> <li><b>DBOT Contractor, workers, &amp; sub-contractors and their workers</b></li> </ul>	<ul style="list-style-type: none"> <li>Orientation on ESHS provisions;</li> <li>Sexual harassment provisions,</li> <li>Labour related aspects as provided in the Labour Management Procedures</li> <li>ESMP requirements and other management plans</li> </ul>	<ul style="list-style-type: none"> <li>Provisions in Bid/Contract documents &amp; also through Pre-bid conference</li> </ul>	<ul style="list-style-type: none"> <li>During contract signing</li> <li>Periodic as part of worker’s joining</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> <li>DBOT contractor</li> </ul>
<p><b>Other Interested Parties</b></p> <ul style="list-style-type: none"> <li><b>IVA</b></li> <li><b>Supervision of contractors, sub-contractors, service providers, suppliers, and their workers/ labor force</b></li> </ul>	<ul style="list-style-type: none"> <li>Project information: scope and rationale and E&amp;S principles</li> <li>Training in RPF, RAP, ESMP requirements and other management plans</li> <li>Grievance mechanism process</li> </ul>	<ul style="list-style-type: none"> <li>Face-to-face meetings</li> <li>Trainings/workshops</li> <li>Invitations to public/community meetings</li> </ul>	<ul style="list-style-type: none"> <li>As needed</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> </ul>



Target stakeholders	Topic(s) of engagement	Method(s) used	Location/ frequency	Responsibilities
	<ul style="list-style-type: none"> <li>ESHS, GBV, SEP, Labour Management procedures</li> <li>Feedback on consultant/ contractor reports</li> </ul>			
<b>Vulnerable Groups</b> <ul style="list-style-type: none"> <li><b>Women and women households</b></li> </ul>	<ul style="list-style-type: none"> <li>Project information - scope and rationale and E&amp;S principles</li> <li>Project status</li> <li>Health and safety impacts</li> <li>Employment opportunities</li> <li>Environmental concerns</li> <li>Grievance mechanism process</li> <li>Gender and GBV related issues</li> <li>Involvement of women Self-help groups for maintenance works</li> </ul>	<ul style="list-style-type: none"> <li>Public meetings, open houses, trainings / workshops</li> <li>Disclosure of written information: brochures, posters, flyers, website, Information boards in villages</li> <li>Notice board(s) at construction sites</li> <li>Grievance mechanism</li> <li>RAP implementation</li> <li>FGDs with women SHGs</li> </ul>	<ul style="list-style-type: none"> <li>As needed</li> </ul>	<ul style="list-style-type: none"> <li>PIU/ PMIDC</li> <li>World Bank</li> <li>ESIA consultant</li> <li>DBOT contractor</li> </ul>

## 10. Grievance Redressal Mechanism

Grievance Redressal Mechanism (GRM) is an important component of any project's implementation. As per grievance mechanism & accountability of WB's ESF, the role of grievance redress mechanism is to receive, evaluate and facilitate the resolution of affected parties' concerns, complaints, and grievances during project implementation and operation. For this purpose, the project will propose and implement a Grievance Redressal Mechanism that will respond to the concerns and grievances of project-affected parties related to the environmental and social performance of the project in a timely manner. The GRM serves as an effective tool for early identification, assessment, and resolution of complaints/ queries of all affected parties promptly and transparently during project implementation and operation.

**Existing Grievance Redress Mechanism:** Existing GRM of Punjab Municipal Services Improvement Project (PMSIP) will be used for Sub-project Ludhiana which is accessible through phone calls, WhatsApp/ Message, and m-Seva portal. It is an online portal on which citizen have access to raise their grievances. The project specific GRM is not intended to bypass the government's own redress process; rather it is intended to address affected parties concerns and complaints promptly, making it readily accessible to all segments of the affected parties, and is scaled to the risks and impacts of the project.

**Who can file a complaint:** A complaint may be registered by stakeholders who may be, directly or indirectly affected by the project. A representative can register a complaint on behalf of the affected person or group, provided that the representative is identified by the affected person or group and submits evidence of the authority to act on their behalf.

**Process and Timeframe:** The grievance redress process and timeframe involved in the GRM is described below:

- I. 1st Level grievance (Field Level):** In case of grievances that are immediate and urgent in the perception of the complainant, PIU will direct the contractor to resolve the complaint and ensures that it is resolved. Efforts will be made to resolve all grievances within seven days from the date of receipt of a complaint / grievance.
- II. 2nd Level grievance (PIU Level):** Grievances not redressed by the staff at field level, shall be brought to the Grievance Redress Committee (GRC) at PIU level supported by Assistant Engineer (AE), Junior Engineer (JE) & E&S Experts which shall be redressed the grievances within 15 working days from the date of receiving the complaint. If again not redressed, it shall be brought to PMU at state level.
- III. 3rd Level Grievance (PMU Level):** All the grievances that are not addressed at 2nd level by PIU will be brought to the third level. It is expected that grievances shall be redressed within 15 days from the receipt of the complaint. Alternatively, the aggrieved person will have the right to go to the Court of law in case they are not satisfied with the outcome of their appeal.

**Grievance Redressal Committee (GRC):** The main responsibilities of the GRC are: (i) provide support to PAPs on problems arising from land/property acquisition; (ii) record grievances, categorize, and prioritize grievances and resolve them; (iii) immediately inform the PMU of serious cases; and (iv) report to PAPs on developments regarding their grievances and decisions of the GRC and the PMU. Other than disputes relating to ownership rights under the court of law, GRC will review grievances involving all resettlement benefits, compensation, relocation, replacement cost and other assistance, including those of the vendors and others who will be impacted by the construction activities.

It is proposed that a PIU level Grievance Redress Committee (GRC) needs to be formed with the following members:

- Superintending Engineer
- Social Development Specialist
- Environmental Specialist

- Civil Society representative
- PAP representative
- A community leader/ RWA office bearer, and
- Representative from Land and Revenue Department (in cases related to land)
- Representative from Women Groups

It is mandatory that GRC constituted at the city and project level for grievance management have at least one-third women members.

**Grievance Procedure:** As the GRM works within existing frameworks of PMSIP, it is recognized that the GRM shall comprise project level redress mechanisms. Most project related grievances could be minor and site-specific.

The grievances can be register through online at <https://mseva.lgpunjab.gov.in> or Toll-Free No. 1800-1800-0172 between 8:00 am to 5:00 pm or WhatsApp Chatbot and Contact No. XXXXXXXXXXXX<sup>77</sup>. One can also register one's grievances after scanning QR Code and downloading Mobile

Application, displayed at every construction site and designated place.

The contact number of Grievance

Redressal cell is displayed at WTP location, Transmission line and ESRs construction sites. The information shall be displayed in Regional language, English and in Hindi.

On receipt of each complaint, the representative will note the date, time, name and contact details of the aggrieved person and the nature of the complaint in the Complaints Register. The designated person shall register and inform the aggrieved person about the timeframe for expected response and resolution. In case the representative is not able to redress the grievance within the project specified timeframe, it will be his/ her responsibility to escalate it to the PIU Ludhiana. If the PIU is not able to resolve the complaint to the satisfaction of the aggrieved persons, it will then refer directly to the PMU at PMIDC.

The steps for Grievance Redressal Mechanism is given as follows:

- Step-1: Receive, register, and acknowledge the Grievances.
- Step-2: Develop resolution and respond to Aggrieved Person
- Step-3: Scale up the grievance if the Aggrieved Person remains dissatisfied.
- Step-4: Recourse to legal and other formal recourse
- Step-5: Record Keeping

The format for Grievance Registration and the format for documenting community grievances are attached in **Annexure 28**.

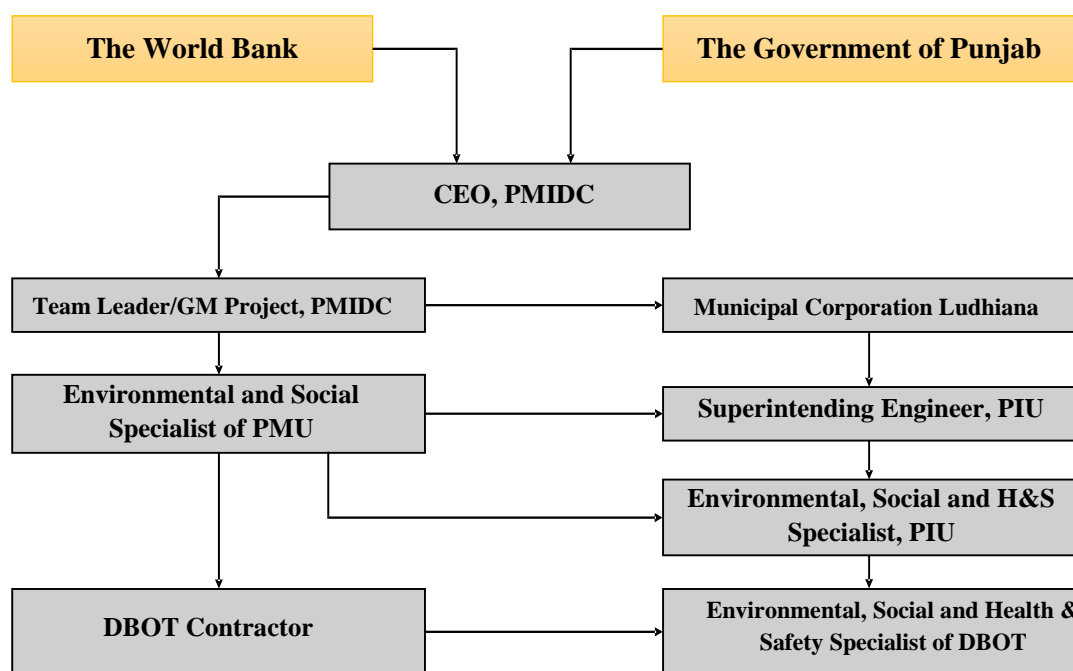


**Figure 17: Grievance Redressal**

<sup>77</sup> WhatsApp no. to be updated by PIU once the same is generated.

## 11. Institutional and Implementation Arrangement

The Punjab Municipal Infrastructure Development Company (PMIDC), Government of Punjab (GoP) and Municipal Corporation of Ludhiana (MCL) are the Implementing Agency for the Ludhiana Bulk Water Supply Scheme (LBWSS). All land related impacts emerging from the project will be managed by the project implementing agencies, namely, Punjab Municipal Infrastructure Development Company and Municipal Corporation Ludhiana with due support from the district administration.



**Figure 18: Institutional Arrangement Flow Chart**

The overall institutional arrangement proposed for the implementation of ESMP is as under:

**Table 54: Roles & Responsibility**

Sl.No.	Agency/Key Personnel	Roles & Responsibility
1	<b>The Project Management Unit (PMU)</b>	Punjab Municipal Infrastructure Development Company (PMIDC) is the State Level Apex Institution that implements urban reforms and investment programs and will act as the nodal agency and Project Management Unit (PMU) for this Project. It will be responsible for integrating actions under the current program at the state level and across the city to support PIU and MCL in implementing ESMP for Sub-Project Ludhiana. PMIDC has an Environment & Social Safeguard Unit headed by a Manager (Environment & Social Safeguard) for management and implementation of safeguard policies of PMSIP.

2	<b>The Project Implementation Unit (PIU)</b>	<p>City level implementation will be the responsibility of the Municipal Corporation of Ludhiana with capacities housed in their PIU and eventually the proposed water utilities will take over after its commissioning.</p> <p>The PIU will be housed within the Municipal Corporation, responsible for Operations and Maintenance (O&amp;M) and for meeting the deliverables with support from PMIDC. The Safeguard unit at PIU comprising Environmental Safeguard Expert, Social Development Specialist and Health and Safety Expert will have the primary responsibility of ensuring compliance with the safeguard documents and supervising the ESMP. In light of this overall institutional structure planned for the program, the following institutional arrangement is proposed for the implementation of Environmental and Social Management Plan (ESMP) in Ludhiana.</p>
3	<b>Superintending Engineer (SE)</b>	<p>Superintending Engineer (SE) will be assisted by Environment, Social and HS Specialist, who further will have support from Manager (Environment &amp; Social Safeguard) at the PMU office. SE through the PMU will be responsible for the implementation of ESMP in coordination with different agencies of Municipal Corporation of Ludhiana.</p>
4	<b>Social Development Specialist (Vacant)</b>	<p>Social Development Specialist located in city level PIU will be responsible for handling of all social, resettlement and land related issues at the city level, with the help of competent land and revenue department for the purpose. The overall coordination and guidance will be provided by the Social Development Specialist in the State level PMU. This will include review of the preparation of sub- project level ESIA/ESMP/RAP, facilitating and monitoring the ESMP including meaningful and informed stakeholder consultations, socio-economic surveys/ census, coordinating the preparation and implementation of ESMP/RAPs. The specialist also ensures functionality and awareness about the GRM set up for PAPs and mandatory disclosure of ESIA/ESMP/RAP and prepare periodic safeguards reports. Support to PIU in reviewing contractors' site-specific C-ESMP including follow up with DBOT Contractor.</p>
5	<b>Environmental Specialist (Vacant. However, offer given to the selected candidate)</b>	<p>Environmental Specialist located in city level PIU will be responsible for handling all environmental related matters. The overall coordination and guidance will be provided by the Environmental Specialist at the State level PMU. Also review Sub-project specific environmental documentation and give recommendation as needed. During implementation, Environmental Specialist will undertake regular environmental monitoring and supervision of the project. This will include review of Environmental and social documents including Environmental &amp; Forest clearances, permits required by the contractors from different Government agencies. Support to PIU in reviewing contractors' site-specific C-ESMP including follow up with DBOT Contractor.</p>

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<b>6</b>	<b>Health &amp; Safety Specialist</b>	Health & Safety Specialist located in city level PIU will support the implementation of the provision of ESMP and provide oversight to contractor for ensuring compliance with Occupational Health & Safety and Work Zone Safety requirements during execution of DBOT contract. The specialist will prepare monitoring report and also provide training and capacity building of relevant stakeholders on health and safety issues.
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