ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR CONSTRUCTION OF NEW 424 MLD STP AND ASSOCIATED INFRASTRUCTURE INCLUDING ONE TERMINAL SEWAGE PUMP STATION AT PIRANA, AHMEDABAD

(DRAFT)

GUJARAT RESILIENT CITIES PARTNERSHIP:

AHMEDABAD CITY RESILIENCE PROJECT (G-ACRP)

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Prepared by

TATA CONSULTING ENGINEERS LTD.

For

AHMEDABAD MUNICIPAL CORPORATION

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List of Abbreviations

Abbreviation	*Expansion*
ACRP	Ahmedabad City Resilience Project
AMASR	Ancient Monuments and Archaeological Sites and Remains Act
AMC	Ahmedabad Municipal Corporation
AMSL	Above Mean Sea Level
AUDA	Ahmedabad Urban Development Authority
APD	Assistant Project Director
ASI	Archeological Survey of India
ASP	Activated Sludge Process
BDW	Biodegradable Wastes
BIS	Bureau of Indian Standards
BMC	Biodiversity Management Committee
BMW	Bio Medical Waste
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
BOQ	Bill of Quantities
BP	Bank Procedures
BPL	Below Poverty Line
C&D	Construction and Demolition
CBD	Convention on Biological Diversity
CBMWTF	Common Biomedical Waste Treatment Facility
CBO	Community-Based Organization
CC	Climate Change
CMS	Conservation of Migratory Species
COD	Chemical Oxygen Demand
CPA	Critically Polluted Area
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health & Environmental Engineering Organization
CRZ	Coastal Regulation Zone
CHS	Community Health Safety

Abbreviation	*Expansion*
CTE	Consent to Establish
CTO	Consent to Operate
CVCA	Critically Vulnerable Coastal Areas
DG	Diesel Generator
DBOT	Design Build Operate Transfer
DMP	Disaster Management Plan
DPR	Detailed Project Report
DTP	Directorate of Town Planning
DWMP	Disaster Waste Management Plan
EA	Environmental Assessment
EAP	Externally Aided Project
ECoP	Environmental Codes of Practice
EC	Environmental Clearance
EE	Environmental Engineer
EHS	Environmental Health and Safety
ESCP	Environment and Social Commitment Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EPR	Extended Producer Responsibility
ERT	Emergency Response Team
ESA	Environmentally Sensitive Areas
ESS	Environmental and Social Standards
FR	Feasibility Report
SDU	Sustainable Development Unit
ESF	Environmental and Social Framework
ESHS	Environmental and Social Health & Safety
ESZ	Eco-sensitive Zone
ETP	Effluent Treatment Plant

Abbreviation	*Expansion*
FHTC	Functional Household Tap Connection
FI	Financial Intermediary
FGD	Focus Group Discussions
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GoI	Government of India
GoG	Government of Gujarat
GPS	Global Positioning System
GRC	Grievance Redressal Committee
GRCP	Gujarat Resilient Cities Partnership
GPCB	Gujarat Pollution Control Board
GUDM	Gujarat Urban Development Mission
GWIL	Gujarat Water Infrastructure Limited
GWSSB	Gujarat Water Supply & Sewerage Board
Ha	Hectares
HH	Households
HR	Human Resources
HFL	Highest Flood Level
ICB	International Competitive Bidding
IDU	Internal Documents Unit (The World Bank)
IEC	Information Education Communication
IEE	Initial Environmental Examination
IESSR	Initial Environmental and Social Screening Report
IFC	International Finance Corporation
INR	Indian Rupee
IPF	Investment Project financing
IUCN	International Union for Conservation of Nature
JJM	Jal Jeevan Mission

Abbreviation	*Expansion*
IS	Indian Standards
KGP	Knowledge, Governance and Policy
LB	Local Body (Urban or Rural)
LDPE	Low-Density Polyethylene
LMP	Labor, Machinery and Plant
LU	Land Use
LULC	Land use and Land Classification
LPCD	Liters per Capita per Day
LFPR	Labour Force Participation Rate
MAM	Majur Adhikar Manch
M&E	Monitoring and Evaluation
MoEFCC	Ministry of Environment, Forests and Climate Change
MLD	Millions of litres Per Day
MBR	Membrane Bioreactor
MPN	Most Probable Number
N	Nitrogen
NCB	National Competitive Bidding
NDZ	No Development Zone
NEP	National Environmental Policy
NH	National Highway
NGO	Non-Governmental Organization
NGT	National Green Tribunal
NMA	National Monuments Authority
NOC	No Objection Certificate
NPDM	National Policy on Disaster Management
NTDNT	Nomadic Tribes and De-Notified Tribes
O&M	Operations and Maintenance
OD	Operational Directives
OHS	Occupational Health and Safety
OP	Operational Policies
P	Phosphorus
PAF	Project Affected Family
PAP	Project Affected Person
PD	Project Director
PDO	Project Development Outcome
PIU	Project Implementation Agency
PM	Particulate Matter

Abbreviation	*Expansion*
PMC	Project Management Consultant
PPE	Personal Protective Equipment
SCADA	Supervisory Control and Data Acquisition
SC/ST	Scheduled Caste/Scheduled Tribe
SEP	Supplemental Environmental Project
SOP	Standard Operating Procedure
STP	Sewage Treatment Plant
SIRT	Systematic Incident Reporting Tool
SBR	Sequential Batch Reactor
SPS	Sewage Pumping Station
SPM	Suspended Particulate Matter
SPCB	State Pollution Control Board

Abbreviation	*Expansion*
SUDU	Sustainable Urban Development Unit
TSS	Total Suspended Solids
TDS	Total Dissolved Solids
WASMO	Water and Sanitation Management Organization
WB	World Bank
WRIS	Water Resources Information System
UASB	Up flow Anerobic Sludge Blanket
UT	Union Territory
ULB	Urban Local Bodies
USD	United States dollar
VFD	Variable Frequency Drive
VEC	Valued Environmental Components

Executive Summary

Project Description

The Government of Gujarat (GoG) intends to utilize financial support from the World Bank for Gujarat Resilient Cities Partnership: Ahmedabad City Resilience Project (G- ACRP) which aims to strengthen the institutional and service delivery systems for Urban Service Delivery (mainly, Sewerage and Drainage) and financial systems in the Municipal Corporation of Ahmedabad and to strengthen the State's institutional capacity and infrastructure for management of services in urban areas. The proposed development objective of G-ACRP proposed to be supported by the World Bank's Investment Project Financing (IPF) is to develop resilient and sustainable urban service delivery and financial systems in Ahmedabad. G-ACRP project consists of three major components which will strengthen AMC's institutional and financial systems and revenue performance; Improving wastewater management services; and develop state level institutional systems and capacities. ESMF and has been prepared for the G-ACRP project and disclosed on the AMC website[1][2].

One of the sub projects to be undertaken under the ACRP project, is the construction of 424 MLD Sewage Treatment Plant (STP) based on the estimated population for succeeding three decades and technology upgradation for meeting the NGT standards for meeting discharge standards for the treated sewage.

Status of the subproject development at the time of ESIA

The sub-project is under Final Detailed Project Report study stage currently. The subproject will be bid out for implementation on a Design – Build – Operate – Transfer (DBOT) mechanism, also including the ESMP prepared through this ESIA, so that the contractor can plan and arrange the required resources for implementing and managing the E&S aspects.

Sub-project Description

The proposed project for construction of new STP of 424 MLD capacity at available 25 ha [3] of land parcel adjacent to 180 MLD STP will meet the treated effluent norms. Construction of a new 424 MLD Pirana terminal sewage pump station is required to feed the new STP as existing TSPS capacity cannot be upgraded and related components.

Proposed STP capacity of 424 MLD shall be constructed to meet better discharge standards (NGT suggested norms with TSS<10 mg/l). Details of the sub project are discussed in detail in section 1.3 of the report. AMC intends to implement this subproject in a DBOT format and has prepared DPR for this subproject. Royal Haskoning DHV Consulting Pvt. Ltd. in consortium with TTI Consulting Engineers (India) Pvt. Ltd. had been appointed as consultant to prepare the Feasibility Report/ Detailed Project Report with preliminary design for the project.

[1] https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAttachment&queryType=Select&screenId=2900003&AttachmentFileName=ESMF.pdf

[2] https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAttachment&queryType=Select&screenId=2900003&AttachmentFileName=ESIA-126-MLD-STP.pdf

[3] DPR for the project- February 2024

Analysis of Alternatives

The Analysis of Alternatives is structured to follow a 'narrowing approach' involving a series of logical steps, starting with the high-level strategy alternatives followed by description of more detailed technology alternatives considered. Using this commonly adopted narrowing approach, the Analysis of Alternatives considers alternatives in the following sequence:

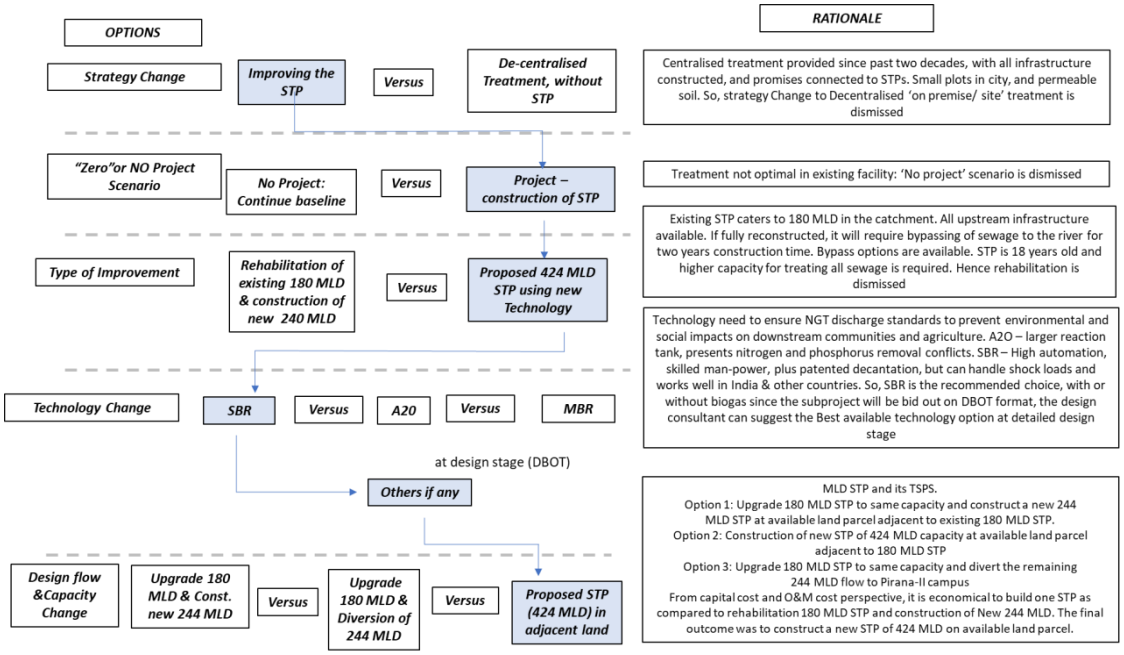
- Strategy Alternative: Decentralised treatment of sewage from individual premises 'on site'. Here, a scenario where residents will be using onsite decentralised treatment in septic tanks is considered against the proposed subproject of centralised STP.
- 'Zero' or 'No Project' alternative: Here, without project scenario i.e., continuing the existing situation compared with the scenario where the proposed project rehabilitation is implemented.
- Design/ Technology Alternatives: Technologies to achieve the stringent discharge standards suggested by NGT are compared with the current one. During Detailed design, this will be subject to further scrutiny and the best environmentally suitable alternative will be adopted.
- Capacity Alternative: Capacity alternatives were assessed.

  Option 1: Upgrade 180 MLD STP to same capacity and construct a new 244 MLD STP at available land parcel adjacent to existing 180 MLD STP.

  Option 2: Construction of new STP of 424 MLD capacity at available land parcel adjacent to 180 MLD STP

  Option 3: Upgrade 180 MLD STP to same capacity and divert the remaining 244 MLD flow to Pirana-II Campus.

  This ESIA is for the proposed alternative namely, construction of new 424 MLD STP of advanced treatment technology such as Sequential Batch Reactor (SBR) to ensure treatment to meet the stringent discharge limits suggested by the National Green Tribunal (NGT). This will ensure full treatment of the sewage reaching the TSPS, without letting bypass of untreated sewage from the Eastern Zone 1 of the city of Ahmedabad (which is served by the existing 180 MLD STP) into the river Sabarmati. For this selected option, expected environmental and social risks and impacts are lower when compared to other options considered. This will overall ensure better environment and health in the city and the region by ensuring full treatment of sewage from its generator catchment, improve quality of water in the river Sabarmati to which the treated sewage is discharged, and improve the reusability of treated sewage. The construction of STP is on the available land of approximately 25 hectares and belongs to AMC. The land required for the proposed 424 MLD STP is sufficient for biological treatment with Biological Nutrient removal system.



Applicable Regulatory and Guidance Framework

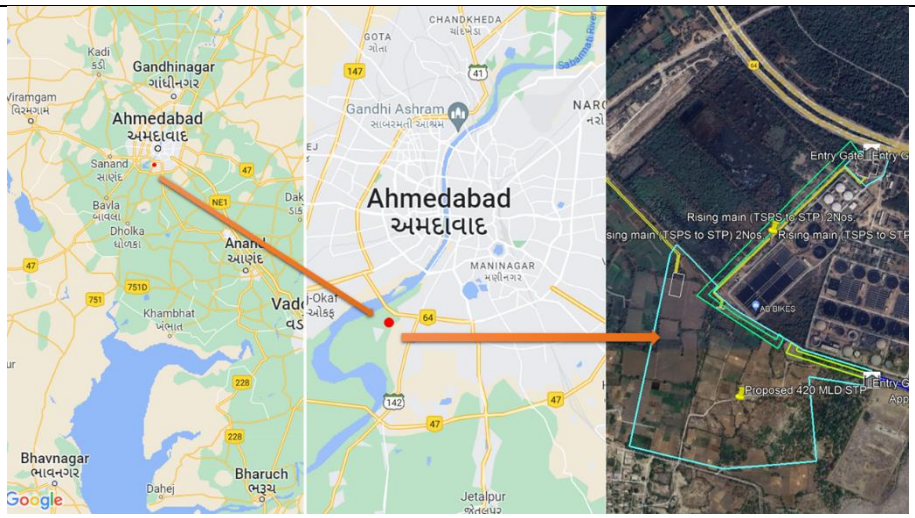
The applicable regulatory framework for the ESIA comprised of the following:

- Applicable international, national, state and city level environmental and social policies, regulations and guidance's (including environmental policy and acts, water and air acts, noise rules, regulations on various type of wastes, wetlands and Eco sensitive areas, tree cutting, biodiversity, Dam Safety, The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, The Sexual Harassment of Women at Workplace Act and others)
- Indian labour and related laws (including The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, The Factories Act, Child Labour (Prohibition and Regulation) Act, Minimum Wages Act, Workmen's Compensation Act & Rules, The Street Vendors Act

- World Bank (WB) Environmental and Social Framework (ESF) and the Environmental and Social Standards (ESSs): Apart from ESS-7 & ESS-9 all other ESSs are relevant for this project. ESS-5 stipulates that project-related land acquisition and land-use restrictions impacts (physical displacement, economic displacement, or both on communities and persons) be addressed. However, as no land acquisition and resettlement will be required in this sub-project and as there is no expected livelihood impacts due to economic displacement, ESS 5 is not relevant for this specific sub-project. The adverse social impacts on adjacent communities include pollution and health effects due to discharge from STP, especially during construction phase and increased insecurity and risk of gender-based violence faced by women and girls due to labour influx. These will be addressed through provisions following WB ESS-1 and ESS-4, World bank Group ESHGs and other Guidelines.
- The ESIA is prepared as guided by the Environmental and Social Management Framework for G- ACRP. The proposed project will comply with national and state regulations, as well as the WB ESF and WBG EHS guidelines and for specific standards the most stringent among these will be complied with.

Baseline environmental and social conditions

Baseline environmental and aspects are presented in the following tabulated summary

Aspects	Description
Subproject name	Construction of 424 MLD STP with construction of new 424 MLD Terminal Sewage Pump Station with allied Infrastructure at Pirana campus I.
Location	Pirana
Co-ordinates	Latitude: 22°58'11.60"N'; Longitude: 72°32'47.11"E"
Details of Administrative/ Physical occurrence	Ward No. 53, Lambha, Ahmedabad, Gujarat State of India East Bank of Sabarmati River, Downstream of Vasna Barrage adjacent to the existing 180 MLD STP on the Eastern side. As per revenue records, land, measuring 25026600 sq. m. Bearing survey No. 417/Part of village Shahvadi, Taluka Vatva, Ahmedabad
Location Map	
Physiography, Microclimate and Surrounding landuse	
Topography, Slope and Soil	Ahmedabad city area is monotonously flat except small patches. Land surface elevation is from 40 m to 60 m AMSL with master slope towards south. Site is flat, sloping from 42 – 46m. HFL is 41.7m.[4]
Micro-climate	Hottest month- May (Maximum Temperature 41.6°C) Coldest Month- January (Minimum Temperature 27°C)
Surrounding land use and activities	**Directions** / **Particulars** North: Sabarmati River, and Existing 180 MLD and 155 MLD outfall East: Existing 155 and 180 MLD STP South: Gyaspur Village: AMC's Waste to Energy (WtE) plant operated by Goodwatts Ahmedabad Pvt. Ltd (under construction), AMC' Ahmedabad City Sludge Hygienization Plant, Luthur Group

[4] Emergency Action Plan Vasna Barrage prepared by National Institute of Hydrology, Jal Vigyan Bhavan, Roorkee (IIT Roorkee, Uttarakhand and Final DPR) and DPR, February 2024 (https://drive.google.com/drive/folders/1b7ZtOTr2db1MF40NoHFWZhVColUfGZNJ?usp=drive_link)

Aspects	Description	
		Company Green Gene Enviro Protection & Infrastructure Pvt. Ltd waste processing industries
	West	Sabarmati River, CETP NTIEM
Any landuse or structure of importance	Vasna Barrage located 1.8 km upstream, two parallel bridges across Sabarmati downstream of the Barrage.	
Site Details		
Site Plan		
Approach to site	Access to the proposed 424 MLD TSPS is from the slip road of Narol -Vishala Highway – NH-64.	
Description of main and subsidiary access ways	Presently, two gates are there on the slip road of Narol Highway, for access to the STP in Pirana Campus 1 and the land parcel allocated to the upcoming 424 MLD TSPS. New entrance is proposed for TSPS from slip road of Narol highway. The construction activities for the upcoming TSPS will be through proposed gate from service road. Approach road to proposed STP has been given in DPR. Proposed length for accessing site is 1100 meters which links site from the Narol Naroda road of which 350 m is already constructed by Jindal Urban Waste Management (Ahmedabad) Ltd which will require resurfacing and whereas balance part of the road connecting the service road is required to be made pucca. Kacha road is present which is not in good condition. It is proposed to overlay the 350 m of the existing road. The cost of the same is included in the Project cost of proposed 424 MLD STP. Refer to image above for details of site, adjacent land use and entry gate.	
Area	2,50,000 sq. m.	
Ownership	AMC	
Historic land use	Historically,it's a fallow land is allotted for construction and development of sewage treatment plant. The land allocated for 424MLD STP is green field area	

Aspects	Description
	having some bushes and shrubs (Total area= 25Ha). The area for new TSPS is proposed within the existing STP towards East (Sown in site map above). The proposed land of TSPS has one small security cabin (Approximate area 9.95 Sq.m), Scrap yard (Approximate area 187 Sq.m) and abandoned RCC tank (Approximate area 176 Sq.m). These structures would be cleared before start of the project.
Current land use	Covered with shrubs and bushes. This is designated land use for STP
Natural features	None on site – it is flat barren city plot in an area surrounded by STPs and SWM facilities, Sabarmati River to North of the site
Impact during any historic event?	Flooding - As per the Final Report on Dam Break Analysis & Flooding simulation prepared by National Institute of Hydrology, Jal Vigyan Bhavan, Roorkee (IIT Roorkee, Uttarakhand), the HFL corresponding to 100 years return period for STP site is 42.78 meters. The design HFL is to be considered 50 mm above HFL of site to account for safety margin and climate change. Hence, design HFL of the site has been considered as 42.83 m as per DPR. NIH report on Dam Break Analysis for Vasna analysed that the top of the structures can be kept 0.3m above the HFL to avoids impact of flooding on STP units. This has been considered while undertaking the design. TSPS – TSPS: Therefore, Design HFL of TSPS has been considered as 42.83m which is same as HFL of STP site due to its proximity to STP site. The average ground level of TSPS site is 43.75 m, which is fairly above the HFL.[5]
Description of existing facility	The proposed STP project is a new green field project to be set up on plot of land behind the existing 180 MLD STP premises. A new Terminal pumping facility is planned to be constructed in the available land parcel admeasuring 0.82 ha which is in front of 155 MLD STP. Historically, the land use was fallow land allotted for construction and development of sewage treatment plant. The land allocated for 424MLD STP is green field area having some bushes and shrubs (Total area= 25Ha). The area for new TSPS is proposed within the existing STP towards East (Sown in site map above). The proposed land of TSPS has one small security cabin (Approximate area 9.95 Sq.m), Scrap yard ((Approximate area 187 Sq.m) and abandoned RCC tank (Approximate area 176 Sq.m). These structures would be cleared before the start of the project.

[5] Emergency Action Plan Vasna Barrage prepared by National Institute of Hydrology, Jal Vigyan Bhavan, Roorkee (IIT Roorkee, Uttarakhand and Final DPR, February 2024 (https://drive.google.com/drive/folders/1b7ZtOTr2db1MF40NoHFWZhVColUfGZNJ?usp=drive_link)

<table>
<tr><th>Aspects</th><th>Description</th></tr>
<tr><td></td><td>The land is in possession of AMC.</td></tr>
<tr><td>Condition of existing plant & safety</td><td>The proposed STP project is planned on AMC land located adjacent to the existing Pirana Campus 1 premises. Land is vacant. TSPS land is within the Pirana Campus 1 premises.</td></tr>
<tr><td>Description of existing facility</td><td>NA</td></tr>
<tr><td colspan="2">Baseline Environmental Quality</td></tr>
<tr><td>Quality of Treated sewage</td><td>
<table>
<tr><td>Parameters</td><td>Agreed Standards as per Consent to Operate from GPCB</td><td>Baseline quality</td><td>NGT suggested discharge standards</td></tr>
<tr><td>BOD (mg/l):</td><td>20</td><td>50</td><td>≤10</td></tr>
<tr><td>COD (mg/l):</td><td>100</td><td>171.2</td><td>≤50</td></tr>
<tr><td>SS (mg/l)</td><td>30</td><td>38</td><td>≤20</td></tr>
<tr><td>pH</td><td>6.5 to 8.0</td><td>7.65</td><td>5.5-9.0</td></tr>
<tr><td>Faecal Coliform MPN/ 100 ml</td><td>1000-10000</td><td>80</td><td><230/ <100</td></tr>
<tr><td>N</td><td>Nil</td><td>4.1</td><td>≤10</td></tr>
<tr><td>P</td><td>Nil</td><td>2.1</td><td>≤1</td></tr>
</table>

The present treated effluent quality for 180 MLD STP does not meet NGT discharge standards. The new proposed STP will meet the NGT standard for treated water and also cater the future load of city.</td></tr>
<tr><td>Noise</td><td>Noise levels are within limits.</td></tr>
<tr><td>Ambient air quality</td><td>All parameters are within the permissible limits</td></tr>
<tr><td>Plant related air quality issues</td><td>Gases are emitted from the sewage and sludge. Gases like Methane are released from sludge. Gas holders are in place. Which is used for generation of electricity.

The movement of vehicles in existing 180 MLD and 155 MLD plant is very minimum, and emissions of dust and other vehicular pollutants is negligible.</td></tr>
<tr><td>Water quality (Ground & Surface)</td><td>Ground Water: Considering the monitoring results mentioned Drinking water quality standards as per latest CPHEEO & IS code 10500 (2012), the water from these sources cannot be used for drinking without treatment.

Surface Water: Surface water baseline monitoring data compared to IS 2296 standards for Sabarmati River and lakes shows all parameters within limits except for Chandola Lake, where COD is slightly high and DO is low, indicating pollution.</td></tr>
</table>

Aspects	Description
	Chloride, TDS, and COD near permissible levels for Class C water, suggesting industrial wastewater pollution. Presence of fecal coliform in Sabarmati River indicates untreated sewage. Improvement under GRCP expected to enhance Sabarmati River's water quality.
Soil quality	The soil of the site is covered with vegetation. Soil contamination is not found.
Fauna & Flora	The STP site has shrubs and bushes. Few trees of *Prosopis juliflora, Acacia (Babool), Neem etc were also observed.* The area around the TSPS and the common inlet point primarily features trees such as Neem (*Azadirachta indica*), Pheasantwood (*Senna siamea*), the Indian Tree of Heaven (*Ailanthus excelsa*). Proposed site harbours variety of common birds and insects. Outfall has growth of *Euchornia sp.* (invasive) in Sabarmati River. Indian Peafowl and Monitor lizard are the Schedule I species as per WPA. Details are added in **ANNEXURE IV**
Proposed Rehabilitation works	
Proposed activity (including Upstream and downstream linked infrastructure proposed for upgradation)	▪ Considering population projection for next 15 years, the estimated flow at proposed STP shall be 424 MLD, including the 180 MLD flow that is currently being treated at the 180 MLD STP at Pirana. Hence, the STP will be designed for an average flow of 424 MLD. The available land at the site is approximately 25 hectares and belongs to AMC. The land required for the proposed 424 MLD STP is sufficient for biological treatment with BNR removal system. ▪ Dewatered Sludge shall meet standards prescribed in CPHEEO manual guidelines Sludge management facility has been proposed by AMC to be ready to manage sludge by commissioning of first/ initial stream of this proposed STP. A new 424 MLD STP with adequate pumping facility is proposed to be developed in the available land parcel adjacent to 155 MLD STP. The services of the existing 180 MLD TSPS and STP in the nearby land shall be considered for upgradation and rehabilitation for future flow and diversion and treatment, if required for future flows or during O&M activities, after the commissioning of new facilities. The infrastructure interventions proposed under the project is detailed in following sections: ▪ Common inlet chamber to receive the flow carried by the two box trunk mains (each of the size 2400x2400 mm) with flow regulating mechanism. ▪ Gravity pipeline(s)/ channel(s) along with flow regulating mechanism to carry the flow from common inlet chamber to existing 182 MLD TSPS (serving 155 MLD STP) and new 424 MLD TSPS. ▪ A fully functional 424 MLD pumping facility, equipped with SCADA-controlled electro-mechanical equipment. ▪ Rising Main(s) carrying the discharge of 424 MLD TSPS to new STP with all associated works such as valves, pressure transmitters, flow meters etc. ▪ New 424 MLD STP including civil, mechanical, electrical and instrumentation works etc.

Aspects	Description
	▪ New pipeline to carry treated sewage and the outfall facility at Sabarmati edge. ▪ Approach Road to STP ▪ Terminal sewage pump station ▪ A new Terminal pumping facility is planned to be constructed in the available land parcel admeasuring 0.9 ha which is in front of 155 MLD STP. The land is already in possession of AMC.
Key environmental issues to be considered to design mitigation measures	Discharge qualities need to be brought to NGT suggested standards and Consent to Establish to be received from GPCB, bypass quality reuse without chlorination not to be done, material storage shall be made proper, waste and sludge storage, sludge treatment & proper disposal, pipeline carrying treated sewage, treated sewage & sludge reuse to be improved. TSPS need to be constructed. Proper monitoring mechanism considering the baseline pollution levels

Social Baseline

The baseline socioeconomic condition used in the ESIA study and discussed has been compiled from the population estimates of Master planning Consultants of AMC, Census 2011 data for the city and the wards and primary data collection. Other data available in the public domain has also been collated and discussed in the baseline section to understand and present the social baseline condition with respect to the area of influence and area of impact for the project, health condition, downstream impact with respect use of water from Sabarmati River, health issues, groundwater extraction and quality and related issues.

The immediate area of influence in ward no 53 Lambha where the STP Is location and area of impact is larger and includes the sewerage catchment in eastern zone 1 for the proposed 424 MLD STP, nearby village of Gyaspur, Shahwadi and others included in AMC limits and downstream villages using the water from Sabarmati. City level data is also presented for overall understanding of municipal services provided.

Demographics & ethnic composition –

Existing STP is within the Lambha ward. Master planning consultants, AMC, have estimated the population of the ward in YR 2021 as 145826 persons with population density as 4943 persons/ sq. km., YR 2031-261269 persons with population density as 8856 persons/ sq. km., YR 2041-456402 persons with population density as 15470 persons/ sq. km. and YR 2051-724467 persons with population density as 24557 persons/ sq. km.

The population in the eastern zone 1 for YR 2013 ranges from 30001 persons/ sq.km to 60000 persons/ sq. m. in eastern zones.

In the future, it is expected that population density will increase in some of the eastern wards which have population density in the range of 40000 per/ sq.km. and below.

Gender based issues/ concerns – Literacy rates are lower for women compared to men. In Lambha, as mentioned above 86% were non-workers females which is double of the male non-workers and literacy rates for females was around 70% compared to males which was 86%. Category of non-workers among women were very high at 39861 females (86%) while 23393 males non-workers comprise of 40.54% only. Women comprised of almost 63% of all non-workers.

The Labor Force Participation rate according to the current weekly status from July 2019 to September 2020 for urban for Gujarat is presented below and data indicates that LFPR for males were significantly higher for males and lower for females in Gujarat.

Assessment of Risks and Impacts

The project is a greenfield project comprising new pumping station of 424 MLD capacity with allied facility, Rising Main from TSPS to STP, Design, Construct and Operate the 424 MLD STP, Sewage Treatment Plant based on SBR technology including all civil, mechanical, electrical and instrumentations works, interconnecting pipe work along with associated buildings, and all infrastructure facilities such as roads, potable water system, internal sewerage network, storm water drainage etc. complete. , Construction of Outfall for disposal of treated effluent and Approach Road till STP.

Some of the key expected Environmental & Social impacts during construction and operations stages are given below;

- Generation of substantial debris, topsoil and muck during the construction of new 424 MLD STP and associated infrastructure.
- Dust and noise generation and emissions to air (resulting in pollution, health impacts and odour) due to demolition, excavation, cutting, back filling, compaction operations and other construction activities, and Operations and maintenance works
- Noise and vibration and other disturbances to residents and businesses during material movement, construction demolitions, and laying of rising main
- Temporary flooding due to excavation during monsoons
- Land and water contamination due to construction waste and operation phase sludge handling
- Spillage of chemicals, fuel, and oil
- Safety hazards to labours (Occupational Health and Safety) and public (Community Health and Safety)
- Increased traffic inconvenience (emissions, congestions, longer travel times, blockage of access), during transport of men and materials to the site, especially as the approach road connecting the STP also is a connecting road from NH 64 to the nearby areas.
- Adverse social impacts on adjacent communities and settlements (e.g., security of women and girls due to labour influx)

Sludge generated from the STP during the operational phase.

The sludge from the STP would be temporarily stored at site and then will be transferred to proposed facility being developed by AMC for further treatment and disposal or use for agricultural purposes.

- The available land at the site is approximately 25 hectares and belongs to AMC. The land required for the proposed 424 MLD STP is sufficient for biological treatment with Biological Nutrient removal system.

Based on the relevance of each ESS, and national/ state Legal, Regulatory and Institutional Framework, ensuing sections summarize the environmental and social risks and impacts likely due to the proposed interventions followed by the mitigation measures considered. The risk and impacts are grouped in respect of the applicable ESSs as follows:

Applicable ESS	Risk and Impacts assessed
ESS1 – Assessment and Management of Environmental and Social Risks and Impacts	ESIA was conducted, and assessed all risks and impacts as applicable to ESSs 2-10; including of associated facilities. The approach road is included as the subproject component. If any associated facilities is identified/proposed during final design and DPR preparation, the same shall be included during updation of C-ESIA and C-ESMP by DBOT contractor.
ESS2- Labour and Working Conditions	Various types of labourers employed during construction and operations & Maintenance of STP, and other facilities proposed; and impacts and risks due to their working conditions
ESS3- Resource Efficiency and Pollution Prevention and Management	Risks and Impacts on Physiography, land use, Geology, Soil, biodiversity, and people due to proposed rehabilitation of existing STP Risks and Impacts on Water Resources, Water Quality due to construction activities, operation and maintenance, and discharge of treated sewage Risks and Impacts on Air Quality, Noise levels during construction, operations Risks and Impacts on land due waste generation/ disposal due to proposed STP. energy-efficient mechanisms, and machinery
ESS4: Community Health and Safety	Risks and Impacts on Community Health and safety during construction, pollution, also considering flooding related aspects of the upstream barrage; Impacts of discharge from STP on adjoining communities, especially during construction phase; increased risk of gender-based violence, sexual exploitation and abuse

	and sexual harassment (GBV and SEA/ SH) for women and girls due to larger labour presence and; other labour influx related risks. The risks and impacts of the proposed sludge management facility on community health and safety will also be assessed by AMC once the technology and location is finalised, considering it as an associated facility if applicable.
ESS5: Land Acquisition, Restrictions on Landuse and Involuntary Resettlement	The construction of the proposed TSPS shall be carried out within the existing Pirana 1 campus premises and the proposed STP will be set up behind the existing 180 MLD STP on AMC vacant land. There is no residential or commercial structures, encroachers or livelihood initiatives being conducted in the land for TSPS and STP. No new land acquisition is envisaged and no impact on nearby settlement.. Land use will not change due to the proposed project for TSPS. Land for STP is already in the possession of the AMC in STP cluster area. There are multiple industries for waste processing near the proposed STP site. The land proposed for 424 MLD STP is covered with bushes and shrubs. The other parcel of land for TSPS is within the existing premise of STP and TSPS. The land identified for outfall for proposed 424 MLD STP was fallow and vacant, and no livelihood activities were observed on the proposed outfall stretch in ROW having length of approx. 800 m and width of 1 to 1.5 metres. The identified land for outfall, ROW of 1 to 1.5 metres, did not contain any temporary or permanent structures or immoveable property, as observed during the site visits. There is some seasonal farming is being carried above the existing pipeline for outfall. The new pipeline would also pass along this existing line. There were no structures or other property or ongoing cultivation activities on or in the land identified with ROW of 1 to 1.5 metres for outfall channel for the proposed 420 MLD STP. Some impact is envisaged during construction (during laying of new pipeline for 424MLD STP) for outfall. After completion of the pipeline work, the land would be restored to its existing condition. However, if agricultural activities are observed on the proposed

	alignment, subsequently, the same shall be included and updated accordingly in the RAP and C-ESMP and C-ESIA by the contractor.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Biodiversity risk is not envisaged as the land is largely fallow land. Also, the proposed STP premise would have green belt all around the plant for native species. Therefore, enhancing the aesthetic and biodiversity of the area. The treated water in river will also enhance the water quality and in turn will benefit to the aquatic life.
ESS8: Cultural Heritage	There is no heritage structure in the project vicinity. No impact is envisaged.
ESS9: Financial Intermediaries	Not Applicable
ESS 10: Stakeholder Engagement and Information Disclosure	The project will be fully disclosed to all the stakeholders for their views and inputs. The project is for enhancement of environment quality and climate resilience for the city.

Assessment and Management of E&S Risk and Impact (ESS 1)

As all the proposed major structural interventions are within the STP or TSPS sites or their structures, no direct adverse impacts are envisaged on physiography or land use. The Land use is not changing as the entire land area, i.e. proposed 25Ha and the existing STP are designated area for the purpose of STP and related activities.

Laying of the proposed two nos rising main (around 0.8 km) is along public infrastructure and government land and will be along the boundary wall of the 155 MLD STP. The rising main alignment given in the DPR is tentative and shall be finalized by DBOT Contractor after survey and investigation. ESIA and ESMP updation will be done by DBOT Contractor based on final alignment. Trenchless method is proposed for laying the rising main across the kuccha roads or lanes to prevent disturbance. The proposed rising main may create temporary disturbances to people and traffic during the construction and maintenances stages, which could be managed through traffic diversions, information to communities, barricading and safety precautions (for communities and workers) and watch and ward in important areas. The proposed subproject involves construction activities, and the labours stay and work at or near the site for about 4 years. Work include construction activities such as civil, mechanical, electrical and other types of work and shall include minor quantities of construction and demolition (C&D) wastes, use of resources such as water and power during construction, pollution from storage and handling of materials, use of paints and other chemicals for construction activities, transportation of raw materials, disposal and/ or reuse of treated sewage for irrigation will pose risks and impacts. Work requires very detailed and clear sequential planning, scheduling, etc. The activities will be labour intensive with risks of accidents such as working at heights, excavations, work in enclosed areas, etc. Impacts and risks are moderate and can be managed by following regulations, adopting best practices

for similar projects, training of staff/ manpower; and ensuring implementation of avoidance, monitoring, and implementation of mitigation measures.

No direct adverse impacts are envisaged on communities including on the disadvantaged or vulnerable people. However, there may be indirect impacts on communities such as increased access due to replacement of kuccha road by resurfaced pucca road, increase in labour due to increased labour opportunities, benefits due to movement of pedestrian due to better road and increased safety due to project related pedestrian movement and availability of lights during evening and nights in the sub project, Project will need to make extra efforts to reach out through stakeholder engagement and effective GRM, to the disadvantaged and vulnerable persons and groups to involve them in both preparation and implementation.

Labour and Working Conditions (ESS 2)

Labour and employment opportunities will be generated during the construction period. Unskilled and semi-skilled labour work can be sourced from the settlements as per availability and willingness of labour. Women can also be hired for specific tasks from the settlements. Since the settlement is nearby some women may be willing to work on-site as labour.

Proposed construction works will require labour for construction activities for almost 4 years and a labour camp will need to be set up for accommodating the workers who are not local. Occupational Health and Safety risks and impacts are identified on construction activities and includes workers working at height, excavations, confined spaces, gaseous place, working with electrical equipment, cleaning of SBR reactors and closed environments getting exposed to potential accidents. Workers near high noise equipment may experience health issues such as hearing loss if no care is taken. Considering the vegetation growth, snake or scorpion bite may occur during site clearance or construction. These impacts are expected during both construction and operation of STP and related infrastructure, but can be managed following good practices, critical controls for High Energy Hazards, adopting Standard Operating Procedures for work types, preparing, and following OHS management plans, ensuring the use of safety equipment onsite, and Personal Protective Equipment, Incident management, regular health check-ups and emergency support, and improving the awareness of the workers. For SBR reactors and maintenance activity, workers' health and safety will be addressed, and mechanical cleaning will be recommended strongly, and any manual cleaning will be avoided. Labour will also require periodic health check-ups as they are working in areas where there is sludge and wastewater, sanitary facilities at the construction site, drinking water, PPEs, shade for resting, first aid, etc. Labour compliances will also be required to be met under various local laws such as labour licenses, permission, training, payments, insurance as mandated under law, etc. All engagement of labourers will follow the project level Labor Management Procedure (LMP). Child labour and forced labour will be prohibited. All workers will have access to project's worker's grievance redress mechanism (GRM).

Area and site under AMC for labour camp within accessible distance from proposed STP to be identified by DBOT contractor and necessary permission/ approval to be taken from AMC. Workers in the labour camp will need sanitary facilities such as toilets, washing areas, and sanitary waste disposal areas. Adequate and safe accommodation with proper ventilation, comfortable stay, sanitation, first aid facilities, water, fire safety, protection from weather conditions and extreme events, facilities including cooking and lighting is essential. Covid- 19 / or other pandemic precautions for such camps to be planned and implemented.

Resource Efficiency and Pollution Prevention and Management (ESS 3)

With respect to Resource Efficiency, the project preparation and the ESIA process will identify feasible measures for efficient (a) energy use; (b) water usage and management to minimize water usage during construction, conservation measures to (energy efficient pumps, appurtenances, solar rooftop) offset total construction water demand and maintain balance for the demand of water resources; and (c) raw materials use by exploring the use of local materials, recycled aggregates, use of innovative technology to minimize project's foot prints on finite natural resources. The project would also need to address the management of materials (such as construction materials, fuels, paints etc.) solid (screenings, wastes, sludge, construction and demolition (C&D) wastes,) and liquid waste (from construction activities, run-offs, wastewater/ sewage from labour camp, leachate from sludge, treated sewage, accidental leakage of untreated sewage) generated during the construction and operation phases. Contractor will prepare management plans (OHS, CHS, Waste Management etc) and implement those. All wastes will be managed following National regulations and WB EHS: C&D wastes will be sent to the AMC C&D waste management facility where it is converted into useful products for recycling back for construction purposes; some of those will be used in the construction purposes and site development for this subproject thus ensuring resource efficiency. During monitoring, if hazardous content is detected, it will be sent to TSDF. Sludge Management process will be decided by DBOT and based on open technology. Contractor will discuss with AMC & manage sludge as per Sludge & Waste Management plan & shall be upgraded in ESIA. The proposed treatment process for sludge from biological unit, should follow CPHEEO guidelines The sludge shall be transferred to AMCs proposed sludge management facility. The sludge and waste management plan which shall be prepared and approved at the pre-construction stage should clearly indicate how C&D waste during construction and the sludge, during operation will be temporarily stored on site and disposed without impacts on workers and communities. Screenings, plastics, and wastes will be treated and disposed at AMCs solid waste management facility. Machines/ equipment's will be auctioned to authorised recyclers. E-waste including Solar panels will be sent to GPCB approved e-waste recyclers and all these requirements will be made part of DBOT contract. Site and material storage areas will be provided with cut off drains to collect and treat liquid wastes.

Pollution of water bodies receiving STP discharges due to reduction in efficiency or non-working of STP due to breakdowns, routine maintenance, and impacts on downstream users is important. Other pollutants include dust, chemicals materials transported and used without care, sludge, and other wastes generated during rehabilitation and O&M. The project being construction of proposed sewage treatment plant will enhance the sewerage treatment and help control pollution and its impacts on all environmental components. This also ensures conservation of resources through their reuse and recycling, use of better energy and water-efficient appliances and mechanisms. Adoption of best environmentally appropriate technology to ensure the quality of treated sewage as per Consent Conditions and regulations, and minimization of Green House Gas (GHG) emissions, adoption of the best standard in case the treated water is to be reused for agriculture based on detailed study and consultations, are important also considering overall pollution loads due to multiple discharges into the river. Temporary construction stage pollution impacts on water, soil, fauna/ flora, workers, and communities are moderate and can be managed by following regulations, adopting best practices, training; and ensuring implementation of avoidance, monitoring, and implementation of mitigation measures.

Treated sewage will be discharged from the proposed STP in operation phases into the river Sabarmati in line with GPCB consent. Discharge standards for treated sewage, suggested by National Green Tribunal, with additional monitoring parameters for Bathing water quality (class B, as per CPCB Designated Best Use criteria), and use of river for irrigation (CPCB Class D: Designated Best Use criteria) will be followed. This NGT standards is an improvement over and more stringent than Environmental Protection (EP) Rules 1986 of the Ministry of Environment and Forests and Climate Change (MoEFCC) of the Government of India. (Discharge Standards in EP Rules 1986 is mentioned as accepted national standards under WB EHS standards for Water and Sanitation). The subproject will follow the most stringent criteria among all available standards/ limits.

GHG Emissions

AMC aspires to become India's leading Carbon neutral municipal corporation by developing carbon neutral plan. Hence it is important that all the infrastructure development should incorporate strategies which have low carbon footprint. The infrastructure constructed should also be resilient to climate change. AMC has developed a Carbon Neutral Vision (CNV) and has identified multiple opportunities to contain carbon emissions and has plans to become carbon neutral by 2025. As per the business-as-usual scenario, in 2025, AMC emissions are projected to be 1,041,535 tCO2e[6]. The opportunities identified under this plan include carbon sequestration, off grid rooftop Solar amongst others. These opportunities will be enhanced under this project.

Amongst all the types of emissions, increase has only been seen across those from electricity consumption at both TSPS as well as STP. This is due to two reasons. Firstly, the quantum of sewage treated has increased from 180 MLD to 424 MLD. New systems with higher efficiency have been recommended at the TSPS where the energy efficiency of pumps will be enhanced from current 122kWh/ MLD to 66 kWh/ MLD, but due to the increase in flow, it will result in higher emissions. Secondly, the technology upgradation would inevitably increase electricity consumption at STP. However, despite the more than two-fold increase in sewage treated, the emissions from treatment process and sludge handling are estimated to be significantly less. The methane and nitrous emissions from treatment of wastewater would significantly be reduced due to improved methane correction factors in the proposed technologies. Furthermore, project intervention would ensure that there is no discharge of untreated sewage into the water bodies, thus reducing emissions from untreated wastewater discharged into the water bodies. The improvements in sludge waste management under the overall project will also help reduce emissions. Through the project intervention, 98000 tCO2e/yr of GHG emissions can be saved on an average.

Community Health and Safety (ESS 4)

Community health and safety issues may result from poor quality of treated sewage, or discharge of untreated sewage/ bypass during maintenance or extreme events and its impacts in downstream villages. Community Health and safety risk during construction may also be due to air pollution (dust & air emissions), odor, traffic movement, congestion & Safety, noise, others). Impacts due to flooding of proposed STP premises during monsoons also need consideration. Impacts and risks on nearby communities (especially settlements) are expected during the construction phase and can be avoided, and managed by proper work activity planning, scheduling, training, and adopting mitigation measures.

[6] *Carbon Neutral Vision 2030*

Impact on downstream users due to release of untreated sewage is also identified. This may happen due to failure of the functioning of the STP. . After the construction of the STP, there will be an improvement in the quality of the treated water released in the Sabarmati River which will benefit downstream users. Appropriate mitigation measures such as a Traffic Management plan will be required to avoid and minimize the impacts occurring.

Settlements are located near the proposed land that may experience impacts largely related to dust & air emission traffic and related movement of material, equipment, and labour during construction. The present access road to the STP location is partially 'kuccha' (mud road) and is not suitable for the movement of heavy vehicles and equipment. All weather Road is part of the project, has been recommended to mitigate dust and air pollution during the construction phase of the project. This suggestion of the ESIA has been incorporated, and the proposed access road improvement is included as part of the subproject: construction of 424 MLD STP. As the existing mud road will be improved without any additional land requirement and as there is no houses right by the road, this will not cause any adverse social impacts.

Women and girls in the settlements and communities may face increased risk of gender-based violence, sexual exploitation and abuse and sexual harassment (GBV and SEA/SH) for women and girls due to larger labour presence and other labour influx related risks. The sub-project will implement the project level SEA/SH action plan (to be prepared by AMC prior commencement of civil work) to minimize and mitigate these risks. The project's GRM will have specific processes to handle grievances related to SEA/SH.

Considering the disaster proneness of the area, especially the flooding and safety aspects of the Vasna Barrage; hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events.

Outcome/ output of this assessment shall be incorporated in the design of all STPs which might be impacted and subsequently assessed in C-ESIA & mitigation measures if required included in C-ESMP. Emergency Preparedness and Response Plan and Disaster Management Plan will be part of C-ESIA/C-ESMP. The Emergency Action Plan-Vasna Barrage Volume II is reproduced in **ANNEXURE X**.

Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS 5)

The construction of the proposed TSPS shall be carried out within the existing Pirana 1 campus premises and the proposed STP will be set up behind the existing 180 MLD STP on AMC vacant land. There is no residential or commercial structures, encroachers or livelihood initiatives being conducted in the land for TSPS. There are no residential, commercial structure, livelihood initiatives being carried out on the land proposed for the STP. There are some settlements mainly in Gyaspur village, which is close in proximity to the proposed land for STP and also industries adjacent the proposed site which are processing solid waste. The land has been allocated for construction of STP as per revenue record, presented in annexure VIII and the land is vacant. No families are located within proposed land. Immoveable property, temporary or permanent structures or livelihood activities were not observed during the site visit.

There are no potential involuntary resettlement issues identified, as there is no land acquisition of private land, no immoveable property or cultivation activities or any other livelihood activities were observed on the land identified for the outfall (RoW of 1 to 1.5 metres) for the proposed 420 MLD STP. Land is more elevated on the Pirana side, and therefore, people do not access the river from the Pirana side due to steepness on the bank and non-availability of flat land at river level, near to the existing outfalls and proposed outfall. There are no restrictions to access the river or public infrastructure during construction activities or operation.

The land has been allocated for construction of STP as per revenue record attached in Annexure VIII and the land is vacant. No families are located within proposed land.

However, if agricultural activities are observed on the proposed alignment of the outfall, subsequently, the same shall be included and updated accordingly in the RAP and C-ESMP and C-ESIA by the contractor.

Biodiversity Conservation and Sustainable Management of Living Natural Resources (ESS 6)

The nearest key biodiversity area for this site is Thol Wildlife Sanctuary (man-made) in Mahesana district, which is around 20 km from the project site, with 10 km of intervening urban high density mixed land use. The lake received water from rains and Narmada Canal, westward of the city and is not affected by outflows or air, noise, dust or vibration during construction and operations of the proposed STP.

The site is dominated by *Prosopis juliflora* and native shrub *Abutilon Indicum*. Few trees include *Peltophorum pterocarpum* and *Azadirecta indica*. No endangered fauna/ flora is observed on the proposed site. Measures to protect old trees will be considered during designing of the project. Clearing of shrubs will not have any impact on natural vegetation of the region. The proposed project may also require tree planting based on the number of trees cut.

It was observed that the entire stretch of Sabarmati is infested with the *Pistia* sp. and *Eichhornia crassipes* which has altered the natural habitat. Sabarmati River stretch is a modified habitat as the water is being sourced from Narmada canal and stored at the river front stretch using the shutters of the Vasna Barrage. The riparian zone of the Sabarmati is converted into the riverfront in the Ahmedabad city. The region around is heavily industrialised, and fast converting into urban land uses, with pollutants reaching the already dry river. However, Hon'ble NGT has constituted River Rejuvenation Committee which has initiated the process of river rejuvenation, but curtailing pollution, monitoring e-flow, undertaking plantations etc, through various stakeholder departments. There is some vegetation and trees in the TSPS and STP land which shall be finalised for tree cutting by contractor post design finalization. Therefore, after finalization of design by DBOT, number of trees required to be cut will be finalized and must be mentioned in the CESMP.

Temporary construction stage impacts are expected on the existing flora and fauna on-site, due to air and water pollution and noise due to construction activities. However, the existing site is in the noisy neighbourhood with industries located around project site. The proposed area is vacant plot of land belonging to the AMC. The land is a modified habitat hence the impacts on ecological aspects of the site are not envisaged.

Discharge of untreated/ sub-optimally treated sewage and waste into the waterbodies (mainly Sabarmati River) may impact the biological process of macrophytes and aquatic fauna. River Sabarmati is already an altered area/ modified habitat due to decades of low water flow as it is non-perennial, and inflow of water from Narmada Canal. There are no critical species here, and there will be no impact since the site is not natural and is a modified habitat with no ecological importance presently. NO RET species are recorded from the study area. However, the subproject interventions to improve the discharge quality will thereby improve the biodiversity in the river and the region downstream of the discharge point, thus supporting overall biodiversity improvement.

Cultural Heritage (ESS 8)

Assessment for heritage structures and cultural places was carried out. The nearest monument is the Fateh Baug Fort at a distance of 3.4 kms from the STP which will not be impacted by the proposed activities in the existing STP site. Chance finds procedure to be implemented considering the status of the historic core of Ahmedabad as a World Heritage City and there may be possibility of finds near the Sabarmati riverbanks.

Stakeholder Engagement and Information Disclosure (ESS 10)

Consultations were held with stakeholders including downstream villages, ex sarpanch and others, STP operators, AMC officials during the preparation of ESIA for sub-project and SEP for G-ACRP project and will be undertaken post disclosure of the ESMF and ESIA. AMC will conduct awareness campaign to inform the settlement dwellers about the GRM.

The ESIA for the proposed 424 MLD STP/TSPS and ancillary components addresses the above suggestions of the stakeholders' post disclosure by including mitigation measures for issues raised in consultations such as health and safety concerns during construction, improvement in the treated sewage quality, reduction is odour in operation phase, etc. Post disclosure of ESMF and ESIA consultations shall be carried out. The key concerns raised by stakeholders shall be incorporated in the ESIA at a later stage. The suggestions of the stakeholders by including monitoring of noise, sludge, air and water and its analysis for defining the baseline and mitigation measures. The project suggests improved management of all wastes and treated water quality to confirm with latest NGT suggested standards (with TSS<10 mg/l). Labour health and safety will be given high priority and appropriate measures to follow and monitor labour regulations have been suggested in the ESMP.

Cumulative Impacts

The cumulative impact assessment shows that the construction of new 424 MLD STP and associated facilities will have positive impacts on all the environmental parameters particularly the water quality of the Sabarmati River and downstream uses.

In existing STPs, BOD, COD, TDS, concentrations load were found higher. The proposed STP treatment would significantly decrease these loads and will have positive impacts on the Sabarmati River water quality. It can be expected that the biological diversity may increase in this non-perennial river in the long run, and ground water quality in the region would improve.

The new proposed STP will reduce the environmental load on BOD, COD and TSS (including that of untreated/ sub-optimally treated sewage getting directly/ indirectly reaching the river) by around 90-95%.

New sewer lines and TSPS will be constructed to this STP.

The construction of 424 MLD STP will also contribute to the incremental air pollution due to construction activities. The STP shall be constructed to meet better discharge standards (NGT suggested norms with TSS<10 mg/l); in the available 25 ha land parcel with odour control system. Since the site is surrounded by industries, and the river; sensitive receptors of noise and dust impacts are the settlements near proposed STP. Short-term impacts on receptors are associated with the impacts due to increment in air pollutants like dust, and emissions from vehicles and machinery, increment in noise levels due to movement of vehicles, and operation of machinery which could be mitigated by adopting best practices and mitigation plans.

The surfacing of part of the approach road to 424 MLD STP has been included. The construction of all-weather roads will significantly mitigate air pollution during the construction phase.

Sabarmati River carries discharges from multiple sources including STPs, effluent treatment plants, 'mega line' carrying treated effluents from CETPs of industrial areas, commercial/ residential areas, storm water drains, canals etc., in the city of Ahmedabad, and the region upstream (which has agricultural areas, and city of Gandhi Nagar and other local bodies), and downstream (agricultural areas and industrial centres).

It is estimated that the subproject with capacity to 424 MLD with treated sewage meeting NGT prescribed stringent standards with TSS<10 mg/l and WB EHS) can ensure around 95 percent reduction in prevalent BOD, Suspended Solids, Phosphate and Nitrate pollution load, if implemented. Therefore, negative cumulative impact is not expected from Pirana STP project. Rather this will help in improving the quality of water in the receiving water body.

Environmental and Social Management Plan (ESMP)

ESMP for the design/ pre-construction, construction, and operation stages of the project has been developed based on the assessment conducted. It presents the management of environmental and social impacts adopting mitigation hierarchy - (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, were technically and financially feasible. ESMP will be incorporated in the bid documents while bidding out DBOT contracts so that the contractor allocates the required resources and mechanisms to implement these measures.

The treated sewage quality for discharge into Sabarmati shall comply with the standards suggested in this ESIA (NGT prescribed standards with TSS<10 mg/l) and/ or most stringent standards prescribed by the GPCB/ NGT/ regulators at any point of time. If AMC and Irrigation Department wishes to reuse treated water for agricultural purposes consent for disposal of treated sewage to Sabarmati River shall be arranged from GPCB and after conducting a detailed study through Agricultural University based on the CPCB guidance on reuse of treated water for irrigation. The design shall incorporate mitigations measures and emergency preparedness to protect from flooding; AMC has conducted hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events. Provision to hold untreated sewage or diversion to other STPs is required to be

made so that during any STP breakdown/ shutoff, the untreated sewage does not flow into the water body or nearby premises and downstream villages.

AMC has prepared, Sludge management options to support wastewater investments under the Gujarat Resilient Cities Partnership- Ahmedabad City Resilience Project (G-ACRP). Responsibility to prepare Sludge Management Plan for the 424 MLD STP is with the Contractor and will be approved by AMC. Mechanical cleaning will be recommended strongly, and any manual cleaning will be avoided for sewers, mains, manholes, reactors, and all sludge management mechanisms in line with National Regulations.

Regular cleaning/ removal of sludge and solid waste to minimize odour nuisance and its disposal shall be ensured by AMC, in their facilities as per existing regulations. Solar lighting/ use of solar energy as much as feasible (provided disposal of hazardous and e-waste including solar disposal is arranged as per regulations, proper storage and use of PPEs while working with damaged panels are ensured). Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD).

Special attention to include vulnerable groups in project benefits and continuous stakeholder engagement to ensure such inclusion. Preparation of Standard Operating Procedure (SOP) for various activities which includes training, PPEs use, templates for permissions, recording and reporting, by contractors/ PIU. IEC materials shall be planned, printed, and displayed during construction, creating awareness, display of posters etc. Training and capacity building of the designated persons for implementing of various plans.

Monitoring Plan

During the construction phase, Environmental and social monitoring will be carried out to check the quality of the environment and triggering of social impacts during ongoing construction activities. It will be carried out through a contractor and PIU will be responsible for the review of the implementation of monitoring. Monitoring will include assessment of Ambient air quality, Intake sewage quality, outfall treated water quality, Ambient noise, Ground water quality, soil quality, and sludge quality. This monitoring shall also include OHS aspects, community safety, and workers safety, labour and working conditions, livelihoods impacts, consultations as part of Construction Supervision and Quality Control by the PMC.

During the operation phase, environmental monitoring will be conducted to understand the impacts on environmental attributes due to project activities. It will be carried out through the DBOT/ EPC contractor and AMC will be responsible for the review of implementation. Monitoring will include Ambient air quality, Inlet sewage quality, outlet treated water quality, Ambient noise, Ground water quality, Soil quality & sludge quality.

To ensure adherence to the ESMP, maintenance of the plant and CTE conditions E&S audit shall be conducted by a third party during the operation phase.

The annual E&S audit to include:

1. Physical assessment of the STP and units' operation status and premises
2. Identification and assessment of environmental management practices
3. Health and safety risks for workers and communities including GBV, SEA/ SH risks

4. Compliances to ESS, National, State, and Local laws and mandatory and statutory compliances including permissions, consent conditions, labour health, safety, security, welfare, etc
5. Implementation of EHS, GRM, various action plans at the site.
6. Maintenance of documents, records, and reports required for the site.
7. LMP compliances.
8. Assessment of capacities, technology in achieving NGT standards and for design specification
9. Environmental monitoring analysis pre and post-treatment
10. Sludge generation and treatment.
11. General work safety records and incident reporting
12. Compliance to CTE (in the construction phase) and CTO (in operation phase) conditions or other regulatory conditions.

Capacity Building

Capacity building will be required at all stages including planning, construction, and operation. It will include various workshops and seminars for AMC project staff, concerned PIU, Contractors staff, supervisors, consultants, environmental and social experts, laborers, stakeholders, etc. The topics for training will include Health and Safety, Environmental management and ESMP implementation, regulatory requirements, Monitoring requirements, Gender equality, biodiversity and wildlife awareness, and others.

Grievance Redressal Mechanism

The types of grievances stakeholders may raise include, but are not limited to:

- Construction related impacts – cracks, damages to structures; dust damaging crops/ trees
- Health and safety risks.
- Negative impacts on the environment.
- Negative impacts on communities, which may include, but not be limited to financial loss, physical harm, and nuisance from construction or operational activities and GBV, SEA/SH.

AMC has a functional complaint system (CCRS, http://www.amccrs.com) which includes a web portal and a toll-free number. It records almost 40-50 thousand complaints every month. Any complaint registered in the system is forwarded to respective zones for action. Each complaint has a proper system by which it can be escalated if one is not happy with the resolution. If some complaints come directly to the zonal office (mostly from the urban poor) they are recorded in the main system. The CCRS is synced with the Gujarat Government's CM Helpline and any complaints coming there are also recorded in the system.

Implementation Arrangements

This ESIA is prepared at the DPR stage of the proposed subproject. At this stage, Feasibility for rehabilitating the STP and its implementation mechanism has been examined and the DPR Report suggests bidding out the proposed subproject in a technology-agnostic manner under Design- Build-Operate (DBOT) model, where the bidder can suggest the best environmentally appropriate technology to ensure the suggested discharge standards. Since the technology is not finalized at this stage, it is proposed to include the ESMP in the procurement documents to enable the DBOT contractor to understand the E&S requirements and include required resources and implementation mechanisms to ensure the management/ mitigation measures. Once the design is finalized during the implementation stage, the DBOT contractor will get the ESMP updated based on actual technology/ design.

Sustainable Urban Development Unit (SUDU) of the PIU constituted at AMC, along with PMC will review and send the document for World Bank review and approval. PMC will supervise E&S aspects and OHS/ CHS as part of construction supervision and quality control. The third-party audit will be conducted annually during each year of the project, also including a review of all E&S aspects during construction including ESMP implementation, OHS/ CHS and environmental monitoring. The E&S audit will be shared with the World Bank (WB) for review and comments, and finalised based on comments/ suggestions and corrective/ improvement measures will be implemented in a time bound manner.

Estimated Budget for Implementation and supervision of ESMP

The cost of 424 MLD TSPS and rising main Rs. 80.14 Crores including all valve and appurtenances. The block cost estimate of the Sewage Treatment Plant of 424 MLD using SBR technology without power generation will be approximately 839.03 crores including 18% GST. The cost of STP is inclusive of sludge dewatering. The cost is inclusive of grading and levelling site, administrative building, all ancillary buildings, laboratory, temporary sludge storage, utilities, landscaping, internal roads, boundary wall of height 2m above FGL guard room, security arrangement, approach road till STP, treated water outfall line & solar roof top arrangement etc all complete. Provisional sum is included in the Project cost to cover any unforeseen expenditures.

The cost of provisional sum shall be required to cover the cost of utility shifting (if required), 33KV electrical connection etc. Provision of Rs 13.55 crores is kept as Provisional sum to cover all such cost. The Operation and Maintenance (O&M) cost for 10 years is approximately Rs. 830.74 crores (undiscounted cost) which is including power cost, repair & maintenance cost, manpower cost, cost of chemicals and cost of disposal of screenings and grit and capital reinvestment cost. Total Cost of the 424 MLD STP including Terminal Pump Station and allied infrastructure 839.03 crores.

Aspects for inclusion in ESCP

Disclosure and consultation of this ESIA, inclusion of the ESMP prepared here in procurement documents for agreement from the contractor on E&S requirements, and updation of ESIA and ESMP for the subproject after finalizing the detailed design shall be included in ESCP.

Design should be responsive to the quality of sewage received at the inlet, and measures shall be incorporated to meet the suggested standards. Bidding documents and contracts to include ESMP and Monitoring Plan to enable the DBOT contractor to allocate appropriate time, resources (manpower and budget) for implementing ESMP Update as required, get approvals, disclose, and implement the Environmental and Social Management Plan (ESMP) for Proposed Pirana 424 MLD STP subproject.

A detailed study on flooding and its impact on investments shall inform the building of resilient infrastructure. C-ESIA, C-ESMP shall be prepared by the DBOT contractor for the design prepared, incorporating the recommendations of the assessment on flooding. In addition, AMC shall have adequate capacity to implement and monitor the sub-project E&S requirements, ESMP, Monitoring Plan, and Capacity Building requirements identified here, as stipulated in ESCP.

Monitor all emissions/ discharges/ disposal of wastes from project facilities during construction and operation stages and ensure that the discharges from project facilities into the environment are as per the latest limits suggested by MoEFCC, GPCB, WB EHS and NGT, whichever is stringent for each parameter. The technology shall be upgraded to meet the directions of GPCB in the consent orders, and any stringent standards suggested by regulators. Conduct disaster evaluation and extreme weather conditions assessment considering earthquake proneness, and flooding/ other risks if any due to presence of Barrage or any disasters; and incorporate avoidance, mitigation, and management measures and Prepare Disaster Management Plan (DMP) including Standard Operating Procedures (SOP) for each STP (as part of DPR, ESIA). Operations shall also follow the latest DMP for Gujarat.

Stakeholder consultations

Consultations were carried out for the preparation of the draft ESIA report. Consultations have been carried out with various stakeholders including settlement inhabitants, STP operators, AMC officials during the preparation of ESIA for sub project. Stakeholder consultation is a dynamic process and consultations will be carried out during the life cycle of the G-ACRP project. Draft and Final ESIA, ESMPs (in English, with translated summary in Gujarati) shall be disclosed on the website[7] of the implementing agency, namely AMC, and in the external website of the World Bank. Consultations will also be carried out after a month of disclosure of ESIA and ESMP on the website of AMC. The suggestions of the stakeholders shall be incorporated, and the documents will be re-disclosed.

Recommendations and the Way Forward

This ESIA/ ESMP shall be updated once the detailed sub-project design is finalized during the implementation stage. ESIA has assessed and outlined important points which shall be included in the Procurement Documents and the detailed design during the implementation stage; for ensuring environmentally and socially beneficial works and operations. The key impact of the subproject will be overall benefits due to the improved quality of treated sewage discharged into the Sabarmati River, resulting in an overall improvement in the environment and health of the people in the city and its region.

The ESIA highlights the **moderate** level of risks and impacts on environmental and social parameters due to the proposed sub-project. These are not long-term – irreversible; but mostly expected to occur during the construction phase and can be avoided, mitigated, and managed. There is no involvement of land acquisition for this project as the proposed activities will be conducted within the existing boundary and land allocated for new STP by AMC.

There will be minor to moderate construction and operation stage risks and impacts on

(i) Noise and Air quality due to construction and demolition, transportation activities,

(ii) Occupational and Community Health and Safety risks and impacts,

(iii) minor disturbances to local/ onsite flora and fauna during construction phase,

(iv) Generation of sludge and wastes including (solid waste, non-biodegradable wastes, E-wastes, Hazardous Wastes, and C&D Wastes) which need to be managed well to minimize risks and impacts,

(v) Accidental discharge of sub-optimally treated sewage or flooding

(vi) Impacts of discharge from STP on adjoining communities, during construction phase and downstream communities during operations phase; vi) increased risk of gender based violence, sexual exploitation and abuse and sexual harassment (GBV and SEA/ SH) for women and girls due to larger labour presence and; other labour influx related risks.

ESMP lists out mechanisms to avoid, mitigate and manage these risks and impacts through good design, adoption of stringent discharge standards and regulatory compliance; and following good international industry practices. Mitigation measures for the same are provided. There will be cumulative impact due to the outflow of treated sewage from this and other STPs proposed to be

[7]https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAttachment&queryType=Select&screenId=2900003&AttachmentFileName=ESIA-126-MLD-STP.pdf

upgraded through G-ACRP which will be highly beneficial given the project objective to ensure stringent discharge standards. After implementation of the subproject treated water quality will be improved and the same will help improve the ecological balance of the Sabarmati River which is currently a modified habitat with no water during most of the year, thereby resulting in an overall better environment and health of the city and its region.

CHAPTER 1. INTRODUCTION

1.1 Background

The Government of Gujarat (GoG) has requested the Bank to support the Ahmedabad Municipal Corporation (AMC) in developing resilient urban infrastructure to address the evolving needs of rapidly expanding urban population in the city, through the Gujarat Resilient Cities Partnership: Ahmedabad City Resilience Project (G- ACRP). The city which is a key economic growth centre for the state, has expressed that there are key gaps in basic urban infrastructure relating to wastewater management/ recycling and reuse, storm water drainage, lake and water body rejuvenation and flood risk management. Further, there are several institutional, planning, financing and governance issues related to service delivery including lack of integrated multi-sector approach for sustainable and resilient municipal service delivery, primarily across various service sectors.

The proposed development objective of G-ACRP proposed to be supported by the World Bank's Investment Project Financing (IPF) is to develop resilient and sustainable urban service delivery and financial systems in Ahmedabad. As a first phase of a programmatic partnership, G-ACRP will provide financing and technical support to Ahmedabad city for implementing reforms and investments to improve service delivery and establish a solid foundation to extend support to other cities in Gujarat. G-ACRP will support AMC in addressing key institutional, financial, and service delivery constraints to improve the resilience and sustainability of priority urban services. G-ACRP project consists of three major components which will strengthen AMC's institutional and financial systems and revenue performance; Improving wastewater management services; and develop state level institutional systems and capacities.

The proposed subject of the Construction of new STP of 424 MLD capacity at available 25 ha[8]. of land parcel adjacent to 180 MLD STP, which will meet the treated effluent norms, construction of a new 424 MLD Pirana terminal sewage pump station is required to feed the new STP as existing TSPS capacity cannot be upgraded and related components. Proposed STP capacity of 424 MLD shall be constructed to meet better discharge standards (NGT suggested norms with TSS<10 mg/l); in the available 25 ha land parcel, behind the existing 180 MLD STP. The life span of the existing 180 MLD STP is 35 years and, therefore, no dismantling of the project is feasible or viable at present. AMC is considering the upgradation and rehabilitation of the existing 180 MLD STP to meet NGT standards for future flows. Feasibility report for the upgradation and rehabilitation of the 180 MLD STP has been prepared previously. Due to shortage of space and to ensure that treatment of all sewage flow is carried out, rehabilitation of the 180 MLD STP shall be considered and finalized only after the commissioning of the 424 MLD STP. Details of the sub project are discussed in details in section 1.3. AMC intends to implement this subproject in a Design-Build-Operate – Transfer format and is in the process of preparing Detailed Project Report for this subproject. Royal Haskoning DHV Consulting Pvt. Ltd. in consortium with TTI Consulting Engineers (India) Pvt. Ltd. has been appointed as Consultant to prepare the Detailed Project Report with preliminary design for the project.

[8] As mentioned in the DPR, February 2024 and informed by AMC officials.

AMC has appointed TATA Consulting Engineers Limited (TCE) to prepare ESIA reports for the subprojects. This report is the ESIA prepared by TCE for the proposed subproject, **CONSTRUCTION OF NEW STP OF 424 MLD CAPACITY AT AVAILABLE 25 HECTARES OF LAND PARCEL ADJACENT TO 180 MLD STP, WHICH WILL MEET THE TREATED EFFLUENT NORMS, CONSTRUCTION OF A NEW 424 MLD PIRANA TERMINAL SEWAGE PUMP STATION IS REQUIRED TO FEED THE NEW STP AS EXISTING TSPS CAPACITY CANNOT BE UPGRADED AND RELATED COMPONENTS.**

1.2 Rationale for the Proposed Sub-Project:

Ahmedabad city is unique in its geographic features (such as almost flat terrain, Sabarmati and Khari rivers draining the city and its region, presence of lakes), climatic conditions (hot-semi arid with less rainfall, scorching summers, and very cold winters), and environmental characteristics; and is prone to extreme events (such as floods and earthquake). The population of Ahmedabad the fifth largest city in India was 5.57 million in 2011 (Census) estimated to be 6.3 million by 2020. With the increasing opportunities for trade and commerce and as a centre for higher education, this heavy growth continues. It is highly industrialized, with a high-density population living hand in hand with a beautiful heritage. Water availability is less - mainly dependent on Narmada waters, while the demand for industrial effluent and wastewater management, sanitation, and waste management are increasing day by day. Today, with its status as a predicted megacity, upgrading and developing sustainable urban environmental infrastructure is very important for its people and environment.

There are six (6) Sewerage (drainage) zones in Ahmedabad. The city has 98 percent water supply network coverage with adequate bulk water treatment capacity. The current per capita water supply is estimated to be 150-160 lpcd, which is slightly more than national benchmark level of 150 lpcd as per the CPHEEO manual. AMC is divided in 6 sewerage catchment areas, three of these are at eastern side and other three are at western side of the river Sabarmati. There are 68 sewage pumping stations, out of these 10 are terminal sewage pumping stations.

The City has 3302 km sewer network as of 2020 covering 95% of the population. The total population is estimated as 6.8 million in 2020. There are 14 STPs with treatment capacity of 1245 mld. There are 70 sewage pumping stations and 2023715 sewer connections as of 2020. Around 90% of the city area is served by the existing sewer network.

Ahmedabad was granted the status of a Metropolitan city in 2014. Accordingly, the per capita water supply to Ahmedabad is 150 lpcd. Thus, the sewer network design and treatment capacity of STPs would have been based on 122 lpcd of sewage generation as shown in the ***Table 1*** below. Additional quantity of about 7% of the sewage shall be allowed on account of infiltration into the sewers. The CPHEEO Manual restricts the infiltration flow to a maximum of 10%.

Table 1: Sewage Generation Details

Sr. No	Description	Prior to 2014 (lpcd)	After 2014 (lpcd)
1	Water Supply to residents (Excluding UFW)	135	150

Sr. No	Description	Prior to 2014 (lpcd)	After 2014 (lpcd)
2	Allow supply for commercial institutional & Civic amenities (minimum)	7.5	7.5
3	Total per Capita water supply	142.5	157.5
4	Sewage generation (80% of water supply)	114	126
5	Infiltration- 7% (Maximum 10%)	7.98	8.8
6	Total per capita sewage generation	122	135

The sewage generation based on 150lpcd water supply and the estimated population of 7.13million in 2021 is 963 MLD. Not all sewage generated in the catchments reaches the STPs for treatment as some of the sewers in the trunk sewer network of the catchments are dysfunctional or partially defunct. However, when the problematic sewers in the network are rehabilitated, the STPs are expected to receive the full amount of sewage.

Based on city's annual growth rate of 3.5%, the estimated population as of this year is 7.13 million. The density of population is around 14,200 people/sq.km. The population is expected to grow to 10.98 million by 2039, the design year (2024+15 years as per CPHEEO) as per the details provided by the Master Plan Consultant. The overall Projected Population for year 2031, 2041 and 2051 is 9.13 million, 11.49 million and 14.01 million respectively.

Eastern Zone -1 covers approximately 75 sq. km area of AMC and the 424 MLD STP comes under Eastern Zone 1. This zone receives wastewater from South zone, central zone, and North zone of AMC. The estimated contributing population for this zone for 2021 is about 24.89 lakh and estimated sewage generation is about 547 MLD. Population in the catchment area of the Pirana STPs Including 180 MLD & 155 MLD is 2.42 million. Eastern Zone 1 has two existing STPs at Pirana of capacity 180 MLD and 155 MLD each. There are 3 under construction STPs viz. Maleskban - 30MLD; Saijpur – 7 MLD and Kotarpur – 60 MLD. There is a distinct catchment area for the under construction STPs; while the catchment area for 180 MLD and 155 MLD STPs is common. Therefore, these two STPs are considered to be under one campus which is termed as Pirana- I campus. The 155 MLD STP is commissioned in year 2021 and is reportedly designed to meet the treated effluent norms prescribed by NGT and therefore, need not any upgradation. The incoming sewage at the campus is more than the combined capacity of existing STPs i.e., 180+155 = 335 MLD; Thus, there is untreated sewage flow which is currently being bypassed to River Sabarmati. Hence, it is required to augment the capacity at New Pirana campus so there is no untreated sewage is discharged from the catchment. MP consultant in their report has proposed additional 240 MLD capacity sewage treatment plant at New Pirana campus to cater the need of future sewage generation up to 2041. Hence, required capacity of STP at Pirana I campus shall be 424 MLD (180 MLD + 240 MLD) which is excluding 155 MLD STP.

As per the CHPEOO Manual on Water Supply and Treatment published in 1999 the recommended per capita water supply for cities provided with piped water supply and

sewerage system (existing or contemplated) is 135 lpcd (litre per capita daily), while for Metropolitan and Mega cities the water supply level is 150 lpcd. The figures exclude Unaccounted for Water (UFW) which should be limited to 15% only. Thus, as per the recommendation of the CPHEEO manual, the current water production for Ahmedabad city shall be 172.5 lpcd (i.e., 150 +22.5 for UFW).

The MP consultant has also carried-out an assessment of water supply and consumption across different administrative zones. The outcome of their analysis reveals that the water consumption is varying across different zone. The per capita water consumption is estimated to be varying from 180 lpcd in North Zone to more than 280 lpcd in West zone/s. The higher per capita consumption in west zone is reportedly attributed to higher ground water consumption through private borewells. However, in the absence of complete metering, the actual per capita water production cannot be estimated[9].

The existing Sewage Treatment capacity within AMC area is 1248 MLD. A sewage flow balance study was carried-out by the Design Consultant, in consultation with AMC, which reveals that against the existing treatment capacity of 1248 MLD, the sewage being received is about 1696 MLD; thereby there is a gap of about 448 MLD. The excess sewage remains untreated and ultimately discharged into Sabarmati River/ Khari River.[10]

As stated above, there is a gap between the amount of sewage generated within the AMC limits and the total amount of wastewater treated. Existing large STPs established more than 10 - 12 years earlier have been working sub-optimally due to operation and maintenance issues, which has also contributed to increasing the pollution load in the river Sabarmati to which they discharge the treated water as suggested in the Consent Conditions issued by the regulator, namely Gujarat Pollution Control Board (GPCB). At various locations along the Sabarmati River, it has been observed that wastes, domestic wastewater, sewage, and effluent from few industries is being directly discharged into the river. This has affected the quality of water in Sabarmati River, the farmlands downstream which are dependent on the river and the ground water quality in the nearby localities.

SBR is an established technology in the recent past and has delivered consistent results. All the new STP projects implemented in AMC region in recent past are on SBR technology. Option analysis has been done for the proposed 424 MLD STP, considering SBR and A2O treatment technology with Considering the whole life cycle cost and to suit the requirement, Sequential Batch Reactor (SBR) is recommended in the DPR. The SBR process is fully aerobic and will work as a perfect reactor which ensures 100% treatment, thereby there is no odour nuisance. Generally, the odour will be generated from Preliminary units and Sludge sump. A buffer zone of 3.0m with planting tall trees around the STP (at least 2-3 rows of trees) shall reduce odour and dust nuisance considerably. In addition to this the open area around the plant shall be suitably landscaped with soft landscaping. The secondary treated sewage itself can be used for gardening. The secondary treatment by SBR can produce a BOD and SS of less than 10 mg/l BNR removal with a pre Anoxic tank. AMC proposes to (i) change the treatment process to enable it to accept and treat the sewage generated by all occupants in its catchment optimally. (ii) ensure higher efficiency and achieve service level benchmark set by National agencies and

9 Final DPR, February 2024

10 The excess sewage from Eastern Zone -3 (VInzol campus) is discharged into Khari river.

regulators, (iii) achieve a better quality of treated sewage as suggested by the National Green Tribunal (which would meet the prevailing MoEFCC 2017 discharge standards as well). This will reduce discharge, and bypass untreated or sub-optimally treated sewage and sludge in waterbodies and land in its catchment and area of influence minimize contamination of surface and ground water sources, and overall improvement in the health of the environment and the society.

1.3 Proposed Subproject Details

The existing 180 MLD Sewage Treatment Plant was designed for an average flow of 180 MLD.

The plant was commissioned in year 2009 by EPC Contractor ''Enviro Control Associates India (P) Ltd. Surat''. Over the years, its functioning is deteriorated as evident from the quality of treated sewage, and many of the infrastructure is dilapidated.

The present 180 MLD STP will also complete its design life by 2024 which is the base year for new STP. Under option 1 as discussed in DPR, there shall be three STPs of varying capacities and technologies in Pirana I complex, and AMC will have to manage O&M of all these three STPs.

There are many industries operational within AMC area and it is understood that these industries indirectly (often illegally) discharge effluent into public sewers without meeting the standard set by the Central Pollution Control Board (CPCB) of India for discharging industrial effluent into public sewers. Moreover, it is understood that some industries operating in areas outside of the AMC boundary and the industrial effluent is brought to AMC area in tankers and illegally discharging into the public sewer system.

Industrial ingress is more dominant into the eastern part of the AMC area.

Since the STP is a greenfield project, there is no utility displacement observed at the site. But can be a Chance find as the proposed work is on undeveloped land. Proposed TSPS land is at the entrance of the Pirana Campus 1 premises and adjacent to the service road. TSPS land contains minor structures such as security cabin, tank etc. which shall be dismantled before construction. DPR mentions 3 utilities in TSPS land such as entrance gate and approach to common premises; 900 mm Ø MS delivery pipeline of Pump No. 8 installed at existing 182 MLD Pirana Terminal SPS, out falling into a chamber connected with the bypass channel leading to Sabarmati River; one 1500 mm ø GRP Rising Main of Pirana Terminal SPS out falling into bypass channel heading to Sabarmati River. These utilities need to be shifted for site clearance in way such as the prevalent services of the existing facilities are maintained throughout the design build period of the upcoming TSPS.

Part of the road connecting to the proposed STP site is Kachha which will be made pucca, outfall channel land for ROW between 1 to 1.5 metres is vacant land under vegetation in the ownership of AMC. On the ROW width for estimated 1 to 1.5 metres as per DPR consultants, no cultivation or grazing activities were observed. Detailed design for shifting, ESIA and ESMP updatio

n will be done by DBOT Contractor based on final alignment and studies done for the sites under project activities.

AMC proposes to:

Construct a new 424 MLD STP to meet the future flow requirements and treated effluent norms prescribed by NGT. The existing 180 MLD STP is designed to meet the treated effluent levels of BOD, TSS and COD as less than 20 mg/l, 30 mg/l and 100 mg/l respectively. The present process is not designed to remove the biological nutrients viz Nitrogen and Phosphorous.

A new TSPS with 424 MLD capacity will be required to collect and pump the sewage received. New outfall structure of adequate capacity will be required for the 424 MLD STP.

The TSPS site shall have boundary wall on all sides. There is existing boundary wall on two sides of the site. It is proposed to construct boundary wall of approx.. length 205m on the balance side of height 2.5m above FGL with fabricated MS angles 'Y' shaped and concertina fencing of 0.75 meters on the top. MS Gate with security cabin and shall be constructed for entry and exit.

Internal bituminous road 6m wide shall be constructed around the periphery for proper access. Landscaping along the periphery and inside of the TSPS area shall be provided with planting tall trees as per regulatory requirement and C-ESMP to improve the aesthetic value. Parking shall be provided for two and four wheelers. Site drainage shall be provided using nature-based solution with ground water recharge arrangement.

Rising Main(s) carrying the discharge of 424 MLD TSPS to new STP with all associated works such as valves, pressure transmitters, flow meters etc. Two M S Rising Mains (each of 2000mmØ) and each one connected with a 2000mmØ Common Header at the TSPS and terminating at the inlet chamber of STP will be provided and laid to serve the STP with raw sewage for treatment. The interconnectivity of the two headers will facilitate parallel operation as well as an inter alia diversion of flow from one rising main to another for want of repair and maintenance of the pumping main for shorter period of time. The approximate length of each rising main from TSPS to STP will be approximately 800 meters as per DPR. A motorable road is proposed to be constructed for ease of access and repair, if any. The rising main alignment given in the DPR is tentative and shall be finalized by DBOT Contractor after survey and investigation. ESIA and ESMP updation will be done by DBOT Contractor based on final alignment.

Existing 180 MLD STP will be considered for upgradation and rehabilitation for meeting NGT standards and may be reserved in case of any surplus flow received in the catchment. The 180 MLD STP will be taken up for upgradation and rehabilitation under different funding, if so required, after commissioning of the 424 MLD STP, for treatment of future flows in compliance to NGT standards.

Ensure higher efficiency and achieve service level benchmark set by National agencies and regulators.

Achieve better quality of treated sewage as suggested by the National Green Tribunal (NGT suggested norms with TSS<10 mg/l) which would meet the prevailing MoEFCC 2017 discharge standards as well.

Following are the components proposed in the proposed sub-project –

A new 424 MLD STP with adequate pumping facility is proposed to be developed in the available land parcel adjacent to 155 MLD STP. The services of the existing 180 MLD TSPS and STP shall be disbanded after the commissioning of new facilities. 180 MLD STP is being considered by AMC for upgradation and rehabilitation to meet NGT standards at a later stage following commissioning of the 424 MLD STP.

A new Terminal pumping facility is planned to be constructed in the available land parcel admeasuring 0.82 ha which is in front of 155 MLD STP. The land is already in possession of AMC. A fully functional 424 MLD pumping facility, equipped with SCADA-controlled electro-mechanical equipment is proposed to be constructed.

Common inlet chamber to receive the flow carried by the two box trunk mains with flow regulating mechanism. It is proposed that the flow received from two 2.4m x 2.4 m duct shall be intercepted and diverted to common inlet chamber. Flow from common inlet chamber shall be regulated and transferred to inlet chambers of existing 182 MLD TSPS (for 155 MLD STP) and new 424 MLD TSPS (for 424 MLD STP) using gravity pipes and channels. New 424 MLD TSPS shall pump the required flow via rising mains to new 424 MLD STP for treatment. After suitable treatment, treated effluent shall be disposed to River Sabarmati. The scheme and all components shall be discussed in detail in subsequent sections. Schematic drawing of the scheme is shown below.

Gravity pipeline(s)/channel(s) along with flow regulating mechanism to carry the flow from common inlet chamber to existing 182 MLD TSPS (serving 155 MLD STP) and new 424 MLD TSPS.

Rising Main(s) carrying the discharge of 424 MLD TSPS to new STP with all associated works such as valves, pressure transmitters, flow meters etc.

AMC and the Gujarat State Pollution Control Board (GPCB) have jointly undertaken a drive to disconnect sewer connections of the flouting industries. The teams of AMC and GPCB have increased the surveillance and monitoring in major industrial clusters to enforce regulatory norms for the treatment of industrial wastewater. AMC is also planning to develop a robust water quality monitoring system that would enable AMC to monitor the industrial pollution risks on a real-time basis Therefore, AMC is of the view that Industrial wastewater pollution or Heavy metal contamination will not be an issue for the STPs by the time of their commissioning. Therefore, Design Norms and the Treatment scheme for this project are finalized considering the wastewater as Domestic sewage without any kind of Industrial wastewater pollution. However, a monitoring and subsequent notification mechanism which described below shall be proposed. This help AMC with an early warning mechanism and assist them to take timely action.

AMC had appointed National Institute of Hydrology (NIH) to undertake Dam Break Analysis & Flooding simulation in line with ESS 4 and based on their recommendations the design HFL corresponding to 100 years return period for STP site is 42.78 meters. The existing STP has an average ground level of 42.98 m. NIH report suggests that the top of the structures can be kept 0.3 m above the HFL to avoids impact of flooding of STP units. This has been considered while undertaking the design. This data will also help the DBOT contractor to plan his facility with most longevity and best performance even in case of climate events.

Bypass arrangement: To deal with any eventuality of an excessive inflow, an extensive power breakdown, breakdown of pump sets, or any such emergency/ force majeures warranting a contemporary diversion of inflowing sewage, two gravity overflow pipes (each of 2000 mm Ø) shall be provided at the inlet chamber of the TSPS. To regulate and control the quantum of overflow/ bypass, each overflow pipe will be equipped with a motorized sluice gate at the Inlet Chamber of the TSPS and finally, the overflow pipelines will be connected the existing bypass arrangement have an outfall into the Sabarmati River.

Pump sets: Assuming the peak inflow twice of the design inflow of 424 MLD TSPS and further considering a 50 % standby pumping capacity over and above the peak inflow, the cumulative pumping capacity requirement at this TSPS has come out to 1260 MLD. Considering space constraint to accommodate the units of the TSPS, the selection of the capacity of individual pump sets has been maximized to the limits as suits for operation with a 415 Volts 50 Hz Electric Motor. Thus, a total of twelve (12) Electric Pump Sets having a 4500 m^3/Hr flow rate @ head of 19.5 have been proposed for installation. Of the 12 pumps, eight (8) shall be adequate to handle the peak inflow without any stagnation/ overflow in the upper stream.

Under electrical works, in the proposed scheme, there will be 12 nos of 355 KW sewage pumps. Under normal conditions, 3-4 numbers will be running and during peak hours 8 nos will be working. Three new transformers of capacity i.e., 2500 KVA is being proposed. For lighting, LED fixtures are proposed and for street lighting it is proposed to have solar street light fixtures type having lithium peroxide battery backup.

Sludge Management: Sludge Management Facility (SMF) has been proposed by AMC to be ready to manage sludge by commissioning of first/ initial stream of this proposed STP. Sludge Management facility shall be considered as an associated facility if applicable and ESIA/ ESMP shall be prepared by AMC & followed in line with Environmental and Social Management Framework (ESMF)

The proposed tendering for the SMF is proposed as a DBOT or PPP model as a separate project. The source of funding shall be either by AMC's own funding or PPP mode investor funding. Statutory permissions are required to be taken such as EC, CTE and CCA shall be in scope of DBOT contractor . Sludge treated at the sludge management facility will need to comply with all other applicable national regulations abiding to ESIA and ESMP for the identified end use.

An approach road shall be constructed to connect the STP land from the service road. The total length of approach road is 1100 m. 350 m of the approach road is already constructed for waste energy plant which will require resurfacing whereas balance part of the road connecting the service road is required to be constructed. The cost of the same is included in the Project cost. No shifting of utilities is required for the road construction.

Table 2: Cost Estimate for the Proposed STP construction and associated facilities

Sr. No	Description of Item	Qty	Amount in Crores (in INR)
1	Investigation survey by total station, Geotechnical survey, and any other survey required to undertake the work complete as per directions of Engineer in Charge.	Lot	0.75
2.	Detailed design, Hydraulic designs & drawings, Structural designs & drawings, detailed estimates/BOQs. Completion all necessary reports (Preliminary and Detailed Design reports, any technical notes as required) including As-Built drawings, vetting of designs from IIT/ NIT etc. The cost is inclusive of all expenditure towards items such as setting up offices for contractor and client, Contractor's yard, Contingencies etc.	5.5 of cost%	42.93
3.	Terminal Pump Station: Design, Supply, Install, Commissioning of Step screens, Pumps, motorised valves, local PLC system, electromagnetic flow meters, street lighting etc. complete to accommodate in the existing pump stations including all Civil, mechanical, Electrical and Instrumentation works etc. Complete.	1 Lot	67.66
4	Rising Main from TSPS till STP including electromagnetic flow meters, valve and appurtenances, road, etc. all complete		12.48
5	Designing, constructing, hydraulic testing, commissioning and giving satisfactorily trial runs of 424 MLD STP of Advanced modern Sequential Batch Reactor Technology , which can be accommodated in the limited identified land space consisting of Preliminary, Secondary and tertiary units and necessary outfall pipes with outfall structure etc. complete as per the requirement of NGT Standards with relevant national/international codes etc. necessary piping work with required valves, gates, drains, path Ways, Administration. Block cum Laboratory, Blower house and watchmen quarters as necessary, Laboratory Equipment, Internal Roads, Pathways, Tools and plants, Treated effluent disposal, approach road, solar roof top arrangements etc. complete as turnkey job with all involved Civil, electrical, Instrumentation and mechanical works, units as per detailed specifications for civil, electrical, Instrumentation and mechanical components complete to achieve latest NGT discharge standards BOD <10ppm, TSS <10ppm, COD <50ppm for disposal to river.		700.38

Sr. No	Description of Item	Qty	Amount in Crores (in INR)
	The plant should be completely automated with SCADA etc complete.		
6	Cost ESMP during Pre-construction and Construction stage		1.28
7	Sub Total		825.48
7	Provisional Sum		13.55
8	Total Cost of the 424 MLD STP including Terminal Pump Station and allied infrastructure.		839.03 Crores

1.4 Objectives and Scope of the ESIA

The subproject has to comply with the Environmental and Social Framework (ESF) of the World Bank (WB) and its Environment and Social Safeguards Standards (ESS). The sub project also needs to comply with various Central and State Government standards, guidelines, and statutory requirements. As per the ESMF prepared by AMC for the G-ACRP, all proposed subprojects shall be screened, and risks categorised, to determine the extent of E&S due diligence required. Hence, for the proposed 424 MLD STP at Pirana, Initial Environmental and Social Screening (IESS) was conducted using the screening format in the ESMF, and risk level was determined. Since Detailed Project Report has been prepared the proposed Pirana 424 MLD STP has been identified as a ***Moderate*** risk subproject, it requires assessment of E&S risks and impacts. The subproject will be bid out for implementation on a Design – Build – Operate – Transfer (DBOT) mechanism, also integrating the ESMP prepared through this ESIA in the procurement documents, so that the contractor can plan and arrange the required resources for implementing and managing the E&S aspects. At this Detailed Project Report Stage, after detailed design of the proposed rehabilitation works, it is established that the location of the facility will not change and land identified for the proposed project is in the possession of AMC. The existing 180 MLD STP is considered for upgradation and rehabilitation in the future, to meet NGT standards, for future flows, after the construction and operation of the new 424 MLD STP. Suggested technological options and other aspects are outlined in the DPR. Based on this and the regulatory requirements, the ESIA assesses the potential risks and impacts of this subproject. Some structures on land proposed to be used for TSPS wil be removed, but these structures are small such as security structure, other previously utilized components within the premises. Most of these are old and not currently being utilized for any purpose. While the location will not change, and the proposed related new infrastructure such as TSPS, roads, rising main etc will also be constructed along with the proposed 424 MLD STP, the DBOT contractor once on board will further update the ESIA and ESMP, if required, based let on the final design and any proposed modifications recommended for the subproject.

Proposed construction activities i.e., proposed 424 MLD STP based on SBR technology including all civil, mechanical, electrical and instrumentations works, interconnecting pipe work along with associated buildings, and all infrastructure facilities such as roads, potable water system, internal sewerage network, Laboratory Equipment, storm water drainage etc. complete, Construction of new 424 MLD Pirana terminal sewage pump station, laying of rising

main from new TSPS to new 424 MLD STP, SCADA system, necessary piping work with required valves, gates, drains, path ways, Administration Block cum Laboratory, Blower house and watchmen quarters as necessary, Laboratory Equipment, Internal Roads, Pathways, Tools and plants, Treated effluent disposal, Construction of new outfall arrangement, approach road, Instrumentation and mechanical components complete to achieve latest NGT discharge standards BOD < 10ppm, TSS <10ppm, COD < 50ppm for disposal to river, etc must adhere to the best standards for sustainable environment, social acceptability and economic viability. As per the World Bank ESF, prior to investing into such development projects the Environmental and Social Impact Assessment is to be carried out.

Tasks undertaken by TCE while preparing the ESIA:

- Updating the Screening Format, prepared by AMC/ WB during preparation of the DPR
- Review of key environmental & social legislations applicable to this project and necessary regulatory requirements, Word Bank ESF, ESMF for G-ACRP and other guidance.
- Site assessment of the identified site for the proposed 424 MLD STP. Assessing the baseline status of air, water, noise, soil, land, ecology, cultural heritage, and socio-economic aspects. In order to assess these impacts baseline monitoring shall be conducted for the sub project site and its immediate surroundings and areas within 5 km radius.
- Conducting stakeholder consultations for environmental & social issues.
- Assessing the Social and Environmental risks and impacts of the subproject due to the construction and operational impacts including cumulative impacts due to other STPs and other activities nearby, and climate change vulnerability.
- Socio-economic assessment to identify the vulnerable groups (e.g., elderly, female-headed households, migrants/ squatters/ urban poor, extreme poor) that may be affected by the sub-project activities.
- Analysis of proposed project site, technology, design, and operations from the perspective of likely environmental and social risks and impacts and develop the ESMP to mitigate/ offset/ reduce the impacts & risks.
- Preparing the and E & S monitoring plan, cost estimate/ budget for ESMP implementation and monitoring, and institutional arrangements for managing and mitigation of the E&S risks and impacts.

1.5 Environmental and Social Risks: An overview

The subproject proposed is new 424 MLD capacity STP at Pirana. The existing Pirana 1 STP campus with 155 MLD & 180 MLD STPs together caters to the Eastern Zone 2, covering 2.42 million people. As per the DPR, the estimated contributing population for this zone for 2021 is about 24.89 lakh and the estimated sewage generation is about 547 MLD. Existing 180 MLD STP is proposed to be considered for upgradation and rehabilitation, subsequently, commissioning of the 424 MLD STP, to meet NGT standards and treat sewage flows. AMC intends to follow the best available discharge standards namely, the discharge standards suggested by the Hon'ble National Green Tribunal (NGT) while rehabilitating the STP, to ensure the best effects on the water body River Sabarmati, where treated sewage is

discharged by the existing facility as per the Consent Conditions of the regulator; GPCB. Consent to Establish and operate will be taken from the GPCB for the proposed 424 MLD STP. This will result in better quality of sewage reaching Sabarmati, with benefits on the environment, overall health, and economy of the inhabitants in eastern zone 1 of the city, people near around nalas, and downstream villages to the south of Ahmedabad, on both sides of the Sabarmati flow path.

1.6 Structure of the Report

The ESIA has been structured as follows:

EXECUTIVE SUMMARY:	**NON-TECHNICAL SUMMARY** of the ESIA Report
CHAPTER 1.:	**INTRODUCTION** provides project (GRCP) description, project components and the rationale for the proposed Subproject (This Chapter), objectives and structure of report.
CHAPTER 2.	**POLICY AND REGULATORY FRAMEWORK:** discusses applicable National/ State/ local regulations, WB ESF/ ESSs, and applicable standards/ guidance applicable for the proposed subproject, screening, and categorisation
CHAPTER 3.	**ENVIRONMENTAL AND SOCIAL BASELINE:** provides the present status of environmental & social parameters which will be affected due to the proposed development.
CHAPTER 4.	**ANALYSIS OF ALTERNATIVES:** looks at possible alternatives to the proposed subproject including a 'no' project scenario, technology alternatives and alternatives for pipeline from TSPS to 424 MLD STP
CHAPTER 5.	**ASSESSMENT of ENVIRONMENTAL AND SOCIAL RISKS, AND IMPACTS:** describes potential impacts and risks due to the proposed subproject and related activities in line with applicable regulations and WB ESSs, cumulative impacts
CHAPTER 6.	**ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN AND MONITORING PLAN:** presents the need to avoid certain risks and impacts on valued environmental components, mitigation/ management measures for identified risks and impacts, with institutional responsibility for implementing these.
CHAPTER 7.	**INSTITUTIONAL ARRANGEMENTS:** discusses the proposed intuitional arrangements to implement, review and supervise subproject risk and impact mitigation
CHAPTER 8.	**PUBLIC CONSULTATION AND INFORMATION DISCLOSURE:** presents the consultations undertaken and proposed to be undertaken, institutional responsibility, mechanisms, and schedules to disclose the subproject E&S documents.
ANNEXURES	**ANNEXURE I: INITIAL ENVIRONMENTAL AND SOCIAL EXAMINATION** **ANNEXURE II: APPLICABLE REGULATIONS** **Annexure III: WORLD BANK ESSS APPLICABLE TO THE PROJECT** **ANNEXURE IV: BIODIVERSITY ASSESSMENT: FLORA & FAUNA**

	ANNEXURE V: PLANTATION LIST **ANNEXURE VI: OHS RISKS DURING VARIOUS SUBPROJECT PHASES** **ANNEXURE VII: DISCUSSION ON MAJOR PROPOSED/ ONGOING PROJECTS IN AHMEDABAD** **ANNEXURE VIII: MAPS AND LAND RECORDS OF STP** **ANNEXURE IX: PHOTOGRAPHS OF CONSULTATION AND BIODIVERSITY** **ANNEXURE X: EMERGENCY ACTION PLAN - VASNA BARRAGE**

CHAPTER 2. POLICY AND REGULATORY FRAMEWORK

There are various national, state level policies and regulations applicable to proposed subprojects. The Ministry of Environment, Forests and Climate Change (MoEFCC) and the Central and State Pollution Control Boards (CPCB and SPCBs) together form the regulatory bodies; while National Green Tribunal (NGT) is tasked with providing an effective and expeditious remedy in cases relating to environmental protection, conservation of forests and other natural resources, and enforcement of any legal right relating to the environment.

Applicable regulations include international environmental treaties to which India is party, National and State regulations, laws and procedures applicable for the sub project encompassing environmental Conservation and management, regulations related waste management, Acts/ Rules applicable to Land Acquisition, ROW use, Encroachments on municipal drains, Acts and legislation with respect to various labour acts and labour welfare, Other regulations/ Policies/ Guidelines applicable to various construction/ implementation activities and other miscellaneous acts. The important legislations are included in the ESMF for the G-ACRP project and compiled in Annexure II. Guidelines pertaining to the sub-project specifically are discussed below:

2.1 Key Guidelines

- Guidelines on Environmental Management of Construction & Demolition (C&D) Wastes, CPCB
- Guidelines for Utilisation of Treated Effluent in Irrigation, September 2019, CPCB
- National Building Codes (Part IV Fire and Life Safety), Bureau of Indian Standards
- AMC Building byelaws

2.2 Technical Guidelines on Sewerage and Drainage at National Level

Central Government agencies have issued various guidelines for various aspects and associated aspects of sewerage and drainage projects. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD) has the responsibility of:

Preparation of Technical Guidelines in the form of Manuals in the field of Public Health & Environmental Engineering which are used as basic documents by the State Public Health Engineering Departments/ State Water Boards/ UTs/ Urban Local Bodies in their functions of planning, designing, construction and operation & maintenance of water supply and sanitation schemes in the above sectors.

The most important guidance applicable to this subproject is listed here, with a description of the guidelines presented in **ANNEXURE II.**

- Manual on Sewerage and Sewage Treatment Systems, 2013
- Manual on Storm Water Drainage Systems, 2019: Applicable - as the manual states that combined storm water and sewage in the same pipeline has resulted in several adverse effects in the process of treatment, operation, maintenance and also on the environment. Manual recommends that sewage should be separated from the storm water drainage system as it is currently in practice all over the world

- Manual on Operation and Maintenance of Water Supply System, 2005
- Manual on Solid Waste Management (applicable to screenings, sludge, grit, other wastes from premises)
- Manual on Municipal Solid Waste Management – 2016
- Manual on Water Supply and Treatment -1999

Guidelines and Advisories are issued by the CPHEEO and MoUD. Though water supply and sanitation are a State subject, CPHEEO provides policies, strategies and guidelines to the States & UTs Governments including Municipal Corporations/ Committees. It acts as an Advisory body at Central level to advise the concerned State agencies and Urban Local Bodies (ULBs) in implementation, operation & maintenance of urban water supply, sanitation and solid waste management projects and helps to adopt latest technologies in these sub sectors. CPHEEO also provides technical assistance to central ministries including MOEFCC in respect of various projects and problems referred by them. The advisories cover various thematic areas including environment, health, safety, public. The below mentioned guidelines and advisories are issued by CPHEEO which are relevant to the designing, planning and implementation of the project.

- A National Policy on Mechanised Sanitation Eco-system has been formulated and circulated to the States for implementation along with the regulation: The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013
- Guidelines for Decentralized Wastewater Management
- Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks
- Advisory note on Septage management in Urban India
- National Policy on Faecal Sludge and Septage Management
- Advisory on Public and Community Toilets
- Advisory on Tariff for Water supply and Sewerage
- Recent Trends in Technologies in Sewerage System.

Details of applicable regulations is presented in ***ANNEXURE II***.

2.3 Standards for Discharge of Treated Sewage

Standards for Discharge of Treated Effluents was initially published in India by MoEFCC under Environment (Protection) Act, 1986. MoEFCC in 2015 and 2017 revised the standards to be followed for disposal of treated sewage. Sewage discharge standards for disposal into water bodies were also discussed by the National Green Tribunal, the environmental watch agency of the country in its many important judgments. The following ***Table 3*** presents a comparison of sewage discharge standards.

Table 3: Comparison of Sewage Discharge Norms/ Orders in India

S. No.	Parameters	General Norms[g] 1986				Draft Notification, Oct. 2017**	NGT Order 2019**
		Inland Surface Water	Public Sewer	Land Irrigation	Marine Coastal Areas		
1	BOD (mg/l)	30	350	100	100	30 (20 for metro cities[h])	10
2	COD (mg/l)	250	-	-	250	-	50

S. No.	Parameters	General Norms[g] 1986				Draft Notification, Oct. 2017**	NGT Order 2019**
		Inland Surface Water	Public Sewer	Land Irrigation	Marine Coastal Areas		
3	TSS[i] (mg/l)	100	600	200	100 (process water)	100 50 (metro cities)	20
4	PH	5.5-9	5.5-9	5.5-9	5.5-9	6.5-9	5.5-9
5	TN[j] (mg/l)	100	-	-	100	-	10
6	Ammoniacal Nitrogen as N	50		-	50	-	-
7	Free NH3 (mg/l)	5			5	-	-
8	Nitrate (mg/l)	10			20	-	-
9	Diss. PO4 as P (mg/l)	5	-	-	-	-	1[l]
10	Faecal Coliform (MPN/100 ml)	-	-	-	-	<1,000	<230

Notes:

[g] standards set in 1986 cover in total 40 parameters, which are not depicted in this illustration. NOTE: industrial wastewater standards are regulated under CETP (Common Effluent Treatment Plant) set, which is not focus on this study.

[h] Metro Cities, all state capitals (including Gujarat) except in certain states

*** Standards applicable for discharge into water bodies and land disposal/ applications, while reuse is encouraged.*

[i] As SS in (mg/l) in General Norms, 1986.

[j] As Total Kjedahl Nitrogen in General Norms, 1986

[k] As NH4-N

[l] Valid for Phosphorus Total (for discharge into ponds and lakes)

Existing STPs were designed to comply with the sewage discharge standards prevailing during the year 2017 and need process/ technology up-gradation to comply with the latest discharge standards. Consent granted by GPCB to STPs in Ahmedabad stipulates upgrading the facilities to meet the CPCB 2017 standards in five years whereas NGT suggested standards[11] are more stringent as presented in **Table 3** *above*. NGT has in 2019 suggested stringent standards for discharge of treated sewage. AMC aspires to follow these guidelines for all proposed activities under G- ACRP, so as to bring in better environmental effects.

[11] *NGT effluent discharge standards for STPs,2019*

Table 4: Comparison of Treated Sewage Discharge Standards across Countries

Country	PE Treated	pH	t (°C)	SS (mg SS/l)	DO (mg O_2/l)	COD (mg COD/l)	BOD (mg BOD/l)	TN (mg N/l)	Total Ammonium (mg NH4-N)	Total Ammonia (NH3-N)	TP (mg P/l)	Microbiological Indicators
EU Urban wastewater treatment Directive (UWWTD)[p]	>2,000			35/ 90% reduction		125/ 75% reduction	25/ 70-90% reduction	-			-	
	10,000-100,000							15			2	
	>100,000							10			1	
Ireland	≤10			30			20	5	20		2	
	>2,000	UWWTD apply as a minimum, but may be more stringent to comply with Water Framework Directive (WFD)										
France	<20			30			35					
	20-2000	6-8.5	<25	50% reduction		60% reduction	35, 60% reduction					
Romania	>2000	UWWTD apply as a minimum, but may be more stringent to comply with Water Framework Directive (WFD)										
Ecuador		6-9	±3[q]	130		200	100	50 TKN	30		10	<2000 FC MPN/100 ml
Tanzania		6.5-8.5	20-35	100 TSS		60	30	15 TKN			6	<10,000 TC counts/100 ml
Jordan				60 TSS	>1	150	60	70			15 as T-PO_4	<1000 E. coli MPN/100 ml Nematodes <1
India NGT 2019		**5.5-9**		**20 TSS**		**50**	**10**	**10**			**1**	**<230 FC MPN/ 100ml**
India 1986[r]	Inland Water	5.5-9	shall not exceed 5°C above the	100		250	30	100 TKN		5 as free NH3	5 diss.	

Country	PE Treated	pH	t (°C)	SS (mg SS/l)	DO (mg O_2/l)	COD (mg COD/l)	BOD (mg BOD/l)	TN (mg N/l)	Total Ammonium (mg NH4-N)	Total Ammonia (NH3-N)	TP (mg P/l)	Microbiological Indicators
			receiving water temperature								PO4 as P	
	Land Irrigation			200			100					

Note to table: Coliforms represented includes E. Coli, Faecal Coli (FC) and Total Coliforms (TC)

[o] *Detail for ranges of permitted consents omitted from this version for clarity*

[p] *TP and TN only considered in designated "sensitive" area*

[q] *of the receiving water body*

[r] *GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS. [SCHEDULE – VI] of The Environment (Protection) Rules, 1986*

A comparison[12] of India's Standards with those in other countries presented in the **Table *4***. It reads that NGT suggested standards for disposal of treated sewage is stringent than that of other prevalent standards.

In addition, as per CPCB, designated best use class of any river in the country would be determined based on the following. Most stretches of Sabarmati confirmed to Class B during pre-COVID-19 lock down period, as per GPCB's recent report[13]. NGT has suggested polluted river stretches (Sabarmati is one) be maintained at < BOD 3mg/L and Faecal Coliforms at <500MPN. So, considering the assimilative capacity, since the existing poor discharge quality maintains the river at B Class, it is clear that following NGT Standards would help maintain this, and probably elevate to higher class.

Table 5: CPCB Designated Best Use Classification of Rivers

Designated-Best-Use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	• Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	• Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	• Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wildlife and Fisheries	D	• pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

2.4 The World Bank ESF and Environmental and Social Standards (ESS)

- ESS-1 Assessment and Management of Environmental and Social Risks and Impacts
- ESS-2 Labour and Working Conditions

[12] *Schellenberg Tatjana, Subramanian Vrishali, Ganeshan Ganapathy, Tompkins David, Pradeep Rohinim, 2020.* ***Wastewater Discharge Standards in the Evolving Context of Urban Sustainability–The Case of India****, Journal: Frontiers in Environmental Science, VOLUME-8 Available at: https://www.frontiersin.org/article/10.3389/fenvs.2020.00030 Accessed on : September 7, 2021*

[1313] *https://gpcb.gujarat.gov.in/uploads/GPCB_STUDY_REPO_DRAFT_IMPACT_LOCKDOWN_WATER_UPTO_JUNE2020.pdf*

- ESS-3 Resource Efficiency and Pollution Prevention and Management
- ESS-4 Community Health and Safety
- ESS-5 Land Acquisition Restrictions on Land Use and Involuntary Resettlement
- ESS-6 Biodiversity Conservation
- ESS-7 Indigenous Peoples
- ESS-8 Cultural Heritage
- ESS-9 Financial Intermediaries
- ESS-10 Stakeholder Engagement and Information Disclosure

ANNEXURE III: discusses the relevance of the described ESS to the project.

2.5 G-ACRP ESMF

Considering the National/ State Regulations and requirements and WB ESF requirements, AMC has prepared an ESMF to guide screening, scoping, identification of risk/ impacts and their assessment, and preparation of mitigation measures, monitoring plan, institutional mechanism and budget for managing the risks and impacts associated with all subprojects under G-ACRP. The ESMF is disclosed and available at: www.ahmedabadcity.gov.in

2.6 Sub-project Screening and Categorisation

All subprojects are subjected to two-stage screening exercise, Stage 1: using the exclusion list, and Stage 2: using the E&S screening checklist. The subproject sites are initially screened to determine if they are to be excluded from G-ACRP during Stage 1 screening.

Table 6: Activities Excluded from G- ACRP as per ESMF

Sr. No.	*Non-permissible Activities*
1	Sub-projects in sites/ locations which should be excluded as per prevailing Rules/ Laws on Natural Habitats and Forests or Archeologically Protected Monuments (National, State, Local): (i) any construction in demarcated Forest areas or protected natural areas or their buffers, (ii) any subproject which would impact critical natural habitats, (iii) any subproject which shall be excluded as per AMASR Act, (iv) any subproject components or activities in the Historic Walled City of Ahmedabad – the UNESCO World Heritage Site
2	Sub-projects in sites/ locations which should be excluded as per applicable siting criteria prescribed by GPCB, Master Plan, Excluded Disaster Zones, or other applicable criteria set out by National, State, Local Body
3	Subprojects involving (i) Activities that impact the safety of Dams/ Barrages, (ii) purchase, storage, and use of Banned Pesticides/ Insecticides/ chemicals/ Asbestos, (iii) Construction of CETPs or any facilities to manage industrial/ hazardous wastes or effluents
4	Sub Projects displacing more than 200 tribal households or 100 Primitive Tribal households

Since the above exclusions are not applicable to the proposed subproject, Stage 2 screening was undertaken by the E&S specialists of the PIU using a combination of the literature review, stakeholder consultations, and the site reconnaissance survey.

The key steps involved in the process are briefly outlined below.

Step 1: (a) Review available project details, location map, and regulatory aspects, (b) conduct reconnaissance site visits for ground-truthing and screening

Step 2: Screen for the presence of any environmentally sensitive areas, project components of high risk, and probable benefits. Study of detailed topographic maps of the project sites with details of ecologically sensitive areas, culturally sensitive areas, archeologically sensitive areas, habitat areas, Reserve Forest, Wildlife Sanctuary, settlements, public amenities/ facilities etc. to undertake screening exercises.

Step 3: Revisit the screening checklist and ascertain the outcomes of the screening checklist after collection of baseline data, monitoring, surveys and consultation.

Step 4: Determine the project category based on screening and E&S instruments to be prepared.

As per indicative categorisation of subprojects in ESMF, proposed STP and related components such as approach road, TSPS, outfall channel etc may be a **Moderate** Risk subproject, however, this categorisation is indicative, also depending on other ESS risks and sensitivities identified through screening.

A matrix is presented below to summarize each type of potential E&S risks and impacts.

The proposed subproject is Construction of new 424 MLD STP in Pirana near the existing 180 MLD STP, which involves construction of new 424 MLD STP of Advanced modern Sequential Batch Reactor Technology, new 424 MLD Terminal Sewage Pump Station (TSPS) and Rising Main from TSPS to Sewage Treatment Plant. As per the DPR prepared, new construction activities will take place in site behind the existing 180 MLD STP. Proposed activities involve proposed under the project include TSPS works, installation of Preliminary, Secondary and tertiary units and necessary outfall pipes with outfall structure etc. complete as per the requirement of NGT Standards with relevant national/international codes etc. necessary piping work with required valves, gates, drains, path Ways, Administration Block cum Laboratory, Blower house and watchmen quarters as necessary, Laboratory Equipment, Internal Roads, Pathways, Tools and plants, Treated effluent disposal, approach road, , arrangements etc.

It is mentioned in the FR that the proposed outfall is into the Sabarmati River parallel to existing outfall channel of the 180 MLD STP. AMC is considering the upgradation of technology and rehabilitation of the 180 MLD STP, post commissioning of the 424 MLD STP to meet NGT standards and treat future flows. Further, sludge management facility has been proposed by AMC to be ready to manage sludge by commissioning of first/ initial stream of this proposed STP The land available is sufficient for 424 MLD STP. As it is a new plant with appropriate technology to substantially improve the quality of wastewater for reuse in industries and other applications with estimated capacity to meet current and future use, the risk is rated as moderate.

ESMF also presents the E&S due diligence procedures to be followed for each type of risk categorisation ***(*Table 7*).***

Table 7: Phase wise Procedures for 'Substantial' Risk category of Projects

Sub-Project Phase	Procedures	Responsibility
	Moderate Risk Projects	
Sub-project Identification/ Pre-Feasibility	IESE of the sub-project (Using Exclusion Criteria & Screening Format (filled format in ***ANNEXURE I***) Risk Categorisation	PIU
	Consultations with key stakeholders (as per SEP)	PIU
	Preparation of ToR for ESIA to be prepared along with DPR	Prepared by PIU, reviewed, and cleared by the WB
Feasibility Study/ Design	Conduct IEE/ ESA or E&S Audit (in case of the existing facility) and prepare ESMP also using ECOPs by Feasibility/ Design Consultant. Update ESMP based on a design by DBOT Consultant	PIU, Consultants
	Public consultations (as per SEP)	PIU, independent consultant
Detailed Design & Tendering	Use ECOPs or Biodiversity Management Framework/ Cultural Heritage Management Framework if applicable; to prepare ESMP	PIU, independent consultant
	Ensure Mitigation measures (from ESMP) included in Design	PIU – PIU technical specialist to send documents to E&S Specialists to ensure required procedures are met, before finalizing the designs
Detailed Design & Tendering	Ensure ESMP, Monitoring Plan, and LMP aspects are included in Bidding Documents	PIU - PIU procurement specialist to send pre-& post review documents to E&S Specialists to ensure required procedures are met, before initiating the bidding process
Construction Works	Implement and monitor ESMP	PIU

Sub-Project Phase	Procedures	Responsibility
	Moderate Risk Projects	
	Update IEE (and ESMP) as required	PIU, Contractor/ Consultant
During Construction Works	ESMP & ESHS Audit by external consultants (Annual Audit) Construction Supervision & OHS/ Safety Audit by CSQAC (Continuous)	PIU, External Auditors
Just before Closure/ Work exit – Post Construction	ESMP Audit (self-audit by PIU)	PIU, Consultant, Contractor

As per the ESMF, since this is a moderate risk subproject, it is important to prepare ESIA at the Feasibility/DPR stage before the subproject is bid out on DBOT format. This ESMP and its requirements will be made part of procurement documents, which contractor has to follow during design, construction and operation & maintenance stages. As the detailed designs will be prepared only during design sage, by the DBOT contractor; the ESIA, ESMP will be updated (or freshly prepared in case of much deviation from the proposal in Feasibility Report/DPR) and additional mitigation measures for construction, O&M stages will be derived from this updated/ new C-ESIA.

This report presents the ESIA for the subproject at the feasibility/DPR stage, and will be updated based on the detailed design, after the design is prepared by the DBOT contractor.

CHAPTER 3. ENVIRONMENTAL AND SOCIAL BASELINE

3.1 Methodology for Environmental Baseline Data Collection

Area of Influence

The subproject deals with proposed 424 MLD STP at Pirana near existing STP. It is expected that key risks and impacts will be on OHS during construction phase, which are largely manageable and reversible by adoption the best practices and vigilance. The subproject aims at adopting the best available/ stringent standards for treated sewage, and hence, overall, the impacts will be beneficial to the entire region.

The term 'area of influence' is understood as "such area where significant environmental impacts caused by project performance are evident on physical, biotic and socioeconomic components, in each component of such environment". In this case, all works will be confined within existing STP site; and treated sewage discharge will be the only aspect which might impact regionally. (i) discharge of treated sewage and bypasses occur through Sabarmati, and hence villages downstream till Vautha (where tidal influence and joining of Vatrak River happens) in case of Sabarmati, and villages in downstream of the sub project are taken as the larger region of influence for cumulative impacts from the perspective of water quality and availability; (ii) air and odour impacts are expected to occur in the immediate vicinity of STP, and hence an impact area of 5 km around the site is considered as the area of influence also considering cumulative impacts due to nearby, AMC's waste to energy plant operated by Goodwatts Ahmedabad Pvt. Ltd (under construction), AMC's waste to energy plant operated by Jindal Urban Waste Management (Ahmedabad) Ltd (under construction), AMC' Ahmedabad City Sludge Hygienization Plant, Luthur Group Company Green Gene Enviro Protection & Infrastructure Pvt. Ltd waste processing industries, AMC's Pirana Landfill Site which is a major influential land use in this case. Noise impacts also are expected to be confined to the site, as it is located near two other STPs, and an upcoming waste to energy projects, adjoining the plot. The nearest settlement is Gyaspur village and solid waste processing industries are located around the proposed site.

Accordingly, a Monitoring Plan for environmental and social parameters was prepared and agreed with the Client to finalize the parameters, number of samples required for the sub project and sampling locations best suited for sampling.

The environmental and social surveys were conducted for the proposed 424 MLD STP in December 2023 and draft ESIA was prepared. For the proposed 424 MLD STP, consultant's team visited the proposed site for project components and interacted with the AMC officials, DPR consultants, surveyors, and collected the available data pertaining to the sites and proposed components. Transect walk was undertaken for all identified works. Primary monitoring of environmental parameters like Air, Water, Noise, Soil & Biodiversity will be conducted in the post monsoon season. The Monitoring plan is enclosed in Inception and Draft Interim Report. Proposed Monitoring locations are also shown in **Figure 2**. For assessing socio economic impacts, transect walk and consultations were conducted in Gyaspur village. Secondary data and wards maps were collected to understand the population and demographic details of the ward in which the STP is located. Information, data pertaining to issues and concerns due to the STP functioning, Sabarmati River, impact on downstream users and farmers issues was also collected. Consultations carried out in the downstream villages

shall be retained as projects are currently under process and no substantial work has been undertaken with respect to the ongoing STPs.

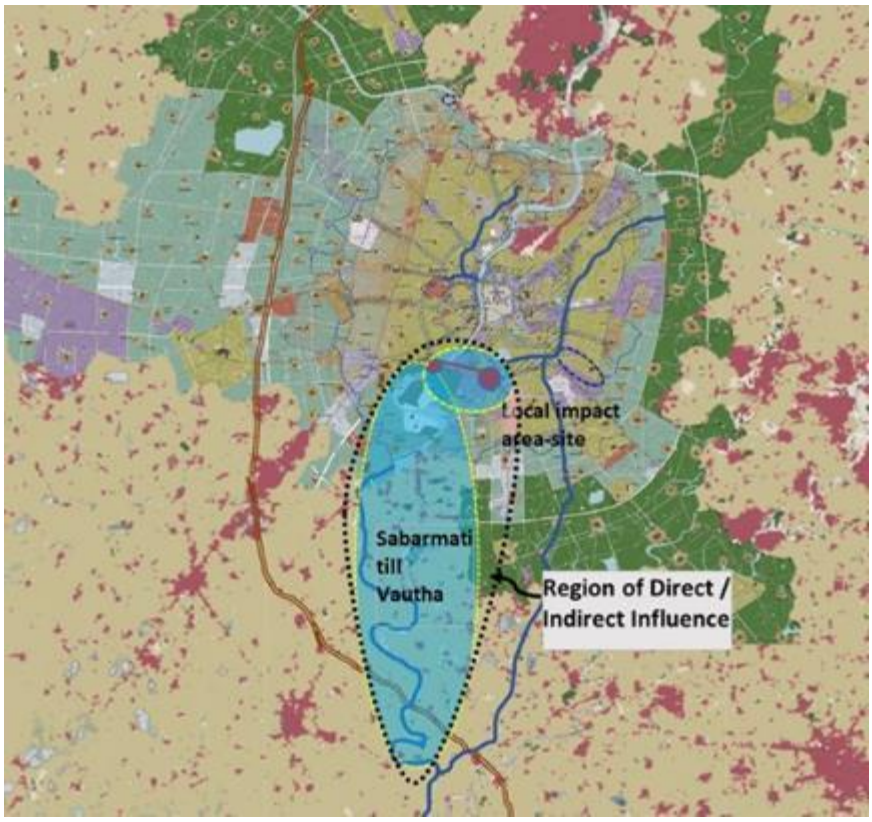


Figure 1 Region of direct & indirect influence

Proposed Monitoring locations for environmental parameters are shown in the following **Figure 2**

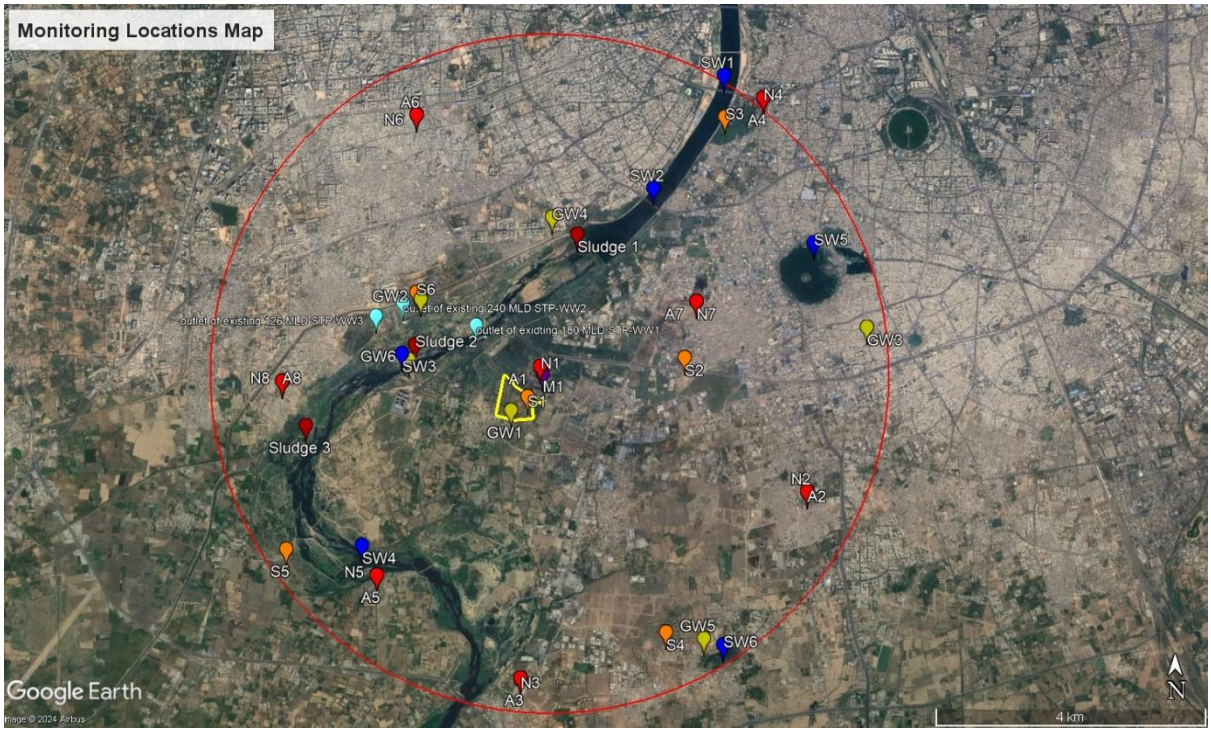


Figure 2 Monitoring Locations for Environmental Parameters

The sampling methodology and procedure for undertaking environmental baseline monitoring is as follows:

Ambient Air Quality Monitoring

The ambient concentrations of PM10, PM2.5, SO_2,NOx, CO, TVOC, HC, Methane, NH_3, H_2S in the ambient air was monitored for the area of influence and baseline data was generated. Analysis of the baseline data was carried out and based on the interpretation mitigation measures are provided.

Noise Levels

Ambient noise levels near habitations was monitored for the period at various locations from area of influence. Sensitive environmental receptors i.e., hospitals, schools, public open spaces were identified for the noise monitoring. Monitoring was carried out for 24 hours to understand the noise levels throughout the day and night as per CPCB guidelines.

Water and Wastewater Quality Monitoring

To identify the critical aspects linked to the water pollution, baseline monitoring for water quality was conducted in upstream and downstream of the river taking discharge location as a reference point. Also, wastewater samples were collected from the outlets of the STPs which are included the monitoring. Methods prescribed in "Standard Methods for Examination of water and Wastewater" prepared and published jointly by American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WPCF).

Monitoring of Groundwater

The groundwater samples (06 locations) were collected from locations of upstream and downstream and analysed for understanding baseline of groundwater characteristics.

Land Environment

Soil samples were collected from the riverbank at upstream and downstream to understand the Physical, Chemical and Biological soil characteristics and sludge contamination.

Sludge and sediments

Sludge samples were collected from the STP site and sediment samples were collected from upstream stream of Sabarmati River after Vasna Barrage, middle stream of Sabarmati, Downstream of Sabarmati River to understand the Physical, Chemical and Biological characteristics and contamination.

Biological Environment

Ecologically important and sensitive locations were identified and surveyed for biodiversity. Total 17 locations were surveyed in and around the project area. Modified line Transect method was used for data collection of flora and fauna. For flora, three quadrats of dimension 10m X 10m each were laid along the line, of the length of a kilometre. In each quadrate, trees, shrubs and herbs were counted. A line transect method was used for fauna with line dimension of 100m Avifauna, mammals, Butterflies, and herpetofauna were counted. Data was recorded digitally on the tabs. GPS co-ordinates of each transect were recorded to prepare the maps. Places where laying line transacts was not possible, inventory of flora and fauna was prepared. All the observations related

to ecology were noted down. Interviews of locals were conducted for information regarding past and present status of land use, resource utilisation and status of flora & fauna, wildlife.

Socio-Economic Environment

Secondary data such as the population estimate data, by Master Planning Consultations, Census 2011, socio-economic profile of the district, district profile, data available on the AMC website related to city, population, city profile and services provided by AMC was collated. Data was also collected from Health Officer of AMC, crime statistics for city, and other data required for the project, etc. Primary data collected through transect walks and consultations were conducted to understand the critical issues related to the project. Socially sensitive stakeholders i.e., STP staff, Contractors of AMC, officials of AMC from concerned department, downstream villagers and industries etc. were consulted during the social impact assessment. Since the upgradation is within the existing premises, no involuntary impacts are envisaged.

Data Analysis

The monitored data is collated, analysed and compared with the baseline levels as established in the EIA study and the regulatory standards specified by different Government agencies. The standards against which the different environment components are compared and are as per the following ***Table 8***.

Table 8: Applicable Standards for Various Environmental Parameters

Sr. No.	Aspects	Applicable Standards
1	Ambient Air Quality	National Ambient Air Quality standards, CPCB
2	Noise Quality	Ambient Air Quality Standards with Respect to Noise, CPCB
3	Surface water Quality	IS:2296: Class 'B', 'C' Water, CPCB
4	Ground water Quality	IS: 10500 Standards, BIS
5	Soil Quality	IS 1498 standards BIS
6	Sludge Quality	Schedule II of Hazardous Waste Management & Handling Rules 2016, Use as a fertiliser & manure as per CPHEEO Manual on Sewerage and Sewage Treatment System, 2013
7	Treated Sewage Water Quality	NGT Standards – Order dated Date of hearing: 30.04.2019 – Discharge into surface water NGT Standards – Order dated Date of hearing: 30.04.2019 – Discharge on land IS 3307(1974)- Discharge for agricultural use

3.2 Project Location

The proposed STP location is in Pirana in an area of around 25Ha, Ward No 53, Lambha, Ahmedabad, city of Gujarat. It lies on the eastern side of the Sabarmati River, adjacent to the 180 MLD STP on the Eastern side. The location map of the STP is presented in **Figure 3** below.

Figure 3: Subproject Location

Neighbouring Landuses of the 424 MLD STP is presented in **Table 9** below

Table 9: Neighboring Land uses of 424 MLD STP, Pirana

Directions	Particulars
North	Sabarmati River and outfall of 180 and 155 MLD STPs
East	Existing 155 and 180 MLD STP
South	Gyaspur Village, AMC's waste to energy plant operated by Goodwatts Ahmedabad pvt. Ltd (under construction), AMC's waste to energy plant operated by Jindal Urban Waste Management (Ahmedabad) Ltd (under construction), AMC' Ahmedabad City Sludge Hygienization Plant, Luthur Group Company Green Gene Enviro Protection & Infrastructure Pvt. Ltd waste processing industries.
West	Sabarmati River, CETP NTIEM

As mentioned in the **Table 9** above, the existing features in North include Sabarmati River and outfall pf existing 180 and 155 MLD STPs, CETP NTIEM on Western side, Existing 155 and 180 MLD STP on Eastern side and Gyaspur Village, AMC's waste to energy plant operated by Goodwatts Ahmedabad pvt. Ltd (under construction), AMC's waste to energy plant operated by Jindal Urban Waste Management (Ahmedabad) Ltd (under construction), AMC' Ahmedabad City Sludge Hygienization Plant, Luthur Group. Area of immediate vicinity and 5 km are considered as area of influence for the purpose of ESIA studies

There are 68 Sewage Pumping Stations and of which 10 are Terminal Sewage Pumping Stations pumping sewage to STPs in Ahmedabad. There are 52 SPS in Eastern Area and 16 are in the Western area.

The Eastern Zone -1 catchment covers approximately 97 sq. km. area of AMC. Catchment includes area between Sabarmati River and Dehgam Road in the North, Narol-Naroda road in the middle and Sardar Patel Ring Road towards the south of the catchment. Eastern Zone 1 has two existing STPs at Pirana of capacity 180 MLD and 155 MLD each. There are 3 under construction STPs viz. Maleskban - 30MLD; Saijpur – 7 MLD and Kotarpur – 60 MLD. the catchment area for 180 MLD and 155 MLD STPs is common. Therefore, these two STPs are considered to be under one campus which is termed as Pirana- I campus.

The TSPS for 180 MLD and 155 MLD are generally termed as Pirana Terminal TSPS and Pirana New TSPS respectively. there are 17 Sub-terminal Sewage Pump Stations which ultimately conveys the sewage of different sub-catchments to twin trunk sewers of 2400x2400 mm of Eastern Zone 1. The TSPS was designed to pump average and peak flows of 180 MLD and 360 MLD to 180 MLD STP.

The size and length of Rising Main from Pirana Terminal TSPS to 180 MLD STP is 2000 mm and 250 meters receptively. This Rising Main is reportedly replaced in year 2020 except the over ground stretch above the wet well of the TSPS.

3.3 Environmental and Social Baseline

Physiography and Climate

3.3.1.1 Topography

The average elevation of Ahmedabad in the west coastal plan is in the range of 40 to 60m above sea level with slope towards the south. The average elevation of the city area is about 50 m AMSL. The terrain is flat for the city except at few undulating topography on mild level. Isolated high grounds, with elevations more than 62 m AMSL, are observed on both sides of river Sabarmati.

The city is situated in a sandy and dry area. There are small hills situated in Thaltej-Jodhpur Tekra and Vastrapur while the rest of the city is almost flat. As seen the Fig 2-1, the terrain goes higher from south to North direction. Sabarmati river enters AMC limits and flows for 14 km through city with the fall of 13 m in ground level along the riverbanks. The falling gradient is 1 in 1100 on eastern part of the city. The ground slopes towards the river at a gradient ranging from 1:1250 to 1:1050. On western side, ground level slopes towards river with a higher graient ranging from1:500 to 1:1000.[14]

The major water body within Ahmedabad city is the Sabarmati River. The oldest irrigation scheme i.e., Kharicut Canal Scheme passes through the eastern part of Ahmedabad city which also serves as one of the Storm water carriers for the city during monsoon. There are many lakes within the AMC boundary namely, Kankaria, Chandola, Vastrapur, etc. which are recharged from the storm water. The slight slope from both east and west towards the south of the city and to the Sabarmati River makes Vasna and Pirana at the south at the river edge, the best suited to receive the sewage for centralized treatment. Hence, Vasna was the preferred location for the first placement of STPs on the west side of the city, while those in the east were located at Pirana.

[14] City Sanitation Plan, Ahmedabad Municipal Corporation, 2012

Figure 4: *Topographic Map, Ahmedabad*[15]

Figure 5: Site Elevation

The above image shows that the highest elevation of the Pirana 424 MLD STP site as 68 m. while the lowest is around 54 m, which is above with the HFL Shastri bridge on the Sabarmati River, which is 42.78 m. As per the Final Report submitted by NIH, the design HFL corresponding to 100 years return period for STP site is 42.78 meters. The existing STP has an average ground level of 42.98 m.

[15] https://en-in.topographic-map.com/maps/g0uy/Ahmedabad/

As per NIH report it was analysed that the top of the structures can be kept 0.3 m above the HFL to avoids impact of flooding of STP units. This has been considered while undertaking the design. NIH Report does not provide sperate HFL level for the TSPS site though the location was shared with them. HFL of TSPS has been hence considered as 42.78 m which is same as HFL of STP site. The average ground level of TSPS site is 43.75 m, which is fairly above the HFL. Extreme rain events will result in higher risks associated with flooding and impact on the water and wastewater infrastructures. AMC has separate storm water and sewage systems.. In some cases there is wastewater mixing in storm water drains and AMC is taking action on the same to segregate as suggested by High Court.. The ground level of the STP has been proposed at 42.30 meters which is above the HFL of 42.78 meters as projected for Shastri bridge on the Sabarmati River. An appropriate cut off drains system has been proposed to quickly drain off the storm runoff at site. this will minimize any impact of the rainfall on the STP operations.

Figure 6: Cross Section of Pirana 424 MLD site and the river

3.3.1.2 Climate

Ahmedabad has a tropical monsoon climate, which is hot and dry, except in the rainy season. Droughts are frequent in north Gujarat, Saurashtra, and Kachchh regions due to poor and erratic rainfall.

On average, the temperatures are always high at Ahmedabad.

June and September receives high precipitation.

Ahmedabad has dry periods in January, February, March, April, May, October, November and December. The warmest month is May with an average maximum temperature of 41°C (105°F). The coldest month is January with an average maximum temperature of 28°C (82°F).[16]

[16] https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,ahmedabad,India

March is the driest month in Ahmedabad.

The average rainfall for Ahmedabad city in year 2020 975 mm and in year 2021 719 mm.[17]

The city has faced major heat wave in 2010 which caused many casualties. A Heat Action Plan (HAP) has been prepared by AMC and the key pillars of this action plan are as follows,

- Building public awareness and community outreach
- Initiating an early warning system and inter agency coordination
- Capacity building among health care professionals
- Reducing heat exposure and promoting adaptive measures such as Ahmedabad Cool Roofs Program.

The HAP provides clear demarcation of responsibilities of various department and agencies during the heatwave's days. It also includes activities and protocol to be followed for different heat alert levels.

Hydrology, Hydrogeology and Soil

3.3.2.1 Hydrology

The River Sabarmati is one of the major west flowing rivers of India and Ahmedabad and Gandhinagar are the major cities that are located on its banks. Sabarmati basin extends over the states of Rajasthan and Gujarat having an area of 21,674 Sq. km with maximum length and width of 300 km and 150 km respectively. While 48 km of the river length is in Rajasthan, 323 km is in Gujarat.

The Sabarmati basin extends over parts of Udaipur, Sirohi, Pali and Dungarpur districts of Rajasthan, Sabarkantha, Kheda, Ahmadabad, Mahesana, Gandhinagar and Banaskantha districts of Gujarat. The terrain of Sabarmati basin is hilly in the early reaches up to Dharoi dam after which the river flows mostly in alluvial plains with gentle slope. There are a total of 50 dams in the Sabarmati basin among which 17 dams fall in Sabarmati lower sub basin and 33 dams,10 weirs, 2 barrages fall in the Sabarmati upper sub basin. At Ahmedabad city of upper Sabarmati basin, the river encompasses a total catchment area of 10,370 sq. km., out of the total basin area of 27,820 sq. km.

Sabarmati enters Ahmedabad city near Karai village and exits the city near Gyaspur after passing through the Ahmedabad city. A barrage has been constructed in 1976, 5 km downstream of Nehru Bridge Ahmedabad (at Vasna) for irrigation purposes and water is supplied to barrage through the Narmada canal since 2002. The length of the barrage and anicut is 610.67 m. After the construction of the Sardar Sarovar Project the water quantity in Sabarmati has reduced. Though the river gets dried up in the summer, leaving only a small stream of water flowing.

The Narmada Canal, which crosses Sabarmati a few kilometres upstream from the city, is part of a larger canal network of Sardar Sarovar Dam. The canal feeds/ siphons water to the Sabarmati River in the city area and maintains the level of water, required by the Sabarmati

[17] Draft Detailed Project Report: Construction of New 424 MLD STP With construction of New 424 MLD Terminal Sewage Pump Station with allied infrastructure at Pirana

Riverfront Project with the help of Vasna barrage. Effluents are released by the industries which is a source of pollution. Details of Vasna barrage are presented in section 3.7.

Another river passing beyond the east and south boundaries of the city is River Khari. The Khari River originates near village Kesharpura of Himatnagar taluka of Sabarkantha district. In the Ahmedabad district, it enters Dahegam taluka and flows near the villages of Chekhala, Babra, Halisa, Vadvasa, and Nandol. Thereafter it enters the Dascroi taluka and passes by Pardhol, Vahelal, Huka, Navrangpura villages. The total length of this river is 160 km, of which 53 km is through Ahmedabad district. The Khari River runs almost parallel to the Sabarmati towards the east, beyond the city limits. It joins Vehari near Kheda, downstream of the city.

Water table near the river is high, as in the case of the present site, which need to be considered while planning STP tanks and other infrastructure and flood effects will be pronounced, as the site is along the edge of the river. River is practically dry during most part of the year as it holds water received from Narmada Canal at the riverfront.

3.3.2.2 Water Impounding Structures: Vasna Barrage

There are many barrages on Sabarmati upstream of Ahmedabad. The nearest one is Vasna Barrage is constructed to divert the water from Sabarmati to the Fatehwadi canal. It holds water from Vasna Barrage (Ch 135.7 km) to Sardar Patel Ring Road Bridge (Ch 156 km). Depths of 0.5 – 1.0 m (above C.D.) are available for all round the year-360 days. Depths of 1.0 – 1.5 m are available for around 75-90 days during monsoon (75 days)

The C.D. at Subhash Bridge is nearly 2.5 m above Riverbed level at Subhash Bridge gauging site. A part of this stretch near Sadar bazaar up to Wasna Barrage had already developed as Sabarmati waterfront by Govt of Gujarat. At upstream of Indira Bridge, released water from Narmada canal ensures all-round the year availability of water in this stretch and downstream. This stretch is feasible for navigation class II waterway.

Afterwards depths of about 5 m are available for 10 km upstream of Vasna barrage near Sabarmati waterfront developed by Govt of Gujarat.

In case of dams, weir and barrages, maximum observed water level of last twenty years or Maximum Water level as mentioned in CWC data has been adopted as (Highest Flood Level) H.F.L.

Chainage	Structure	H.F.L (m)
135.7 km	Vasna Barrage	41.770

3.3.2.3 Water availability

Gauge station is at Subhash Bridge is located at 135.7 km upstream of river mouth. Daily gauge- data for period 1979 to 2010 was collected from WRIS and analysed. Only water level gauge data for period June to October is available. The Ahmadabad city experienced heavy flood in August 2006 when high flood level of 47.45 m MSL was reported at this gauge for highest observed flood discharge.

In Monsoon period depths in the range of 0.5 m to 2m above CD will be available for periods as below.

0.50 m to 1 m and above: 114 days

1.0 m to 1.5 m and above: 75 days

1.5 m to 2.0 m and above: 36 days

The Vasna barrage is connected to other dams and canal network for water releases during monsoon. The release from Dharoi and Vasna is decided based on the flood conditions at each location and responsibility is designated in various documents including Irrigation Dept, various central and state depts concerned with the Irrigation department–- Head/ Canal Command and CWC. DSO, GERI has conducted studies related to dam safety of projects in Gujarat and made critical observations and recommendations for the same which are mentioned in the report. Water releases has also been addressed for dams/barrages etc by Government of Gujarat in its Disaster Management Plan 2021: Flood Warning Arrangements available in the public domain.

Land Use & Land Cover

Gujarat is the fourth most urbanized state in the country. About 42.6% of Gujarat population (25.71 million) lives in urban areas as compared to India's 31.16% (Census 2011). Urbanization refers to the process by which rural areas become urbanized through economic development and industrialization. Demographically, urbanization refers to the redistribution of the population from rural to urban settlements. The following corridors of growth stand out prominently in Gujarat:

- Mehsana-Gandhinagar-Ahmedabad-Vadodara-Bharuch-Surat-Valsad (72% of state's urban population by 2021)
- Ahmedabad-Rajkot-Junagarh (9% of state's urban population by 2021, excluding Ahmedabad)

Urban areas of Gujarat are distinct in landuse with nearly 40% of the urban population of Gujarat resides in the three large cities of Ahmedabad, Surat, and Vadodara.

Ahmedabad district comprises 11 talukas which includes Ahmedabad City, Barwala, Bavla, Daskroi, Detroj-Rampura, Dhandhuka, Dholka, Mandal, Ranpur, Sanand, and Viramgam. The total area of Ahmedabad district is 7,170 sq. km. The urban and peri-urban regions of Ahmedabad are characterized by diverse microenvironments viz. rural areas in the West, densely populated urban conglomerates in the West and Central regions, industrial regions in the Central and East Ahmedabad. Landuse – Land Classification of Ahmedabad district is as presented in the following chart.18

The district of Ahmedabad in total has almost three-fourths of the land under agriculture.

The project includes the following:

Terminal Pump Station (TSPS): New pumping station of 424 MLD capacity with allied facility

- Rising Main from TSPS to STP

[18]Darshana R, *etal*. 2020. LAND USE AND LAND COVER MAPPING – A CASE STUDY OF AHMEDABAD DISTRICT, JO - ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences
Available at: https://www.researchgate.net/publication/343802850_LAND_USE_AND_LAND_COVER_MAPPING_-_A_CASE_STUDY_OF_AHMEDABAD_DISTRICT/citation/download

- Design, Construct and Operate the Sewage Treatment Plant based on SBR technology including all civil, mechanical, electrical and instrumentations works, interconnecting pipe work along with associated buildings, and all infrastructure facilities such as roads, potable water system, internal sewerage network, storm water drainage etc. complete.
- Construction of Outfall for disposal of treated effluent
- Approach Road till STP

  An approach road needs to be constructed to connect the STP land from the service road. Total length of approach road is 1100 m. 350 m of the approach road is already constructed by JWIL which will require resurfacing and whereas balance part of the road connecting the service road is required to be constructed. It is proposed to overlay the 350 m of the existing road.

  The image for the proposed access road repairs and upgradation is presented in **Figure 3.**

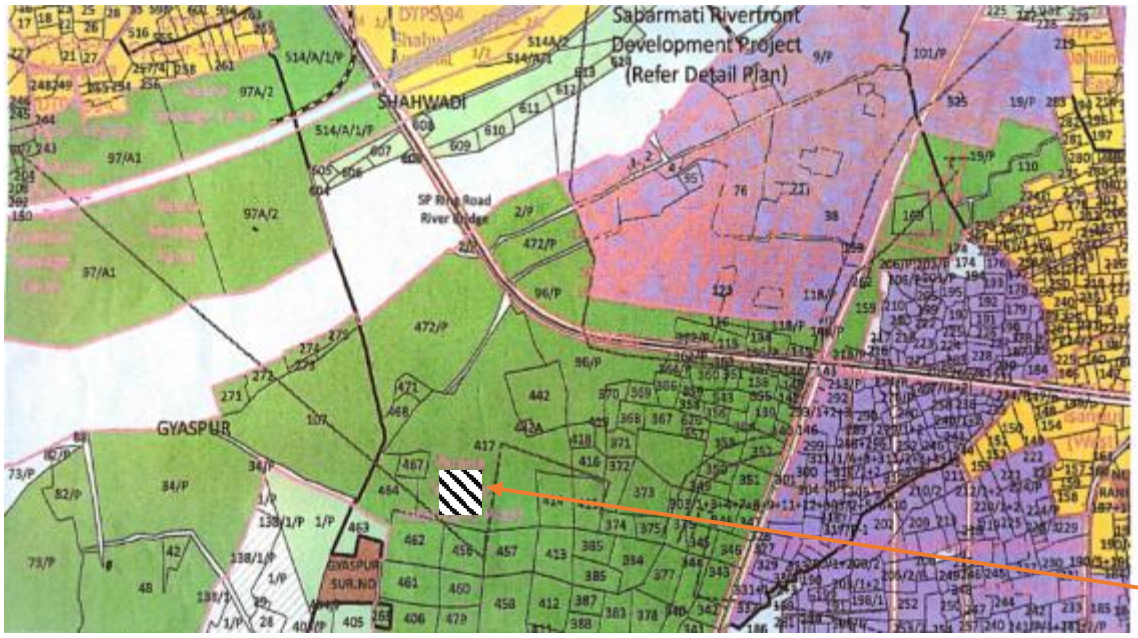


Figure 7: Gyaspur Land use Plan

Cultural Heritage

The walled city of Ahmadabad, founded by Sultan Ahmad Shah in the 15th century, on the eastern bank of the Sabarmati River presents a rich architectural heritage from the sultanate period, notably the Bhadra citadel, the walls and gates of the Fort city and numerous mosques and tombs as well as important Hindu and Jain temples of later periods. The urban fabric is made up of densely packed traditional houses (pols) in gated traditional streets (Puras) with characteristic features such as bird feeders, public wells and religious institutions. The city continued to flourish as the capital of the State of Gujarat for six centuries, up to the present. The historic walled city of Ahmedabad has it all to be the first city in India to be inscribed in UNESCO's World Heritage City list of 2017. However, the 424 MLD STP is to the east of Ahmedabad, outside the walled city. Baseline reconnaissance and monitoring established that here are no cultural heritage areas within 500 m buffer area of this STP. The location of the

subproject does not have any ancient monuments and/ or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 3.4 kms from the STP. Construction activity within existing STP boundary and there are no cultural properties in premises.

There are some locally important religious/ cultural areas like Somnath Mahadev Temple Vishala, Gyaspur which is at 1.7 kms from the site. The temple is accessed through a different route and is not affected by any of the activities proposed to be undertaken for sub project.

Considering the proximity to the Heritage city, chance find procedure shall be framed and implemented for any such discovery for all excavation and construction activities.

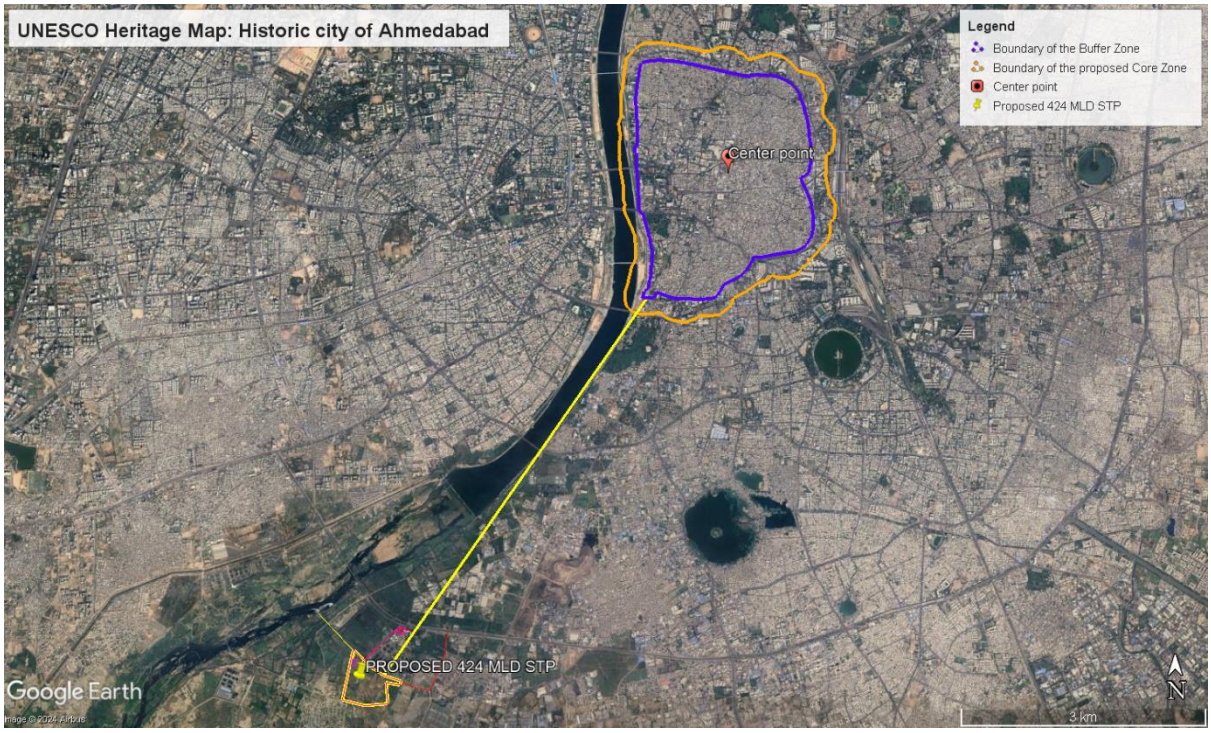


Figure 8: Distance from center point of World Heritage City

Ecology and Biodiversity

Ecology and Biodiversity (E&B) assessment for the site was carried out during September to December 2023. The E&B assessment was done for 10-kilometer area surrounding the proposed STP site. This area is mostly urbanized environment and at fringe some villages are there. Currently, there are two existing Sewage Treatment Plants (STPs) in the New Pirana campus, with capacities of 180 MLD and 155 MLD, respectively. These STPs are operating at or near their rated capacities.

The total incoming sewage flow to the campus exceeds the combined capacity of these existing STPs, which is 335 MLD (180 MLD + 155 MLD). As a result, there is untreated sewage that is currently being bypassed and discharged into the River Sabarmati. Therefore, it is imperative to expand the sewage treatment capacity at the New Pirana campus to ensure that no untreated sewage is discharged from this catchment area.

However due to scanty rainfall, since 2002, this stretch from North of the city is receiving inflow from Narmada Main Canal. However, water is held at Vasna barrage for maintaining the ambience of riverfront. Water flow from barrage to Fatehwadi Canal and the river is minimal. Thus, the river has become a modified habitat also reeling under pollution from nearby industries, wastes and other discharges from the city and surroundings.

The nearest key biodiversity area for this site is Thol Wildlife Sanctuary (man-made) in Mahesana district, which is around 24 km from the project site, with 10km of intervening urban high density mixed land use. As per the Notification of MoEF&CC published dated 09 February 2015, Central Government notifies Thol Wildlife Sanctuary in the State of Gujarat, as Eco sensitive Zone, up to 2.244 kilometres from the boundary of the Thol Wild Life Sanctuary[19]. The lake received water from rains and Narmada Canal. The sanctuary is far-off from the project site to have any impact for air, noise, dust or vibration during construction and operations.

Following are the survey locations considered for undertaking the Ecology & Biodiversity Assessment.

Table 10: Ecology and Biodiversity Survey Locations

Sr. No.	EB Site	Coordinates	Land use
1.	Thol WLS	23° ’'46.0”"N 72°2’'51.1”"E	Wildlife Sanctuary
2.	EB STP	22°5’'53.0”"N 72°3’'31.8”"E	Project Site
3.	EB outfall	22°5’'37.5”"N 72°3’'29.1”"E	Existing project outfall in Sabarmati River. Riverbank
4.	EB Near STP	22°5’'1.4”"N 72°3’'49.7”"E	Between Fatehwadi canal & STP
5.	EB Agri	22°5’'31.0”"N 72°2’'49.2”"E	Agriculture on banks of Sabarmati (Downstream)
6.	EB 2	22°5’'0.0”"N 72°3’'36.4”"E	Sabarmati River Upstream
7.	EB River	22°5’'23.1”"N 72°3’'4.3”"E	Sabarmati River Upstream
8.	EB 3	22°5’'9.2”"N 72°3’'57.9”"E	Sabarmati River Down stream
9.	EB Downstream	22°5’'6.7”"N 72°3’'42.8”"E	Sabarmati River Down stream
10.	EB Canal	22°5’'16.3”"N 72°3’'3.5”"E	Fatehwadi Canal Downstream
11.	EB Agri	22°5’'39.6”"N 72°3’'20.3”"E	Agriculture near outfall of STP
12.	EB Sarkhej	22°5’'39.3”"N 72°3’'14.1”"E	Sarkhej pond

[19] *http://environmentclearance.nic.in/writereaddata/Online/EDS/07_Dec_2016_143943053GC62JOF7MoMreply.pdf*

Sr. No.	EB Site	Coordinates	Land use
13.	EB LJ	22°5’’35.5”"N 72°2’’31.9”"E	Educational institution
14.	EB lake	23° ’’24.5”"N 72°3’’22.0”"E	Malav Lake
15.	EB Nehru Nagar	23° ’’20.5”"N 72°3’’31.6”"E	Urban
16.	EB 1	22°5’’20.0”"N 72°3’’58.4”"E	Pirana STP
17.	EB 14 Downstream	22°5’’58.9”"N 72°3’’14.0”"E	Sabarmati River Down stream

Nearest nationally recognised wetland is Chandola Lake (56.78 ha, human-made, within AMC) at 4.5 km northeast radially from the site, with intervening high density mixed land use comprising other STPs, solid waste dumping yard, power station, residential, commercial, industrial, public/ semi-public and religious landuses to the east of Sabarmati.

Lake shows presence of invasive *Euchornia sp.* which indicates higher sewage inflow into the lake from nearby areas or Kharicut canal.

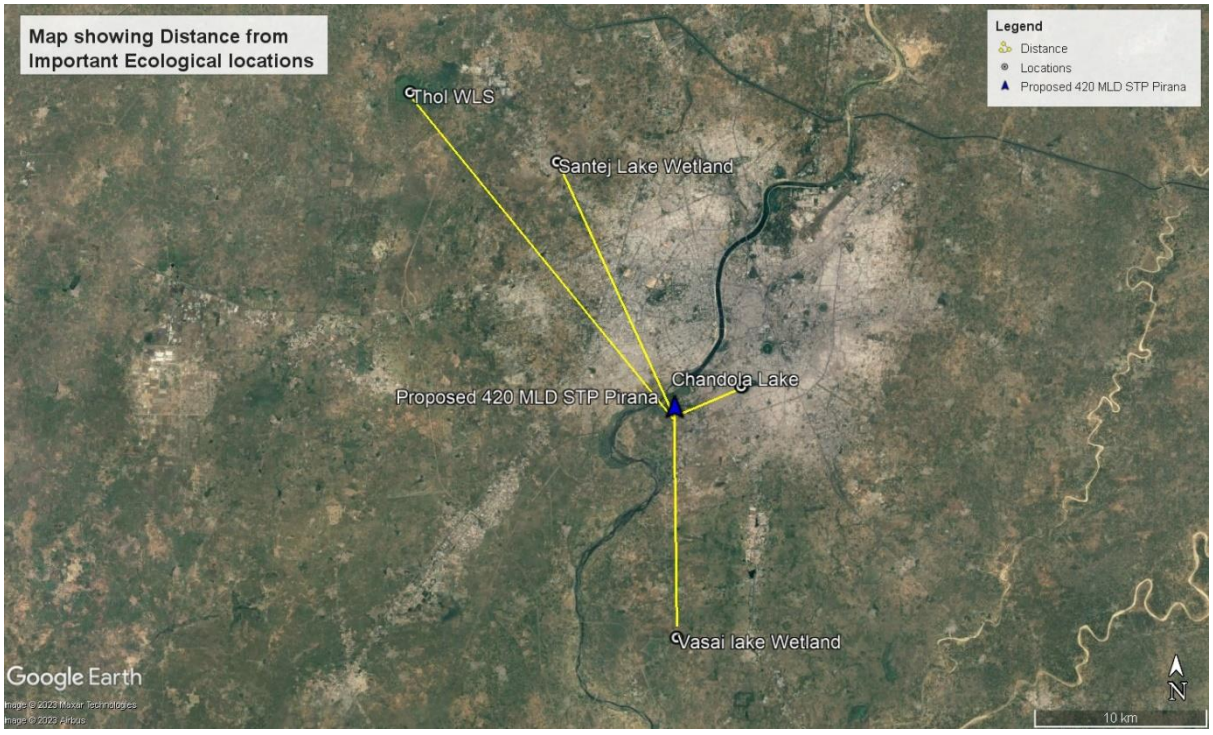


Figure 9: Map Showing distance from important ecological locations with respect to Project Site

It is a large lake in the Ahmedabad city and has great potential to serve as habitat for migratory birds, but the lake edges are encroached, and recreational uses and settlements are developed which has polluted the lake. Chandola lake is not connected to the Sabarmati River but is connected to the Kharicut canal. No direct discharge to any lake from the Pirana STP is envisaged.

Ecological Features of the project site:

The Algaroba (*Prosopis juliflora*), an evergreen shrub and a dominant invasive species, has been widely observed on the newly proposed site along with the widely spread native shrub species Indian abutilon (*Abutilon indicum*). The Neem tree (*Azadirachta indica*) and the Drumstick Tree (*Moringa oleifera*), are also observed on the proposed Sewage Treatment Plant (STP) area. The area around the TSPS and the common inlet point primarily features trees such as Neem (*Azadirachta indica*), Pheasantwood (*Senna siamea*), the Indian Tree of Heaven (*Ailanthus excelsa*) etc. As per the total station survey conducted by DPR consultant there are around 50 trees at the newly proposed 424 MLD STP site and around 38 trees at TSPS Site. In urban areas, the dominant tree species are the Copperpod (*Peltophorum pterocarpum*) and Neem (*Azadirachta indica*). Furthermore, the study area includes common cultivated crop plants, including Wheat, Chillies, Sugarcane, Cotton, and various types of grass for fodder. Some areas also cultivate other food and non-food crops. Lantana camara, an invasive species, has been observed in the study area. No species listed are Rare, Endangered, or Threatened according to the IUCN Red List have been observed in the study area. **ANNEXURE IV**, gives a comprehensive inventory of the botanical species present in the studied area. This includes trees, shrubs, climbers, herbs, and common crop plants, with their scientific names, common names, and their respective plant families.

Fauna

A faunal assessment conducted in the study area has documented the presence of various bird species, including the Asian Green Bee-eater (*Merops orientalis*), Rosy Starling (*Pastor roseus*), Indian Robin (*Copsychus fulicatus*), White-eared Bulbul (*Pycnonotus leucotis*) Red-naped Ibis (*Pseudibis papillosa*), Ashy Prinia (*Prinia socialis*), The Indian Peafowl (*Pavo cristatus*) etc at the the proposed 424 MLD site. The Indian Peafowl is protected under Schedule 1 of the Wildlife Protection Act of 1972.

In the vicinity of the proposed TSPS location, several bird species were sighted, including the Jungle Babbler (*Argya striata*), Common Myna (*Acridotheres tristis*), and Red-vented Bulbul (*Pycnonotus cafer*) etc. Additionally, Bengal Monitor Lizard (*Varanus bengalensis*) was also observed, it is also protected under schedule 1 of the Wildlife Protection Act of 1972.

Along the banks of the Sabarmati River at the proposed outfall location, bird species such as the River Tern (*Sterna aurantia*), Black-headed Ibis (*Threskiornis melanocephalus*), Black-winged Stilt (*Himantopus himantopus*), Little Cormorant (*Microcarbo niger*), Common Sandpiper (*Actitis hypoleucos*) etc were spotted. Having a river crossing the city Ahmedabad generally have a high number of aquatic birds which also include migratory species. Furthermore, the study area was found to be inhabited by butterflies like the Common Crow (*Euploea core*), Common Grass Yellow (*Eurema hecabe*), Danaid Eggfly (*Hypolimnas misippus*) etc. Hanuman Langur (*Semnopithecus entellus*), Indian Grey Mongoose (*Herpestes edwardsii*), Five-striped Palm Squirrel (*Funambulus pennantii*) etc are the among the mammals observed In the study area .area. No sightings endangered fauna were recorded within the site or its 500-meter buffer zone. Additionally, no Rare, Endangered, or Threatened (RET) species were observed in the study area.

The assessment also considered important bird areas (IBAs) and bird migratory routes through India in relation to the proposed project area, including the solar grid-connected rooftop. **Figure *10*** illustrates these important bird areas and migratory routes throughout Asia and

India. Analysis of these routes relative to the proposed project site indicates that it does not fall within any important bird area or within the migratory bird route.

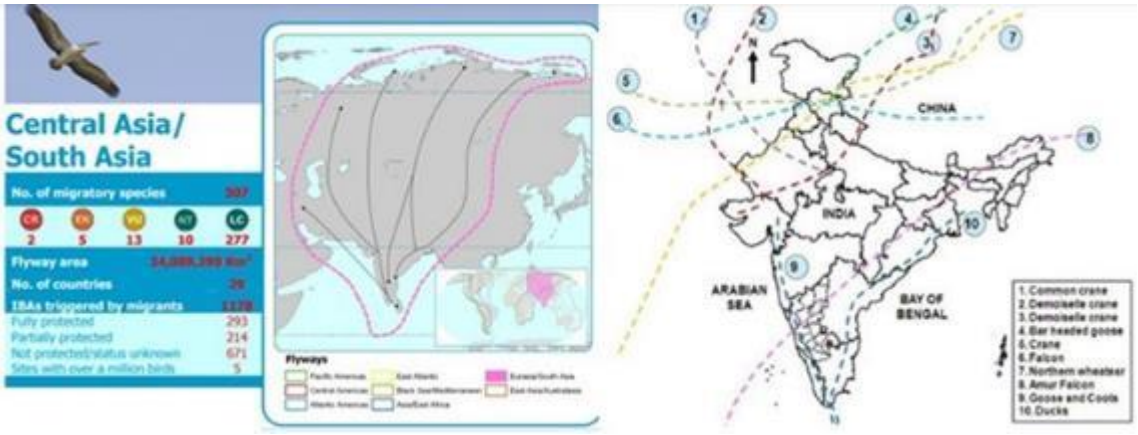


Figure 10: International Flyways and Bird Migratory Routes through India

The mitigation strategy entails assessing options for transplantation of trees within the project area and planting new trees at a ratio of 1:10. These transplanted and newly planted trees will be integrated into the greenbelt that is planned to surround the sewage treatment plant, ultimately contributing to the enhancement of biodiversity in the area. Furthermore, the aquatic biodiversity of the Sabarmati River is expected to improve as a result of the enhanced quality of treated sewage discharged from the STP.

Aquatic Biodiversity

The aquatic biodiversity study was conducted in the Sabarmati River in the stretch of Valad village (upstream of Sabarmati River – beyond inlet from Narmada Canal) to Vanzar village (downstream after Vasna Barrage – Sabarmati River) of approximately 20 Km.

The biodiversity study was based on secondary data and field observations. Following are the findings of this study:

1) It was observed that the entire stretch of Sabarmati is infested with the *Pistia sp.* and *Euchornia crassipes* which has altered the natural habitat.
2) Sabarmati River stretch is a modified habitat as the water is being sourced from Narmada canal and stored at the river front stretch using the shutters of the Vasna Barrage. The riparian zone of the Sabarmati is converted into the riverfront in the Ahmedabad city.
3) Downstream of the river has a riparian zone with tree growth majorly *Prosopis sp*. The entire stretch including downstream of river after Vasna Barrage has presence of plants like *Pistia sp., Euchornia crassipes* (water hyacinth), *Ipomea* sp., *Typha* sp., *Wolffia* sp. (water meal or duckweed) etc. These are clear bioindicators of water pollution or eutrophication. These varieties are also used effectively in phytoremediation, particularly for the rhizofiltration of effluents contaminated by heavy metals.
4) Pisces fauna of the river includes majorly *Tilapia sp., Gambusia sp., Clarius batrachus, Garra gotyala, Catla, Channa sp.* etc. *Tilapia* is an invasive species which was found in

Sabarmati River, Vasna Barrage area and downstream area of Sabarmati River. These are mainly contributed by the inflow from Narmada Canal.

5) Aquatic birds including migratory birds are observed along the Sabarmati and Khari River in areas apart from riverfront area due to no riparian zone.
6) Aquatic flora in the river and downstream provides habitat for aquatic birds like Purple moorhen, Bronze winged jacana, white breasted waterhen, Red Wattled lapwing egrets, herons etc.

It can be concluded that overall aquatic ecology is influenced by invasive species. The poor water quality supports the species like *Pistia, Euchornia, Tilapia* etc, dominant in nature, which does not allow native species to grow and survive.

The proposed project will help in improving the water quality and in turn the diversity in aquatic ecosystem.

Air Quality

Air quality monitoring is also being conducted by GPCB at various locations. Which indicates that PM_{10} & $PM_{2.5}$ exceeds the set standards considerably. GPCB monitoring indicates that the vehicular emission is the major emitting factor in the study area.

Table 11: Air Quality in Ahmedabad City[20]

Sr. No.	City	Location	Parameter(µg/m³)			
			PM_{10}	$Pm_{2.5}$	SO_2	NOx
		National Ambient Air Quality-Standards	**60**	**40**	**50**	**40**
1	Ahmedabad East	Naroda GIDC	156	50	14.6	27.3
2		Naroda S.P.Ring Road, loc Petrol Pump	146	47	14.9	29.8
3		Via Hall, GIDC Vatva	152	48	15.3	29.6
4		Mukesh Industries, Narol	155	50	16.2	31.1
5	Ahmedabad City	Cadila, Narol	166	53	14.7	30.1
6		L.D.Engg. College	142	46	13.4	27.1
7		Shardaben Hospital	154	50	13.9	28.3
8		R.C. Tech. High School	143	46	13.2	28.5
9		Behrampura Referal Hospital	160	51	14.1	29.6
10		Dynowash, Pirana	188	56	15.8	32
11		SolaL.T. Chankyapuri	159	51	14	29.2
12		Rakhiyal Pumping Station	159	51	13.9	29.3
13		Nehru bridge, Ahmedabad	170	54	14.2	31
14	Ahmedabad Rural	Zydas41ujarat41hh-Changodar	134	43	14.9	27.2
15		Satellite	162	52	13.8	28.6

It is seen from the **Table 11** that, the readings of PM_{10} and $PM_{2.5}$ are exceeding in all the places of monitoring, attributed to the vehicular traffic related emissions and dust generation. Since

[20] *GPCB data 2020*

the existing air quality especially PM_{10} and $PM_{2.5}$ are already higher in the neighbourhood, it is important to minimise such impacts from the proposed project activities.

Air quality monitoring and assessment was carried out for the subproject site. The ambient concentrations of PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO and HC in the ambient air was monitored at the locations finalised based on the environmental sensitivity in influence. The samples were collected during December 2023 and the results were compared with National Ambient Air Quality Standards (NAAQ). Following are the locations of the baseline monitoring,

Table 12: Air Quality Baseline Monitoring Locations

Sr. No.	Location Code	Location Name	Coordinates	
			Lat. (N)	Log.(E)
1	A 1	180 MLD Pirana STP	22.973592	72.54898
2	A 2	Shreeji Kaila Vidyalaya police station, Shreenagar Nr.mahadev nagar, Near SBI ATM B/h Narol, Ahmedabad, Gujarat 382405	22.95606	72.586744
3	A 3	Khodal Maa Mandir Ahmedabad, Gujarat 382405	22.93111	72.54511
4	A 4	Behrampura Police Chowky–- Police station Behrampura Char Rasta Narol Road Ahmedabad-1, Calico Mills, Behrampura Ahmedabad, Gujarat 380022	23.008104	72.580679
5	A 5	Juna vanazar primary42ujaral–- Elementary school vas Juna vanazar Sarkhej-Okaf	22.944733	72.524821
6	A 6	Ashapura temple, palkhi society, vibhavari society, 42ujaraj park, ahmedabad,42ujaratt 380051	23.006191	72.531236
7	A7	Opposite to Sagar Paper Products A28 Elaben Estet, Narolgam, Ahmedabad, Gujarat 380024	22.977023	72.570742
8	A8	Near MIM ROW HOUSE–- Apartment complex, Sarkhej-Okaf, Gujarat 380055	22.969703	72.510957

Table 13: Results of Baseline Air Quality Monitoring

Location Code	Parameter Analysis Result										
	PM10 µg/m³	PM2.5 µg/m³	SO_2 µg/m³	NOx µg/m³	CO mg/m³	TVOC µg/m³	HC µg/m³	Methane µg/m³	NH3 µg/m³	H2S µg/m³	Odour
A 1	98	35	22.8	26.7	0.80	42.50	12.5	9.8	15.7	7.5	Pungent Odour
	106	38	20.5	24.7	0.50	31.70	13.9	10.3	14.1	5.3	Pungent Odour
A 2	79	27	15.6	23.4	0.07	BDL	1.5	--	--	--	No Odour
	81	29	17.3	24.2	0.02	BDL	1.2	--	--	--	No Odour
A 3	104	35	21.4	27.8	0.50	4.50	2.7	--	--	--	No Odour
	88	30	24.7	29.5	0.70	3.20	3.8	--	--	--	No Odour
A 4	105	28	25.6	31.6	0.40	7.20	10.8	--	--	--	No Odour
	112	32	28.3	32.4	0.50	5.40	11.7	--	--	--	No Odour
A 5	54	18	13.4	18.5	BDL	BDL	BDL	--	--	--	No Odour
	48	16	11.5	17.5	BDL	BDL	BDL	--	--	--	No Odour
A 6	112	42	22.8	27.3	1.05	6.20	9.7	--	--	--	No Odour
	104	37	24.7	29.1	1.00	4.90	8.4	--	--	--	No Odour
A 7	157	45	18.5	25.3	0.20	3.40	12.3	--	--	--	Light Pungent Odour
	139	42	17.9	24.7	0.40	1.80	11.6	--	--	--	Light Pungent Odour
A 8	105	35	21.3	25.8	0.80	BDL	3.4	--	--	--	No Odour
	98	32	20.6	24.3	0.50	BDL	2.1	--	--	--	No Odour

The baseline monitoring shows that the air quality at the STP site and other locations is within the limits prescribed by CPCB. Though PM 10 is higher at 180 MLD Pirana STP, Khodal Maa Mandir, Behrampura Police Chowky–- Police station, Ashapura temple, Sagar Paper Products, MIM ROW HOUSE–- Apartment complex mostly attributed to the vehicular traffic related emissions (gas emissions from exhaust) and dust generation and continuous urban and industrial emissions use of machinery, and fuel combustion. Pungent odor is recorded at the STP locations indicating the presence of NH_3, Methane and H_2S emissions from the treatment process and related aspects. The odour problem is also due to large dump site and ongoing bio-mining process at the dumpsite.

Air emissions from wastewater treatment operations may include hydrogen sulphide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (e.g., chloroform generated from chlorination activities and other volatile organic compounds (VOCs) from industrial wastewater), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols. The dumping ground is in the vicinity of the proposed area Sagar Paper Products and data is exceeded on air quality and odor. There are also waste processing industries near and adjoining the proposed area. Fugitive VOC emissions are associated with VOC-containing liquids or gases where the material is under pressure, exposed to a lower vapor pressure, or displaced from an enclosed space, tanks.

Water Availability and Quality

3.3.7.1 Surface Water & Sewage

Surface water quality was assessed for the upstream, downstream and outfall from the STP into the river. Sampling was conducted during December 2023.

Table 14: Surface Water Quality Monitoring Results

Sr. No.	Parameters	Unit	Sampling Point Location						Indian Standards 2296	
			Sabarmati River				Chandola Lake	Lambha lake	Class B	Class C
			Upstream-(Sardar Bridge)	Upstream	River Down Stream	Down Stream				
			SW-1	SW-2	SW-3	SW-4	SW-5	SW-6		
1	pH @ 25 ° C	--	7.91	7.9	7.92	7.94	7.52	8.37	6.5 to 8.5	
2	Colour	Pt. Co. Scale	10	15	10	20	20	20	300	
3	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	-	-
4	Temperature	^{0}C	28.5	28.5	29.5	29.5	29.8	29.5	-	-
5	Turbidity	NTU	0.1	0.1	0.1	0.1	10	0.1	-	-
6	Dissolved Oxygen	mg/L	6	6.6	5.9	5.5	1.7	3.9	5	4
7	Total Dissolved Solids	mg/L	625	668	820	780	514	740	-	1500
8	Total Suspended Solids	mg/L	88	83	97	100	54	BDL(MDL:4.0)	-	-
9	Chemical Oxygen Demand (COD)	mg/L	101	120	136.8	132	109.1	52.6	-	-
10	BOD (3 days at 27^{0}C)	mg/L	30	35	40	42	14	6	3	
11	Oil & Grease	mg/L	BDL(MDL:5.0)						-	-
12	Total Hardness as $CaCO_3$	mg/L	101	101	104.9	103	99	277.2	-	-
13	Calcium as Ca	mg/L	30.2	31	30.2	31	27.8	59.5	-	-
14	Magnesium as Mg	mg/L	6.3	5.8	7.2	6.3	7.2	31.3	-	-
15	Total Alkalinity	mg/L	135.7	145.7	140.7	140.7	170.9	341.7	-	-
16	Chloride as Cl^-	mg/L	8.6	8.6	8.6	9.5	102	386.2	-	600
17	Sulphate as SO_4^{-2}	mg/L	11.8	9.8	11.7	12	66.5	65	-	400

Sr. No.	Parameters	Unit	Sampling Point Location						Indian Standards 2296	
			Sabarmati River				Chandola Lake	Lambha lake	Class B	Class C
			Upstream-(Sardar Bridge)	Upstream	River Down Stream	Down Stream				
			SW-1	SW-2	SW-3	SW-4	SW-5	SW-6		
18	Nitrate as NO_3	mg/L	1.4	1.3	1.4	1.3	BDL(MDL:0.1)	0.2	-	50
19	Residual Free Chlorine	mg/L	BDL(MDL:0.1)						-	-
20	Fluoride as F	mg/L	0.24	0.46	0.25	0.43	BDL (MDL:0.20)	0.75	1.5	
21	Phenolic Compound	mg/L	BDL(MDL:0.001)						0.005	
22	Sodium as Na	mg/L	24.6	27.5	24.4	27.5	125.8	332.7	-	-
23	Potassium as K	mg/L	3.7	4	2.8	2.8	4.4	6.9	-	-
24	Ammonical Nitrogen	mg/L	BDL(MDL:2.0)						-	-
25	Total Kjeldahal Nitrogen (TKN)	mg/L	BDL(MDL:2.0)						-	-
26	Total Nitrogen	mg/L	4.1	5.2	4.7	5.4	4.5	4.9	-	-
27	Ammonia	mg/L	BDL(MDL:0.2)						-	-
28	Salinity	ppt	0.015	0.015	0.015	0.017	0.18	0.7	-	-
29	Total Phosphorous as P	mg/L	0.15	0.18	0.16	0.18	1	0.2	-	-
30	Copper as Cu	mg/L	BDL(MDL:0.05)						-	1.5
31	Manganese as Mn	mg/L	BDL(MDL:0.1)						-	-
32	Iron (as Fe)	mg/L	0.212	0.257	0.251	0.26	1.131	0.277	-	50
33	Zinc as Zn	mg/L	BDL(MDL:0.05)						-	15
34	Mercury as Hg	mg/L	BDL(MDL:0.001)						-	-
35	Cadmium as Cd	mg/L	BDL(MDL:0.003)						-	0.01
36	Arsenic as As	mg/L	BDL(MDL:0.01)						0.2	
37	Cyanide as CN	mg/L	BDL(MDL:0.05)						0.5	

Sr. No.	Parameters	Unit	Sampling Point Location						Indian Standards 2296	
			Sabarmati River				Chandola Lake	Lambha lake	Class B	Class C
			Upstream-(Sardar Bridge)	Upstream	River Down Stream	Down Stream				
			SW-1	SW-2	SW-3	SW-4	SW-5	SW-6		
38	Lead as Pb	mg/L	BDL(MDL:0.01)						-	0.1
39	Nickel as Ni	mg/L	BDL(MDL:0.02)				0.309	BDL (MDL:0.02)	-	-
40	Chromium (Total) as Cr	mg/L	BDL(MDL:0.05)					BDL(MDL:0.05)	0.5	
41	Cobalt as Co	mg/L	BDL(MDL:0.5)					0.116	-	-
42	Hexavalent Chromium as Cr^{+6}	mg/L	BDL(MDL:0.05)						-	-
43	Total Coliform	CFU/100 ml	80	66	72	80	12	50	500	5000
44	Faecal Coliform	CFU/100 ml	70	60	70	80	10	44	-	-

The surface water baseline monitoring data is compared to IS 2296 – Class “B” & “C” standard value for Sabarmati River and lakes as mentioned in table. The baseline monitoring data indicates that all the parameters are within the limit as per IS 2296. It is observed that for Chandola Lake the COD level is on slightly higher side and DO level is lower which indicates the pollution in the lake. The parameters such as chloride, total dissolved solids, COD is near to permissible levels of Class C type water as per IS 2296. This indicates industrial wastewater pollution near the water body. Also, presence of faecal coliform indicates mixing of untreated sewage in Sabarmati River. It is estimated that the improvement under GRCP will help enhance the water quality of the Sabarmati River.

Table 15 *: Wastewater Quality Monitoring Results*

Sr. No.	Parameters	Unit	Sampling Point Location- Outlet of Existing STPs			Effluent Discharge Standards	
			180 MLD	240 MLD	126 MLD		
			WW-1	WW-2	WW-3	NGT	CPCB discharge
1	pH @ 25 ° C	--	7.65	7.58	7.53	5.5-9.0	5.5 to 9.0
2	Colour	Pt. Co. Scale	BDL (MDL:5.0)		10	-	Removal of colour & unpleasant odour as far as practicable
3	Odour	--	Agreeable	Agreeable	Agreeable	-	
4	Temperature	^{0}C	29.8	30	30	-	Not exceeding 5^{o}C above the receiving water temp.
5	Turbidity	NTU	BDL(MDL:0.1)		1	-	-
6	Total Dissolved Solids	mg/L	900	860	648	-	-
7	Total Suspended Solids	mg/L	38	41	36	20	100
8	Dissolved Oxygen	mg/L	1.9	1.7	1.6	-	-
9	Chemical Oxygen Demand (COD)	mg/L	171.2	164.1	88.9	50	250
10	Biochemical Oxygen Demand (BOD) (3 days at 27 ^{0}C)	mg/L	50	40	42	10	30
11	Oil & Grease	mg/L	BDL (MDL:2.0)			-	10
12	Total Hardness as $CaCO_3$	mg/L	202	205.9	128.7	-	-
12	Calcium as Ca	mg/L	50.8	52.4	39.7	-	-
13	Magnesium as Mg	mg/L	18.3	18.3	7.2	-	-
14	Total Alkalinity	mg/L	251.3	261.3	407	-	-
15	Chloride as Cl^-	mg/L	323	332.5	142.5	-	-
16	Sulphate as SO_4^{-2}	mg/L	86.6	91	48.4	-	-
17	Nitrate as NO_3	mg/L	3	3.2	0.7	-	10
18	Residual Free Chlorine	mg/L	BDL(MDL:0.1)			-	-
19	Fluoride as F	mg/L	0.59	0.62	0.28	-	2
20	Phenolic Compound	mg/L	BDL(MDL:0.1)			-	1
21	Sodium as Na	mg/L	256.2	244.8	188.5	-	-

Sr. No.	Parameters	Unit	Sampling Point Location- Outlet of Existing STPs			Effluent Discharge Standards	
			180 MLD	240 MLD	126 MLD		
			WW-1	WW-2	WW-3	NGT	CPCB discharge
22	Potassium as K	mg/L	16.4	15.7	12.2	-	-
24	Ammonical Nitrogen	mg/L	BDL(MDL:2.0)			-	50
25	Total Kjeldahal Nitrogen (TKN)	mg/L	3.2	3.6	3.6	-	100
26	Total Nitrogen	mg/L	4.1	4.7	4.1	10	-
27	Ammonia	mg/L	BDL(MDL:0.2)			-	5.0
28	Salinity	ppt	0.58	0.6	0.26	-	-
29	Total Phosphorous as P	mg/L	2.1	1.8	1	1.0	-
30	Copper as Cu	mg/L	BDL(MDL:0.05)			-	3
31	Manganese as Mn	mg/L	BDL(MDL:0.1)			-	2
32	Iron (as Fe)	mg/L	0.343	0.316	0.451	-	3
33	Zinc as Zn	mg/L	BDL(MDL:0.05)			-	5
34	Mercury as Hg	mg/L	BDL(MDL:0.001)			-	0.01
35	Cadmium as Cd	mg/L	BDL(MDL:0.003)			-	2.0
36	Arsenic as As	mg/L	BDL(MDL:0.01)			-	0.2
37	Cyanide as CN	mg/L	BDL(MDL:0.05)			-	0.2
38	Lead as Pb	mg/L	BDL(MDL:0.01)			-	0.1
39	Nickel as Ni	mg/L	BDL(MDL:0.02)			-	3.0
40	Chromium (Total) as Cr	mg/L	BDL(MDL:0.05)			-	2.0
41	Cobalt as Co	mg/L	BDL(MDL:0.5)			-	-
42	Hexavalent Chromium (Cr+6)	mg/L	BDL(MDL:0.05)			-	0.1
Microbiology							
43	Total Coliform	CFU/100 ml	80	80	80	-	-
44	Faecal Coliform	CFU/100 ml	80	80	80	Desirable–- 100 Permissible -230	-

The baseline data shows that discharge of treated effluent at the outlet of STP 180 MLD, 240 MLD and 126 are within the prescribed discharge limits as per CPCB guidelines standards except BOD, But they are not meeting NGT standards for BOD, COD, TSS & Phosphorous. As per DPR, the different season data for outlet of 180 MLD STP shows higher value of BOD, COD and TDS as compared to CPCB standard and NGT norms. Also, it shows the poor performance of BNR removal. The new better treatment plant is needed for city to meet the NGT standards and Cater future load of city.

Table 16: Ground Water Quality Monitoring Results[21]

Sr. No.	Parameters	Unit	Sampling Point Location						IS: 10500
			Near Pirana STP 424 MLD	Near Vasna STP	Near Nandanvan Party Plot Farm	Near Vasna Municipal Garden	Near Lambha Lake	Near Riverfront Area	
			GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	
1	pH @ 25 ° C	--	7.54	8.25	7.9	8.01	7.72	8.35	6.5 to 8.5
2	Colour	Pt. Co. Scale	BDL(MDL:5.0)						5
3	Odour	--	Agreeable						Unobjectionable
4	Temperature	^{0}C	29.9	29.5	30	30	29.8	29.7	-
5	Turbidity	NTU	0.1	BDL(MDL:0.1)	BDL(MDL:0.1)	0.1	0.1	BDL(MDL:0.1)	5
6	Total Dissolved Solids	mg/L	2384	1268	974	772	2536	692	500
7	Total Suspended Solids	mg/L	BDL(MDL:4.0)						-
8	COD	mg/L	BDL(MDL:2.0)	12.1	16.2	BDL(MDL:2.0)	20.2	BDL(MDL:2.0)	Nil
9	BOD 3 days at 27 ^{0}C	mg/L	BDL(MDL:1.0)	2	2	BDL(MDL:1.0)	3	BDL(MDL:1.0)	Nil
10	Oil & Grease	mg/L	BDL(MDL:5.0)						-
11	Total Hardness as $CaCO_3$	mg/L	435.6	168.3	168.3	99	544.5	67.3	300
12	Calcium as Ca	mg/L	71.4	55.6	47.6	31.7	99.2	15.1	75

[21] Standards recommended by Central Ground Water Board were used for the assessment. http://www.cgwbchd.nic.in/qulstd.htm

Sr. No.	Parameters	Unit	Sampling Point Location						IS: 10500
			Near Pirana STP 424 MLD	Near Vasna STP	Near Nandanvan Party Plot Farm	Near Vasna Municipal Garden	Near Lambha Lake	Near Riverfront Area	
			GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	
13	Magnesium as Mg	mg/L	62.5	7.2	12	4.8	72.2	7.2	0.1
14	Total Alkalinity	mg/L	728.6	376.9	497.5	122.1	381.9	341.7	200
15	Chloride as Cl^-	mg/L	567.7	323.5	85.5	193.8	826.1	76	250
16	Sulphate as SO_4^{-2}	mg/L	261	100.1	78	125.4	607.5	42.2	200
17	Nitrate as NO_3	mg/L	12.5	3.4	8.7	8.9	9.8	4.6	45
18	Residual Free Chlorine	mg/L	BDL(MDL:0.1)						0.2
19	Fluoride as F	mg/L	1.12	0.89	1.01	0.65	0.38	1.32	1
20	Phenolic Compound	mg/L	BDL(MDL:0.001)						0.001
21	Sodium as Na	mg/L	658.7	380.8	230.8	220.9	709.5	189	-
22	Potassium as K	mg/L	11.6	3.4	1.4	1.8	3.6	1.6	-
23	Dissolved Oxygen	mg/L	6.1	7	6.9	6.8	6.9	6.8	-
24	Ammonical Nitrogen	mg/L	BDL(MDL:2.0)						-
25	Total Kjeldahal N (TKN)	mg/L	BDL(MDL:2.0)						-
26	Total Nitrogen	mg/L	BDL(MDL:2.0)						-
27	Ammonia	mg/L	BDL(MDL:0.2)						-
28	Salinity	ppt	1.03	0.6	0.15	0.35	1.49	0.14	-
29	Total Phosphorous as P	mg/L	1.7	0.19	0.11	0.12	1.9	0.1	-
30	Copper as Cu	mg/L	BDL(MDL:0.05)						0.05
31	Manganese as Mn	mg/L	BDL(MDL:0.1)						0.1
32	Iron (as Fe)	mg/L	0.382	0.306	0.113	0.325	0.362	0.327	0.3
33	Zinc as Zn	mg/L	BDL(MDL:0.05)						5
34	Mercury as Hg	mg/L	BDL(MDL:0.001)						0.001
35	Cadmium as Cd	mg/L	BDL(MDL:0.003)						0.01
36	Arsenic as As	mg/L	BDL(MDL:0.01)						0.05
37	Cyanide as CN	mg/L	BDL(MDL:0.05)						0.05

Sr. No.	Parameters	Unit	Sampling Point Location						IS: 10500
			Near Pirana STP 424 MLD	Near Vasna STP	Near Nandanvan Party Plot Farm	Near Vasna Municipal Garden	Near Lambha Lake	Near Riverfront Area	
			GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	
38	Lead as Pb	mg/L	BDL(MDL:0.01)						0.05
39	Nickel as Ni	mg/L	BDL(MDL:0.02)						-
40	Chromium (Total) as Cr	mg/L	BDL(MDL:0.05)						0.05
41	Cobalt as Co	mg/L	BDL(MDL:0.5)						-
42	Hexavalent Chromium as Cr+6	mg/L	BDL(MDL:0.05)						-
	Microbiology								
43	Total Coliform	CFU/100 ml	10	80	12	4	10	25	0
44	Fecal Coliform	CFU/100 ml	5	80	Absent	Absent	Absent	20	0

3.3.7.2 Ground Water

The district forms a part of the Cambay Basin and drain into the Gulf of Cambay or Khambat. The depth to ground water level (DTWL) during the pre-monsoon period (May 2019) ranged from 2.25 to 27.55 mbgl. The range of ground water level in the district is given as below.

Table 17: Ground Water Level pre-monsoon 2019 [22]

No of well analysed	DTWL mbg		No of well in different Depth Ranges (m)					
	Min	Max	0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	>40
21	2.25	27.55	0.00%	38.00%	24.00%	29.00%	10.0%	0.00%

Groundwater samples were collected during December 2023 and quality was assessed following CPCB water quality Guidelines 2017. The sampling results are presented in **Error! Reference source not found.**7.

The baseline monitoring data shows that TDS, Total alkalinity, Total Hardness, Chloride, sulphates, calcium and magnesium, chloride, sulphate, total alkalinity are exceeding the prescribed limits as per IS 10500 standard values for near Pirana STP site, as the location is in vicinity of industrial area and dumping ground which contributes to the ground water pollution for the location. The faecal coliform is present near Pirana STP, near Vasna STP, near lambha lake and near riverfront area indicates the industrial and sewage intrusion in the ground water.

Soil Quality

Soil quality sampling was conducted during December 2023. Following are the locations of the sampling,

Table 18: Results of Soil Analysis

Sr. No.	Parameters	Unit	Sampling Point Location					
			Proposed STP Site	Infront of Aarvee Denims	Env. Sensitive Location Within 05 km	Near Lambha	Near Vanzar	240 MLD STP
			S-1	S-2	S-3	S-4	S-5	S-6
1	pH	--	8.9	8.23	8.95	8.74	8.37	8.94
2	Electrical Conductivity	µs/cm	179.3	243.1	425	342	178.5	159.6
3	Bulk Density	gm/cc^3	1.3704	1.2672	1.3159	1.3728	1.3811	1.3784
4	Arsenic	mg/kg	BDL (MDL: 0.05)					
5	Copper as Cu	mg/kg	21.1	16.7	55.5	18.1	9.6	22.7
6	Lead as Pb	mg/kg	4.2	6.85	20.2	7.4	4.32	2.9
7	Nickel as Ni	mg/kg	29	28.4	32	36.8	29.4	26.7
8	Iron as Fe	mg/kg	6692.1	6525.2	8477.7	7656.9	7133.6	5537
9	Zinc as Zn	mg/kg	40.4	663	85.5	35.2	25.4	52.4
10	Manganese as Mn	mg/kg	143.1	169.3	197.2	248.6	129.4	60.3
11	Phosphorous as P	mg/kg	798.7	1113.7	1396.1	998.7	796.2	799.6
12	Porosity	%	47	44	35	41.6	41.5	40.8
13	Cation Exchange Capacity	meq/100g	26.7	26.8	27.1	27.4	27.4	27.5

[22] *DIST-WISE FRQ TEALE OF MAY2019 for website.xlsx (cgwb.gov.in)*

Sr. No.	Parameters	Unit	Sampling Point Location					
			Proposed STP Site	Infront of Aarvee Denims	Env. Sensitive Location Within 05 km	Near Lambha	Near Vanzar	240 MLD STP
			S-1	S-2	S-3	S-4	S-5	S-6
14	Water Holding Capacity	ml/ 100 gm	40	45	44	48	40	44
15	Texture Class	--	Clay Loam					
16	Water Soluble Sodium	mg/kg	188	678.8	888.1	966.6	253.1	337.5
17	Water Soluble Potassium	mg/kg	96	147.7	195.2	138.4	97.4	52.8
18	Magnesium	meq/ 100gm	29.4	137.8	194.5	126.9	87.6	87.7
19	Available Nitrogen	mg/kg	109	123.5	103.9	196.6	114.6	94.6
20	Sodium Absorption Ratio (SAR)	--	2.3	6.6	7.2	12.1	3.4	4.9
21	Permeability	Cm/Sec	0.176	0.178	0.168	0.174	0.178	0.180
22	Salinity	ppt	0.24	1.2	1.8	2.0	0.24	0.17
23	Particle Size Distribution							
	Silt	%	19.8	18.9	20.4	15.2	9.1	14.6
	Clay	%	66.1	64.4	62.0	69.0	80.1	70.4
	Sand	%	14.1	16.7	17.6	15.8	10.8	15

The soil of project site and vicinity is of alluvial in nature and disturbed. In general, the soil pH is varying from 8.23 to 8.94 which is in alkaline in nature. Higher pH at certain places can be attributed to low detritus and organic material. The soil quality is typical of urban environment for disturbed soil.

Soil of the area is mostly disturbed due to large scale construction and urban activities. The heavy metals concentration was low in the project site area.

Sludge & Sediment

The sludge were collected from the STP & Sediment samples were collected from down, middle and upstream of the Sabarmati River.

Table 19 Sludge Quality

Sr. No.	Parameters	Test Method	Unit	Sampling Locations			
				Pirana STP 180 MLD Sludge	Upstream Stream of Sabarmati River After Vasna Barrage	Middle Stream of Sabarmati	Downstream of Sabarmati River
				Sludge 1 -	Sediment -1	Sediment -2	Sediment - 3
1	pH	EPA 9045 C, SW-846 Method :2004	-	6.95	8.62	8.30	8.10
2	Moisture Content	Lab SOP No. UERL/CHM/SOP/135	%	36.44	13.4	8.95	9.11
3	Calorific Value (Dry Basis)	IS: 1350 (Part 2):2022	kcal/kg	254.4	BDL (MDL: 200.0)	BDL (MDL: 200.0)	BDL (MDL: 200.0)
4	Electrical Conductivity	EPA 9050A SW 846:2004	mS/cm	1510	268	332	464
5	Arsenic	EPA 7061B SW-846 Method: 1994	mg/kg	BDL(MDL:0.05)	BDL (MDL: 0.05)	BDL (MDL: 0.05)	BDL (MDL: 0.05)
6	Mercury	EPA 7471A SW-846 Method: 2007	mg/kg	BDL(MDL:0.05)	BDL (MDL: 0.05)	BDL (MDL: 0.05)	BDL (MDL: 0.05)
7	Hexavalent Chromium	EPA 7196A SW-846 Method: 1992	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
8	Oil & Grease	EPA 9071B SW 846 Method: 2004	mg/kg	8	BDL(MDL:5.0)	BDL(MDL:5.0)	BDL(MDL:5.0)
9	Cyanide as CN	EPA 9010 & 9213, SW-846 Method: 1996	mg/kg	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
10	Cadmium as Cd	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
11	Lead as Pb	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)

Sr. No.	Parameters	Test Method	Unit	Sampling Locations			
				Pirana STP 180 MLD Sludge	Upstream Stream of Sabarmati River After Vasna Barrage	Middle Stream of Sabarmati	Downstream of Sabarmati River
				Sludge 1 -	Sediment -1	Sediment -2	Sediment - 3
12	Nickel as Ni	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
13	Copper as Cu	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
14	Zinc as Zn	EPA 1311/7000B SW-846 Method:2007	mg/L	212.5	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
15	Iron as Fe	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
16	Total Chromium as Cr	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
17	Manganese as Mn	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
18	Cobalt as Co	EPA 1311/7000B SW-846 Method:2007	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
19	Water Holding Capacity	Lab SOP No. UERL/CHM/SOP/150	ml/100 gm	52	64	72	70
20	Phosphorous as P	IS: 10158 :1982	mg/kg	5890	590.7	512.4	442.5
21	Colour	--	--	Black	Brown	Black	Brown
22	Texture	--	--	Solid	Solid	Solid	Solid
23	Total Kjeldahl Nitrogen	Distillation Method	mg/kg	712.6	84.2	62	58.6

Sr. No.	Parameters	Test Method	Unit	Sampling Locations			
				Pirana STP 180 MLD Sludge	Upstream Stream of Sabarmati River After Vasna Barrage	Middle Stream of Sabarmati	Downstream of Sabarmati River
				Sludge 1 -	Sediment -1	Sediment -2	Sediment - 3
24	Volatile Solids	Gravimetric Method	%	20.47	1.6	1.21	1.17
25	Bulk Density	Lab SOP No. UERL/CHM/SOP/149	gm/cc3	0.982	1.0262	0.9875	0.9684
26	Phenol	Spectrophotometer Method	mg/kg	N.D.	N.D.	N.D.	N.D.
27	Total Organic Carbon	--	mg/kg	20.6	22.4	28.06	25.63
28	Odour	--	--	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable

The pH of all the sediment defines alkaline nature. Nitrogen and Phosphorous contents of the Sludge are high.

Ambient Noise

Noise monitoring activity had undertaken during Decmber 2023.

Table 20: Sampling locations of noise levels

Sr. No.	Location Name	Location Code	Day Time: (6 am to 9 pm)	Night Time: (10 pm to 5 am)
1	At 180 MLD Pirana STP	N1	65.5	57.1
2	Shreeji Kaila Vidyalaya police station, Shreenagar Nr.mahadev nagar Nr sbi atm B/h Narol, Ahmedabad, Gujarat 382405	N2	58.9	45.8
3	Khodal Maa Mandir, Ahmedabad, Gujarat 382405	N3	64.6	51.0
4	Behrampura Police Chowky - Police station Behrampura Char Rasta Narol Road Ahmedabad-1, Calico Mills, Behrampura Ahmedabad, Gujarat 380022	N4	64.5	47.5
5	Juna vanazar primary schhol - Elementary school vas Juna vanazar Sarkhej-Okaf	N5	52.4	42.5
6	Ashapura Temple 2G4J+85V, Palkhi Society, Vibhavari Society, Jivraj Park, Ahmedabad, Gujarat 380051	N6	67.8	49.9
7	Sagar Paper Products, A28 Elaben Estet, Narolgam, Ahmedabad, Gujarat 380024	N7	57.8	46.3
8	MIM ROW HOUSE - Apartment complex, XGC6+MG5, Sarkhej-Okaf, Gujarat 380055	N8	58.5	46.4

Primary data provided above shows that During night-time the noise levels in the residential area within 05 km (against the Wind direction) of Pirana STP site is exceeding limits of 45 dB. This may be due the closeness to the highway and ongoing construction works. The rest of the noise levels as per the National Ambient Noise levels are well within the limits set as per regulations for Industrial, commercial and residential areas in Ahmedabad.

Secondary data[23] from 10 - 23 May 2018 at 24 locations shows that the average noise level always exceeded the guidelines of World Health Organization (WHO) for the daytime noise (75 dB(A) for Industrial area, 65 dB(A) for Commercial area, 55 dB(A) for Residential area and 50 dB(A) for Silence zones). For a major portion of the traffic corridor (79.6%), even the minimum noise level was above the permissible average noise level, which is a matter of concern, but as expected in a crowded Indian city. The highest noise level observed was 86.0 dB (A). Traffic corridors near the central business district namely, Akhbarnagar followed by Naranpura were found the nosiest.

[23] *Current World Environment Vol. 16, No. (1) 2021, Pg. 198-209, Monitoring and Assessing the Environmental Noise along a Busy Traffic Corridor of Ahmedabad City, India*

There are settlements near the STP, the nearest being Gyaspur, there are solid waste related industries near the proposed land. Noise levels at the location are within limit. It is expected that due to proposed STP, there will be a temporary localised increase in the local noise levels during construction phase.

As the STPs have a separate entry/ exit it will not affect movement of any local vehicles.

The movement of vehicles carrying personnel and raw material for this sub-project will increase traffic movement and may cause conflicts. For the proposed project major concerns related to traffic are 1. Uneven roads, 2. non-marking of roads, 3. Movement of heavy vehicles on the road as the area has many industries processing solid waste 4. Some amount of light vehicle and two wheelers from village areas or for workers movement in the road 5. Absence of signages. Improvement of road infrastructure and providing signages will be necessary. During construction, the project planning should be made in such a way that minimal bypass or diversion is required and traffic management plan is implemented to avoid traffic congestion and accidents and incidents.

Apart from above measures, AMC (through PMC) should depute their own supervisory team to coordinate with residential and commercial groups for educating the masses about diversions, road blockages and other measures. Prior information should be given to the residents in the area through various media tools such as TV broadcast, Pamphlet etc.

Comprehensive Environmental Pollution Index

Comprehensive Environmental Pollution Index (CEPI) was adopted by MoEFCC for depicting the overall pollution Index of Industrialised area. This index is sum of all kinds of pollution viz. air, water, soil, noise, ecological status etc. in the industrial areas of cities and is an indicator of environmental health of the city. The CEPI Index for Naroda/ Odhav industrial cluster of Ahmedabad is comparatively better than other industrialised areas of Gujarat as given below:

Table 21: Comprehensive Environmental Pollution Index of Gujarat clusters

Sr. No.	Name of polluted industrial area (PIA)	CEPI Score As per monitoring during 2018 by CPCB
1	Vadodara (Critically Polluted Area - CPA)	89.09
2	Ankleshwar (CPA)	80.21
3	Vapi (CPA)	79.95
4	Surat (CPA)	76.43
5	Vatva (Vatva & Narol) (CPA)	70.94
6	Rajkot (CPA)	70.62
7	Bhavnagar (Severely Polluted Area - SPA)	61.94
8	Ahmedabad (Naroda & Odhav) (Other Polluted Area - OPA)	57.11
9	Morbi	54.24

Source: GPCB Annual report 2019-2020

Category	CEPI Score
CPA	>70
SPA	60-70
OPA	<60

For managing pollution from industrial areas and industries, collectively and cumulatively, regulatory measures, mechanisms for preventing emissions, treatment facilities for wastes and industrial effluents need to improve.

Natural Disaster Assessment

Being near to Sabarmati River, the Pirana 424 MLD STP needs to be more vigilant for floods. This STP is also located at around 3 km from Vasna Barrage and south end of the Riverfront. HFL of Sabarmati River is 41.77 m at the Vasna Barrage near the project area. Thus, clear demarcation of HFL is important to identifying the areas which would be impacted.

The lower promenade of the Sabarmati Riverfront got submerged in 2006, 2011, 2015 and 2017. In 2006, low lying slum at Vadaj experienced severe flooding and houses and shops were half submerged and hundreds of slum dwellers from Vadaj and riverbank areas (behind VS hospital and Tagore hall, Khanpur and Shahpur, Behind NID) were relocated to schools.[24] In 2015, the release of 1.8 lakh cusecs of water from Dharoi dam had led to the flooding of the riverfront[25]. People were evacuated from Fatehwadi, Chandrabhaga and Indira bridge area. During 23 - 27 July 2017, Ahmedabad district, City taluka and Bavla taluka reported 81.16%, 107.86% and 115.60% rainfall respectively[26]. Ahmedabad received 828.2 mm rains, as against a normal level of 291.1 mm[27]. Around 200mm of rainfall was received in the city in 24 hours in 2017.[28] More than 150 factories shut down,[29] and slums in the city were waterlogged while the districts of Ahmedabad and Gandhinagar were also on alert due to the Daroi dam releasing water into the Sabarmati River, which had already received water from the Narmada,[30] and 2800 people from low lying areas were evacuated[31].

Based on the above experiences with floods, during worst floods scenario, potential risks identified to and in STP premises during construction and operation phases include: submergence of the STP and nearby areas including access roads, trunk mains and outfalls, structural damage of STP components and linked structures; reverse flow from outlet; Impacts on outfall points, wastes, debris, carcasses carried into the premises by flood waters, choked machinery, inlets and outlets, impact of monitoring equipment, submerged equipment and electric short circuits, risks to workers and nearby communities due to flooding, disruption of construction works and material stacked, issues with stored sludge and chemicals, possibility

[24] *https://www.deshgujarat.com/2015/07/29/blog-year-2006-sabarmati-flood-in-ahmedabad-i-witnessed/*
[25] *https://indianexpress.com/article/india/gujarat-floods-submerged-sabarmati-riverfront-throws-up-snakes-and-many-questions-4775653/.*
[26] *https://gidm.gujarat.gov.in/sites/default/files/educate_your_self_document/Gujarat%20Flood%202017%20-%20A%20Case%20Study%20by%20NDMA%20%26%20GIDM_2.pdf*
[27] *https://www.business-standard.com/article/current-affairs/a-rare-phenomenon-caused-gujarat-floods-117072900734_1.html*
[28] *https://www.indiatoday.in/india/story/ahmedabad-airport-gujarat-floods-heavy-rains-sabarmati-river-gandhinagar-1026704-2017-07-27*
[29] *https://www.theguardian.com/world/2017/jul/31/india-monsoon-floods-gujarat-death-toll-over-200*
[30] *https://hdrc-sxnfes.org/wp-content/uploads/2020/04/Report-Flood-Final-19_08_17.pdf*
[31] *https://timesofindia.indiatimes.com/city/ahmedabad/flood-fury-hits-gujarat-25000-people-evacuated/articleshow/59744404.cms*

of water borne disease post flood; untreated sewage release and downstream impacts on communities, impaired functioning caused by damage to equipment and machinery.

As per the seismic map of India, Ahmedabad falls under the Zone III (Moderate Damage Risk Zone). Ahmedabad along with other areas of Gujarat had experienced a massive earthquake in January 2001. It is important that the proposed rehabilitation also consider structural strengthening to make the STP resilient to earthquake, flooding, and other disasters.

3.4 Socio-Economic Baseline

The baseline socioeconomic condition used in the ESIA study and discussed has been compiled from the population estimates of Master planning Consultants of AMC, Census 2011 data for the city and the wards and primary data collection. Other data available in the public domain has also been collated and discussed in the baseline section to understand and present the social baseline condition with respect to the area of influence and area of impact for the project, health condition, downstream impact with respect use of water from Sabarmati River, health issues, groundwater extraction and quality and related issues.

The immediate area of influence in ward no 53 Lambha where the STP is location and area of impact is larger and includes the sewerage catchment in eastern zone 1 for the 180 MLD STP, nearby village of Gyaspur included in AMC limits and downstream villages using the water from Sabarmati. City level data is also presented for overall understanding of municipal services provided.

Ward Data

STP is located in Ward Number 53 for Lambha which is included in 5 kms area of study of existing STP and area of influence/ impact and has a significant geographic area for the sewerage catchment, in which the STP is located. The Eastern Zone -1 catchment covers approximately 97 sq. km. area of AMC. Catchment includes area between Sabarmati River and Dehgam Road in the North, Narol-Naroda road in the middle and Sardar Patel Ring Road towards the south of the catchment. Eastern Zone 1 has two existing STPs at Pirana of capacity 180 MLD and 155 MLD each. There are 3 under construction STPs viz. Maleskban - 30MLD; Saijpur – 7 MLD and Kotarpur – 60 MLD. There is a distinct catchment area for the under construction STPs, while the catchment area for 180 MLD and 155 MLD STPs is common. Therefore, these two STPs are considered to be under one campus which is termed as Pirana-I campus. The present estimated contributing population for this zone is about 24.22 lakh. The present sewage generation for this entire zone is estimated to be around 570 MLD. The entire sewage is ultimately conveyed to Pirana I campus.

Study area profile and limitation

The study area majorly is occupied by industries. There are one settlement Gyaspur in the immediate vicinity of the proposed STP. As mentioned earlier, the STP is surrounded by other STPs, industries involved in waste processing and solid waste dumping area and landfill.

Industries are located in the general area. Permanent settlements or residential areas were not located near the existing STPs. Settlements came up later near the area due to rapid urbanization in the area. Consultations were also held with STP contractors and inhabitants of settlements at Gyaspur (10 m from STP boundary), Shahwadi (2.8kms), Juna Vanzara(3.0 km from STP boundary) and Kamod (4 km from STP boundary). During consultations it was

revealed that there were few settlements in the area during construction of the existing 180 MLD STP. A transect walk was conducted within the proposed plant area to observe specific issues related to the land area. Consultations were also undertaken with various stakeholders with reference to the STP including AMC Officials, Operators and villagers. During the updating of the ESIA, further consultation with stakeholder groups will be conducted by implementing agency.

155 MLD STP in located behind the existing 180 MLD STP at Pirana within 50 to 100 m. There were few settlements, adjoining the proposed 25 ha. land although Gyapsur village is in close proximity to the land, about 10 metres away. As per the revenue records, proposed land comes under the Shahwadi[32] village, in Vatva Taluka of Ahmedabad district. These areas are at present included in Lambha ward of AMC. Impacts are mainly with respect to the environmental issues such as dust, traffic movement, dumping ground in the vicinity of the STP, release of untreated sewage, impact of CETP, odour and related issues during construction and operation and discussed in section 4.6.

Besides settlements, the dumping ground/landfill site is located in the area. There are industries processing solid waste in various waste near the proposed project site such as material recovery facility, waste to energy etc.

Governance & Administrative Context

For administrative purposes, the city is at present divided into 7 zones - Central, East, West, North, South, Southwest zone and Northwest zone. Each zone is further split into wards. As per the section 63 and 66 of the Bombay Provincial Municipal Corporation Act, the AMC is responsible for certain obligatory and discretionary services. The area where STP is located comes under the Ahmedabad Municipal Corporation, ward no 53 Lambha as mentioned above.

Demographics and Ethnic Composition

Demographic Profile: Lambha Ward[33]
One km area around the existing STP is within the Lambha ward. Master planning consultants, AMC, have estimated the population of the ward in YR 2021 as 145826 persons with population density as 4943 persons/sq. km., YR 2031-261269 persons with population density as 8856 persons/sq. km., YR 2041456402 persons with population density as 15470 persons/sq. km. and YR 2051-724467 persons with population density as 24557 persons/sq. km.

The population density in the eastern zone 1 for YR 2013 ranges from 30001 persons/sq.km to 60000 persons/sq. m. in eastern zones. In the future, it is expected that population density will increase in some of the eastern wards which have population density in the range of 40000 per/sq.km. and below.

Downstream Villagers

Jal Jeevan Mission (JJM) envisions to provide safe and adequate drinking water through individual household tap connections by 2024 to all households in rural India. Jal Jeevan

[32] The TPS scheme for the village in TPS no 56 under Narol Shahwadi scheme. Name may have been revised to Shahpur in AMC records.
[33] Census data and TP scheme and ward area may not necessarily match as the area covered may vary in both.

Mission (JJM) has been launched in partnership with States, to enable every household in villages to have Functional Household Tap Connection (FHTC) in the next 5 years. It is envisaged that with FHTC, each household will have potable water supply in adequate quantity. Implementing agencies include Water and Sanitation Management Organization (WASMO), Gujarat Water Infrastructure Limited (GWIL) and Gujarat Water Supply & Sewerage Board (GWSSB). GWSSB mentions that the regional water supply schemes are based on reliable sources like tube-wells (Underground sources) or Surface water sources (Dam or Narmada water). Water is fed up to village level by transmitting water from bulk water transmission lines by the GWSSB. FHTC coverage is 100% for households' in relevant talukas (Dholka, Bavla, Detroj, Daskroi, Sanand and Dhanuka for downstream villages) of Ahmedabad district are covered in Jal Jeevan Mission for drinking water supply. Based on the JJM data available34, at taluka level coverage is 100 %. See table below.

Consultations conducted for the above mentioned communities and groups are presented in section 8.3, **Table 47** for outcome of consultation during preparation of ESIA and will also be conducted pre and post disclosure. Additional consultations will be undertaken after finalization by DBOT Contractor.

Literates:

Total literate population is 79%. Males literates comprise of 86.22% of total males and female literates are 69.84% of total females.

Workers and occupation:

In Lambha ward, the proportion of total workers is 39% and main workers comprise of approximately 88.71% of total workers. More than 94% of the population comprises of other workers categories indicating occupation in the secondary and tertiary sectors given the presence of industries such as chemicals, petrochemicals, dairy, drugs and pharmaceuticals, power, transmission, etc in the city. Less than 0.05% is involved in household industries, 1.41% as cultivators and 0.3% as agriculture labours.

Migration

As per the census 2011 data on migration for Gujarat for Ahmedabad urban areas, there are 25.64 lakhs total migrants within the Ahmedabad city. 18.2 lakhs are from within the state but outside Ahmedabad city. 10.3 lakhs are from urban areas, 11.96 lakhs are from other districts in Gujarat. 6.95 lakhs migrants come from other states, with 2.16 lakhs from Rajasthan, 1.91 lakhs from Uttar Pradesh and 1.10 lakhs from Maharashtra. As per the census 2011 data on migration for Gujarat for Ahmedabad urban areas, there are 25.64 lakhs total migrants within the Ahmedabad city. 18.2 lakhs are from within the state but outside Ahmedabad city. 10.3 lakhs are from urban areas, 11.96 lakhs are from other districts in Gujarat. 6.95 lakhs migrants come from other states, with 2.16 lakhs from Rajasthan, 1.91 lakhs from Uttar Pradesh and 1.10 lakhs from Maharashtra.

[34] https://ejalshakti.gov.in/IMISReports/Reports/WaterQuality/rpt_WQM_GPwiseTesting_P.aspx?Rep=0

Table 22: Habitation wise Functional Household Tap Connection (FHTC) Coverage (Reported Till 06/03/2022) Financial Year: 2021-2022, Ahmedabad District[35]

Sr. No.	Block	Total Habitations as on 01/04/2021	Non PWS Habitations	With FHTC Coverage >=50			With FHTC Coverage >=75			With FHTC Coverage >=100%		
				Habitations	House Holds	House Connections	Habitations	House Holds	House Connections	Habitations	House Holds	House Connections
1	BAVLA	54	0	0	0	0	1	2800	2503	53	37878	37878
2	DASKROI	116	0	0	0	0	0	0	0	116	84016	84016
3	DETROJ	68	0	0	0	0	0	0	0	68	28845	28845
4	DHANDHUKA	43	0	0	0	0	1	519	517	42	17220	17220
5	DHOLERA	41	0	0	0	0	2	2650	2432	39	12347	12347
6	DHOLKA	80	0	0	0	0	1	260	258	79	54201	54201
7	MANDAL	46	0	0	0	0	0	0	0	46	23333	23333
8	SANAND	99	0	0	0	0	0	0	0	99	60741	60741
9	VIRAMGAM	97	0	1	1650	1236	0	0	0	96	43133	43133
Total		**644**	**0**	**1**	**1650**	**1236**	**5**	**6229**	**5710**	**638**	**361714**	**361714**

[35] https://ejalshakti.gov.in/imisreports/

During consultation people informed that Gyaspur villages currently had significant proportion of migrants who had come from outside the state although ex sarpanch mentioned that the migrants comprise maximum 10 % of the population.

Health

The data for this section was collated from the Health Officer, AMC, for Ahmedabad city and Health Aspect Study and Mitigation to improve the health in Catchment area of Identified Polluted River Stretches for the city. The proportion of cases in the eastern zone was high more than 34% for AGE in 2018 and almost 29% in 2021. Cases of Jaundice which were almost 24% of such cases in the city and declined to 1.77% only in 2021 and fever between 2018 to 2021 cases of Typhoid were also higher and ranged from 23% in 2018 to 25% of total typhoid cases in the city. Eastern zone had around 17 %of all cholera cases in the city in 2018 which reduced to 8 % in 2021. Fever cases ranged from 34% in 2018 to 29% in 2021. Almost all ailments had an increase in YR 2019 before decreasing significantly in 2020.

Table 23: Disease/ Ailments from 2018-2020 for Ahmedabad City

Disease/ Ailment	Year	East Zone	Total cases for Ahmedabad city	% of cases in the Sewerage Catchment Zone
Acute Gastroenteritis (AGE)	2018	2327	6767	34.39
	2019	1927	6004	32.10
	2020	540	1779	30.35
	2021	697	2407	28.96
Jaundice	2018	560	3154	17.76
	2019	457	2610	17.51
	2020	137	580	23.62
	2021	154	129	1.77
Typhoid	2018	741	3286	22.55
	2019	956	4291	22.28
	2020	313	1137	27.53
	2021	374	1477	25.32
Cholera	2018	13	77	16.88
	2019	14	86	16.28
	2021	5	64	7.81
Fever	2018	2327	6767	34.39
	2019	1927	6004	32.10
	2020	540	1779	30.35

Disease/ Ailment	Year	East Zone	Total cases for Ahmedabad city	% of cases in the Sewerage Catchment Zone
	2021	697	2407	28.96

Gender issues/ concerns

Literacy rates are lower for women compared to men. In Lambha, as mentioned above 86% were non-workers females which is double of the male non-workers and literacy rates for females was around 70% compared to males which was 86%. Category of non-workers among women were very high at 39861 females (86%) while 23393 males non-workers comprise of 40.54% only. Women comprised of almost 63% of all non-workers.

The Labor Force Participation rate according to the current weekly status from July 2019 to September 2020 for urban for Gujarat is presented below and data indicates that LFPR for males were significantly higher for males and lower for females in Gujarat.

Table 24: Labor Force Participation Rate (CWS) July 19 to Sept 20

State	Gujarat		India	
	Male	Female	Male	Female
Jul-Sep 2019	77.7	16.7	73.9	20.3
Oct-Dec 2019	78.8	18.5	73.8	21.1
Jan-Mar 2020	79.1	19.2	73.7	21.9
Apr-Jun 2020	74.4	17.7	71.7	19.6
Jun-Jul 2020	77.3	18.3	73.5	20.3

Source: GoI, Aug 2021, National Statistical Office, Periodic Labor force Survey (PLFS) July-September 2020, Ministry of statistics and Programme Implementation.

Institutional Set ups

Stakeholder groups identified during site assessment were as AMC officials, 155 and 180 MLD STP staff, Contractors of AMC and residents of Gyaspur. Industries/upcoming projects located near the proposed site, to understand any issues and concerns with respect to the baselines conditions, pollution concerns in the locality, existing STPs and proposed STP/TSPS, approach road, outfall channel, treated water usage, odour, noise and related issues anticipated from existing and upcoming projects. Industries/ upcoming projects located near the proposed site.

Stakeholder consultations & Identified Groups

Consultations were carried out for the preparation of the draft ESIA report for Pirana in September and December 2023. Stakeholder consultation is a dynamic process and consultations will be carried out during the life cycle of the GRCP project. Consultations will also be carried out for disclosure of ESIA and ESMP.

Other Developments in the Project/ area and Sabarmati Riverfront

Gyaspur dumping ground at the eastern side of the existing 180 MLD STP. At present, the dumping of municipal waste is ongoing and may continue during the construction phase of the 424 MLD STP. The dumping ground is in the vicinity of the proposed area and potential impacts identified are related to cumulative impacts on air quality and odour management during the transportation of goods, material and equipment during the construction phase and operation phase. There are also waste processing industries near and adjoining the proposed area.

There are two WtE projects are coming in the close vicinity of proposed STP. These two plants will process about 3000TPD of municipal solid waste. AMC is implementing Bio-mining/ Remediation project for Pirana dumpsite (ongoing project). These projects are for removing the dumpsite in the area and enhancing the green cover.

Upcoming projects on the Sabarmati Riverfront by AMC, includes road between Subhash Bridge and railway bridge on western side, sports complex on eastern side, sports complex behind National Institute of Design, Park between Nehru Bridge and Ellis Bridge, Multi-level parking on western side and foot bridge between Ellis bridge and Sardar bridge.

A list of upcoming projects in Ahmedabad and their important with respect to various identified subprojects is provided in **ANNEXURE VII**.

CHAPTER 4. ANALYSIS OF ALTERNATIVES

As per ESF, "The assessment [ESIA] will evaluate the project's potential environmental and social risks and impacts; examine project alternatives; identify ways of improving project selection, siting, planning, design and implementation in order to apply the mitigation hierarchy for adverse environmental and social impacts and seek opportunities to enhance the positive impacts of the project."

Analysis of Alternatives involves the following:

- Systematically compares feasible alternatives to the proposed project site, technology, design, and operation—including the "without project" situation—in terms of their potential environmental and social impacts.
- Assesses the alternatives' feasibility of mitigating the environmental and social impacts; the capital and recurrent costs of alternative mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the alternative mitigation measures.
- For each of the alternatives, quantifies the environmental and social impacts to the extent possible, and attaches economic values where feasible.

The Analysis of Alternatives described in this chapter is structured to follow a 'narrowing approach' involving a series of logical steps, starting with the high-level strategy alternatives followed by description of more detailed technology alternatives considered. Using this commonly adopted narrowing approach, the Analysis of Alternatives considers alternatives in the following sequence:

- Strategy Alternative: Abandoning the Existing Centralized Treatment to follow decentralized 'on site' treatment 'on site'

  Here, a scenario where existing STP would be abandoned, and residents will be using onsite decentralized treatment in septic tanks is considered against the proposed subproject.

- 'Zero' or 'No Project' alternative,

  Here, without project scenario i.e., continuing the existing situation compared with the scenario where the proposed project rehabilitation is implemented.

- One option was an additional 240 MLD capacity sewage treatment plant at New Pirana campus to cater the need of future sewage generation up to 2041. Hence, required capacity of STP at Pirana I campus shall be 424 MLD (180 MLD + 240 MLD) which is excluding 155 MLD STP. Afterwards only 424 MLD STP has been decided to cater the flow. Considering population projection for next 15 years, the estimated flow at proposed STP shall be 424 MLD. Hence, the STP will be designed for an average flow of 424 MLD. The available land at the site is approximately 25 hectares and belongs to AMC. The land required for the proposed 424 MLD STP is sufficient for biological treatment with BNR removal system.

    - The services of the existing 180 MLD TSPS and STP shall be disbanded after the commissioning of new facilities. The infrastructure interventions proposed under the project is as enunciated below:

- Common inlet chamber to receive the flow carried by the two box trunk mains (each of the size 2400x2400 mm) with flow regulating mechanism.
- Gravity pipeline(s)/ channel(s) along with flow regulating mechanism to carry the flow from common inlet chamber to existing 182 MLD TSPS (serving 155 MLD STP) and new 424 MLD TSPS.
- A fully functional 424 MLD pumping facility, equipped with SCADA-controlled electro-mechanical equipment.
- Rising Main(s) carrying the discharge of 424 MLD TSPS to new STP with all associated works such as valves, pressure transmitters, flow meters etc
- New 424 MLD STP including civil, mechanical, electrical and instrumentation works etc
- New outfall facility
- Approach Road to STP
- Terminal sewage pump station
- A new Terminal pumping facility is planned to be constructed in the available land parcel and measuring 0.9 ha which is in front of 155 MLD STP. The land is already in possession of AMC.
- Design/ Technology Alternatives
- Technologies to achieve the stringent discharge standards suggested by NGT are compared with the current one. During detailed design, this will be subject to further scrutiny and the best environmentally suitable alternative will be adopted.

- The contractor will be responsible for storage, testing and transfer sludge for disposal appropriately based on the monitoring results & existing regulations, as agreed in writing with AMC . Sludge management facility has been proposed by AMC to be ready to manage sludge by commissioning of first/ initial stream of this proposed STP. Contractor shall prepare CESIA and CESMP which includes sludge management plan showing it collection, storage, and transport in line with regulations and good practices on Health & Safety ad Pollution Prevention for its eventual disposal at the AMC's proposed sludge management facility.

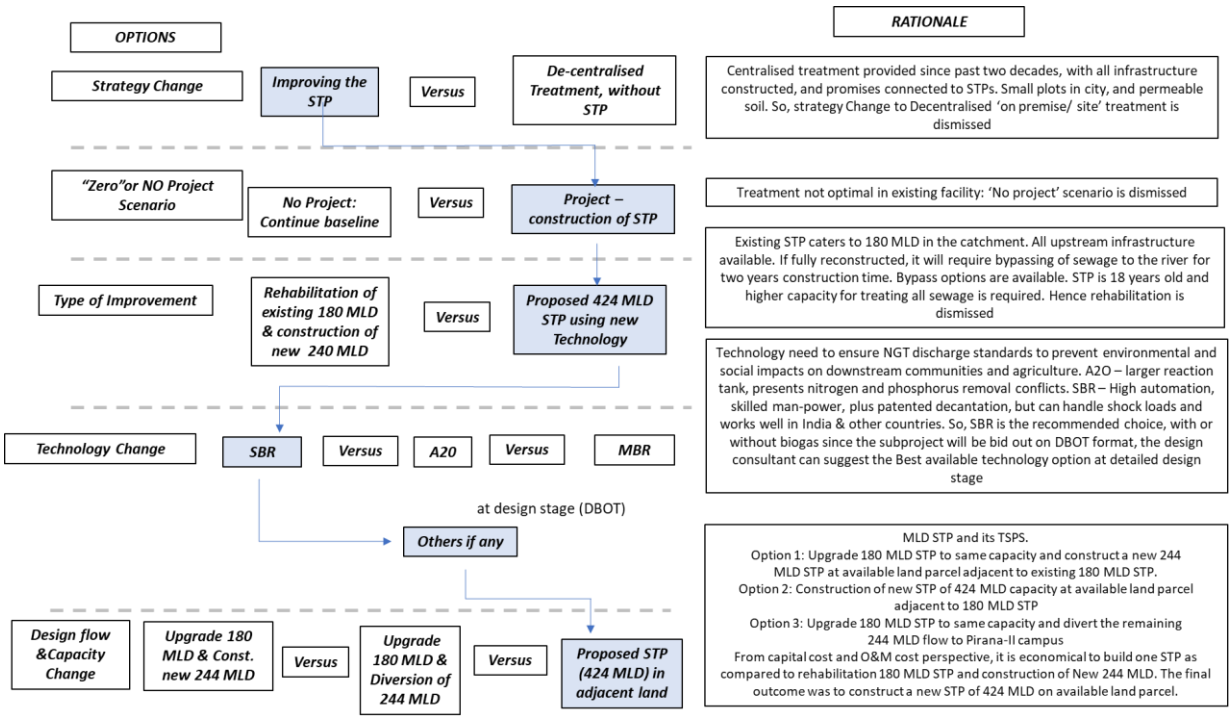


Figure 11 Analysis of Alternatives

4.1 Option analysis for design flow and STP capacity

Three different options were analyzed for arriving at design flow and STP capacity for 180 MLD STP and its TSPS.

- Option 1: Upgrade 180 MLD STP to same capacity and construct a new 244 MLD STP at available land parcel adjacent to existing 180 MLD STP.
- Option 2: Construction of new STP of 424 MLD capacity at available land parcel adjacent to 180 MLD STP
- Option 3: Upgrade 180 MLD STP to same capacity and divert the remaining 244 MLD flow to Pirana-II Campus.

Each option has been analyzed based on the feasibility of Land availability, Adequacy of Upstream Infrastructure, and probability of discharge and/or diversion of additional flow/s.

Recommended option

The comparative analysis demonstrate that all three options are feasible from land and social & environmental perspective with no major concerns. All the options focus on capacity expansion and upgradation to meet the future flow requirement with stringent treatment norms.

In Option 2, a single STP is proposed to meet the future flow requirement under single investment, while the Option 1 and 3 address the same under two subprojects focusing on utilizing existing 180 MLD STP to same capacity by process upgradation and the treatment of remaining flows under separate subproject.

The Option 1 and 3 considers utilization of the existing structural assets at existing 180 MLD STP.

Upgradation of existing STP in phase wise manner will be a challenge as area availability is limited. There is also the concern of untreated sewage being released in the river during rehabilitation of the existing STP. The capacity requirement is also higher based on the estimated population as given by the Master Planning consultants. These options would also involve management and operation of multiple STPs and offer lesser efficiency.

Detailed deliberations were also held with AMC team and design consultants while discussing the pros and cons of the three options. The final outcome was to construct a new STP of 424 MLD on available land parcel which is vacant and under possession of AMC.

4.2 Zero or NO project Alternative

4.2.1 Without Project Scenario

The existing STP was designed with ASP technology to achieve following norms:

Table 25: STP Inlet Outlet Quality viz a viz Standards/ Norms

Sr. No.	Parameter	Unit	Designed Discharge Quality of Treated Sewage	Actual Inlet Quality, 2021	Actual quality of treated sewage at Outlet, 2021	Prevailing MoEFCC 2017[36]	NGT suggested Discharge quality
1.	BOD	mg/l	20	48	13	20	<10
2.	COD	mg/l	100	171.2	44.8		<50
3.	SS	mg/l	30	18	31.6	<50	<20
4.	pH	-	6.5 - 8.0	7.56	7.56	6.5 -9.0	5.5-9.0
5.	Residual Chlorine	mg/l	0.5	BDL	2.4		
6.	Fecal Coliform	MPN/ 100ml	1000-10000	59	48	<1000	<100
7.	Oil & Grease	mg/l	<10	BDL	BDL		
8.	Total Nitrogen	mg/l		48	7.2		< 10
9.	Phenolic Compounds						<1
10.	Total Phosphorous	mg/l		1.83	1.96		< 1

There is no provision for removal of faecal coliform and bio nutrients in the existing 180 MLD STP. With existing treatment facility, it may not be possible to achieve the NGT suggested discharge quality. This may affect the surface water quality at Sabarmati and ground water quality and heath of the city and downstream of Sabarmati, in case of reuse for irrigation.

Due to the age of the STP, equipment's are not functioning as per design requirement. If the treatment plant is not upgraded, there may be impacts on the water quality of Sabarmati River downstream which will affect any fauna, flora in the river, and also result in degradation of

[36] *These Standards shall apply to all STPs to be commissioned on or after the 1st June, 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.*

soil quality. High chlorine content for disinfection may impact plant growth and soils. In addition, treatment costs are also high, and machinery need upgradation.

Construction of new 424 MLD STP will result in achieving the NGT suggested standards and help in improved health of the people and environment without abandoning the existing STP area. The present 180 MLD STP will also complete its design life by 2024 which is the base year for the new STP.

4.3 Technology Alternatives

4.3.1 Screening of Technologies for STP

At present, following sewage treatment technologies are the best available to arrive at NGT suggested discharge standards:

- Sequencing Batch Reactor (SBR).
- Anaerobic-Anoxic-Oxic (A2O) Process (Biological Nitrogen and Phosphorous Removal Process)
- Membrane Bio Reactor (MBR)- Due to the high Capital and Operation & Maintenance costs for the huge flows of 424 MLD, this process is not considered. Detailed description and comparison will be provided in the DPR stage as World Bank is preferred for Open Technology for the DBOT tender.
- Moving Bed Biofilm Reactor (MBBR) -is an attached growth process and will not remove phosphorous biologically and limited experience in India for such higher capacity plants. Thus, this process has not been considered further in FR.

Table 26: Comparison of Various Biological Treatment Options

Sr. No.	Treatment process	Advantages	Disadvantages
1	Anaerobic/ Anoxic/ Aerobic (Oxic) A2O process	• Both nitrogen and phosphorus are removed simultaneously in this process • A portion of alkalinity consumed in the aerobic tank is recovered by denitrification reaction in the anaerobic reaction tank by recycling nitrified liquor from the aerobic tank to the anoxic tank • Well-proven technology worldwide	• Generally, this process needs a larger volume of reaction tank than that used in the standard activated sludge process. • The process operating parameters of nitrogen removal, such as SRT conflict with that of phosphorus removal; therefore, the optimum SRT condition needs to be set to remove both nitrogen and phosphorus.
2	Sequential Batch Reactor (SBR)	• Smaller footprint • High-quality effluent • Similar to extended aeration	• High automation • No energy production • Skilled manpower required

Sr. No.	Treatment process	Advantages	Disadvantages
		• Ability to handle shock loads. • Efficient use of aeration system • The successful functioning of plants in India and worldwide	• Decantation mechanisms are patented
3	Moving Bed Biofilm Reactor (MBBR)	• Less space requirement	• High media quantity requirement • Long shut down period for plant maintenance • will not remove phosphorous biologically • limited experience in India for much higher capacity plants.
4	Membrane Bio-reactor	• Separate biological process • No tertiary treatment required	• Low sludge production • High capital & maintenance cost

Source. Final DPR Rev1, Construction of New 424 MLD STP With construction of New 424 MLD Terminal Sewage Pump Station with allied infrastructure at Pirana February 2024. Prepared by Royal Haskoning DHV Consulting Pvt. Ltd. For AMC

Proposed 424 MLD STP

The Design Consultant has submitted the "DPR Construction of New 424 MLD STP With construction of New 424 MLD Terminal Sewage Pump Station with allied infrastructure at Pirana" for the nominated works as per RFP. Based on the detailed assessment stated in earlier Chapters and to achieve the NGT standards, it is proposed to construct one new plant of 424 MLD at Pirana. Till the time the new STP is constructed and commissioned the existing 180 MLD STP will be kept operational. The available land at the site is approximately 25 hectares and belongs to AMC. The land required for the proposed 424 MLD STP is sufficient for biological treatment with BNR removal system.

The existing Plant of 180 MLD at Pirana is based on ASP technology and functional. The existing Sewage Treatment capacity within AMC area is 1248 MLD. A sewage flow balance study was carried-out by the Design Consultant in consultation with AMC while referring the SCADA and Pump Log-book database. The study reveals that against the existing treatment capacity of 1248 MLD, the sewage being received is about 1696 MLD; thereby a Gap of about 448 MLD.

Industrial ingress is more dominant into the eastern part of the AMC area. AMC is of the view that Industrial wastewater pollution or Heavy metal contamination will not be an issue for the STPs by the time of their commissioning as AMC and the Gujarat State Pollution Control Board (GPCB) have jointly undertaken a drive to disconnect sewer connections of the flouting industries. The teams of AMC and GPCB have increased the surveillance and monitoring in major industrial clusters to enforce regulatory norms for the treatment of industrial wastewater. AMC is also planning to develop a robust water quality monitoring system that would enable AMC to monitor the industrial pollution risks on a real-time basis.

The upstream sewerage network has adequate capacity to safely convey the estimated sewage flows for future years. A new TSPS will be required to collect and pump the sewage received.

As per the DPR, decision design matrix was prepared in order to decide the appropriate process for the treatment of sewage and the evaluation criteria included Technical, Financial and Overall Evaluation. All criteria were given a rating from 0 to 2 (with 2 being the most favourable). The ratings were added together for each criteria category and given a score. In the overall score of all the process, Sequential Batch Reactor has been considered as the best treatment process which scored the high and suits the area.

Comparison of life cycle cost of sewage treatment technologies using block cost estimates for SBR and A2O treatment alternatives have been worked out andis viable when analysis is considered for a period of 15 years for O&M. SBR is an established technology in the recent past and has delivered consistent results. All the new STP projects implemented in AMC region in recent past are on SBR technology. Hence, SBR option has been recommended for the proposed Project.

The sludge from the proposed STP shall meet the benchmark stated in National guidelines. Treated sludge shall be disposed to the upcoming Sludge Management Facility which shall be developed by AMC. No bypass shall be allowed from WB funder facility, as per the directions of National Green Tribunal (NGT)[37] and WB EHS. AMC is updating sewer system (as part of G-ACRP). STP once upgraded and obsolete equipment are upgraded, it will be able to take the additional 10% load which comes into the STPs during heavy rains. AMC also takes the opportunity offered by agglomeration of STPs at Pirana and Vasna to divert and treat peak flows.

Sequential Batch Process is a plug flow type process, and the flow is not continuous. There are 4 cycles of batch process. These are:

- Fill and aerate: During this cycle, the tank is filled up to a set operating level. Aeration blowers are started for a predetermined time to aerate the primary treated effluent along with the biomass.
- Aerate: During this cycle, there is neither inflow nor outflow till the treatment is complete which is indicated by the Dissolved Oxygen content.
- Settle: The biomass with perfect settling conditions, again no flow.
- Decant: The supernatant from the top under quiescent conditions.

During aeration in stages 1 and 2 above, the return activated sludge pumps keep running. This ensures MLSS concentration to desired levels which is essential for full biological treatment.

Till this process is completed in one tank, the other tank should be able to receive flow. The entire process takes 2.5 to 8 hours, depending on the inflow and the biological load. During

[37] Page 20. 3 nd QUARTERLY REPORT OF THE CENTRAL MONITORING COMMITTEE (CMC) IN COMPLIANCE OF THE ORDER DATED 21.09.2020 (UPLOADED ON 26.09.2020) IN THE MATTER OA No. 673 of 2018 (on critically polluted river stretches (such as Sabarmati – see pages 20, 23); bypass of sewage is critically viewed by NGT in http://www.indiaenvironmentportal.org.in/files/file/Kharicut-canal-pollution-NGT-order.pdf)
Available at:
https://greentribunal.gov.in/sites/default/files/news_updates/Status%20Report%20filed%20by%20CPCB%20in%20OA%20No%2082%20of%202021(SZ).pdf;
Accessed on: November 2021

peak flow the 1st cycle of Fill and aerate may take shorter time whereas during minimum night flow the cycle may take longer. The completion of aeration is indicated by the Dissolved oxygen level. The whole process is susceptible for full automation and controlled by actuator valves and decanting mechanism with variable frequency drives. The surplus activated sludge is withdrawn periodically for sludge treatment.

The advantages of this process are as follows:

- ✓ Complete treatment in a single basin: Separate chambers are not required as in the case of an ASP based STP.
- ✓ Very Robust and Consistent performance for changing Influent Loads
- ✓ Excellent Treated Quality by Biological process alone to BOD5<10, TSS<10, Total Nitrogen (TN) <10, Total Phosphorus (TP)≤1for municipal sewage of medium to high strength without adding Chemicals.
- ✓ Lowest Footprint / Land required
- ✓ Power savings at rated capacity and also at lower organic and hydraulic loads with the help of DO control in SBR basin. This is possible by running the blowers just for the Oxygen required for the BOD/COD reduction with the help of DO control in the basin. In other words, blowers will work as and when there is DO required (enough to provide for the Organic Load). All other activated sludge processes use higher power consumptions at all biological and hydraulic loads as all the equipment will be running all the time.
- ✓ Easy to operate the plant as the design provides for advancing the cycles for storm / Heavy Monsoon conditions too.
- ✓ Separation of Mixing and Aeration equipment for providing separate time zones for Aerobic and Anoxic Process to achieve Denitrification / Phosphorus reduction and BOD reduction and Nitrification respectively.

As the SBR process is fully aerobic and will work as a perfect reactor which ensures 100% treatment, thereby there is no odour nuisance. Generally, the odour will be generated from Preliminary units and Sludge sump. A buffer zone of 3.0m with planting tall trees around the STP (at least 2-3 rows of trees) shall reduce odour and dust nuisance considerably. In addition to this the open area around the plant shall be suitably landscaped with soft landscaping. The secondary treated sewage itself can be used for gardening.

The secondary treatment by SBR can produce a BOD and SS of less than 10 mg/l BNR removal with a pre Anoxic tank.

4.3.2 Factors for Selection of Treatment Technology

4.3.2.1. Compliance to the NGT standards

Treatment of the sewage to the quality prescribed by NGT which includes biological nutrient removal. Hence, there shall be improvement of the water quality of River Sabarmati. Also, proposed upgradation shall avoid nuisance to the public due to the potential odor from the STP. It is intended to adopt a treatment technology that should be sustainable and be capable of overcoming the above-mentioned constraints and requirements. In order to achieve the

above, it has been decided to consider Suspended Growth systems such as A2O Process, and SBR.

4.3.2.2. Capital Cost

The second most important criterion for selection of appropriate treatment technology is "Not entailing excessive cost" which implies that the financial cost should not be excessive in relation to the financial capability of the Sector concerned and to the discharge standards or environmental protection envisaged.

4.3.2.3. Less Footprint Requirement

The third important criterion for selection of appropriate treatment technology is the minimum possible footprint requirement considering scarce land resources available in the city.

4.3.2.4. Ease in Operation & Maintenance and Lower Associated Cost

The fourth important criterion for selection of appropriate treatment technology is the ease of operation and maintenance and lower associated cost. To operate and maintain a STP, appropriate technical and managerial expertise must be available. Due to the scarcity of qualified personnel in the field of wastewater treatment, operation and maintenance of the technology should be trouble free. In addition, the operation and maintenance cost should be least possible to avoid excessive burden on the urban bodies.

4.3.2.5. Proven Track Record of Operation in Indian climate

The selected treatment technology should have very good track record of operation, availability of expertise and spare parts in India.

4.4 Alternatives for pipeline from TSPS to 424 MLD STP

Two M S Rising Mains (each of 2000 mm Ø) and each one connected with a 2000 mm Ø Common Header at the TSPS and terminating at the inlet chamber of STP will be provided and laid to serve the STP with raw sewage for treatment. The rising main shall be laid along the boundary of 155 MLD STP and the land belongs to AMC. The rising main alignment given in the DPR is tentative and shall be finalized by DBOT Contractor after survey and investigation. ESIA and ESMP updation will be done by DBOT Contractor based on final alignment. As per the design calculation attached (Appendix C.), the flow velocity in the rising main has come out to 1.55 m/sec, which is within the limits of CPHEEO guidelines. Both the rising mains will have an independent full bore electro-magnetic flowmeter (each of 1400 mm Ø) for measurement of realtime and cumulative flow. The interconnectivity of the two headers will facilitate parallel operation as well as an inter alia diversion of flow from one rising main to another for want of repair and maintenance of the pumping main for shorter period of time. The approximate length of each rising main from TSPS to STP will be approximately 350 meters. A motorable road is proposed to be constructed for ease of access and repair, if any. The rising main is proposed to be constructed under the road.

4.5 Outfall facilities

The treated sewage from the STP will be discharged to the Sabarmati River. Outfall shall be designed for the ultimate design year. Site is in close proximity to the River Sabarmati. There

are three possible alignments of conveying the treated effluent to River Sabarmati for disposal. These three options are discussed in detail below.

Option 1 – outfall channel near ILFS site

This the shortest possible alignment for laying the outfall channel. The length of outfall is approx. 800 m. This alignment will ensure minimum head loss and keeping the top water level in the channel above HFL. The ownership of the land for laying the outfall is in possession of AMC. During site visit and transect walk on the proposed outfall channel, two parcels of land between the outfall of 155 and 180 MLD STPs, were found under crops mainly (seasonal vegetables and greens). The land identified for outfall for proposed 424 MLD STP was fallow, few shrubs and small trees were observed. On the river side small heaps of solid waste was observed. There were no structures or other property or cultivation activities on the land identified for outfall, proposed to be for 1 to 1.5 metres width.

Option 2 – outfall channel along ILFS site

The alignment for laying the outfall channel is planned along the road along the ILFS site with final disposal below the bridge. The length of outfall is approx. 1400 m. there shall be significant head loss and it will not be possible to keep the top water level in the channel above HFL. The ownership of the land for laying the outfall is in possession of AMC, though agricultural activity is happening for the last 155 m of stretch near the river. The land identified for outfall for proposed 424 MLD STP was fallow, few shrubs and small trees were observed. On the river side small heaps of solid waste was observed. There were no structures or other property or cultivation activities on the land identified for outfall, proposed to be for 1 to 1.5 metres width.

Option3 – Outfall channel along service road

The alignment for laying the outfall channel is planned along the service road with final disposal below the bridge. The length of outfall is approx. 3400 m. there shall be significant headloss and it will not be possible to keep the top water level in the channel above HFL. There are various utilities below the service road including the bypass channel from existing Pirana campus and hence Row for laying the outfall channel The ownership of the land for laying the outfall is in possession of AMC, though agricultural activity is happening for the last 155 m of stretch near the river. The land identified for outfall for proposed 424 MLD STP was fallow, few shrubs and small trees were observed. On the river side small heaps of solid waste was observed. There were no structures or other property or cultivation activities on the land identified for outfall, proposed to be for 1 to 1.5 metres width.

Outfall channel alignment will be finalized by DBOT Contractor after survey and investigation and ESIA and ESMP updation will be done based on final alignment marked. DPR recommends Option 1 as viable. During site visit undertaken for ESIA during September 2023 and visits for prior projects under G-ACRP in 2021 and 2022, it was observed that only in one land patch, between outfalls of the existing STPs some cultivation was being done irregularly. Most of the other land adjacent and parallel to the river were fallow and vacant including the land stretch proposed for outfall channel for 424 MLD STP. During visit in Sept and Dec 2023, the patch of land did not have any standing crops or land being seeded. As estimated for corridor of impact less than 1 to 1.5 metres of width will be required. As the out channel proposed is parallel to the 180 MLD STP outfall channel, significant impacts are not envisaged. However, if

agricultural activities are observed on the proposed alignment, subsequently, the same shall be included in the RAP and C-ESMP and C-ESIA by the contractor.

4.6 Recommendation

- As the SBR process is fully aerobic and will work as a perfect reactor which ensures 100% treatment, thereby there is no odor nuisance. It also gives excellent Treated Quality by Biological process alone to BOD_5<10, TSS<10, Total Nitrogen (TN) <10, Total Phosphorus (TP) ≤1for municipal sewage of medium to high strength without adding Chemicals. SBR with efficient sludge collection and management can be provided to achieve the desired NGT Discharge Norms.
- MBBR with Tertiary Treatment can be provided to achieve the desired NGT Discharge Norms (but difficult in case of P) consideration of disadvantages mentioned in ***Table 26*** shall be made at design stage.
- MBR technology is good and generates high quality of effluent (5-7m years) but the capital cost and O & M cost is very high. Membrane life is also short, and membranes needs to be replaced after certain interval of time which has high periodic cost.
- Existing UASB can be upgraded by modifying its variants such as SAF, SBR, MBBR etc.; but the civil structural condition of the existing plant is poor
- Inlet chamber should be equipped with online sensor for managing the high variability in the inlet water quality.
- Piping and pump material should be of non-corrosive material.
- High Court of Gujarat has constituted a task force which is disconnecting all illegal industrial connections to sewers. To avoid the issue of such mixing, a holding tank is recommended with online monitoring of inlet sewage to avoid the failure of pump and treatment system.

Since the proposed subproject will be built on a DBOT model, the contractor will finalise the design and update the ESIA and ESMP after assessment of final technology to ensure the desired standards.

Though Detailed Project Report suggests SBR as the best alternative, it is suggested that DBOT Procurement be Technology Agnostic to explore all possible options as well – to focus on the Best Available Technology Option, taking into account environmental, social and economic considerations. SBR can be considered concerning the benefits regarding odour control, efficient sludge collection and biological process. This will help improve environmental quality of surrounding areas by reducing odour.

CHAPTER 5. ASSESSMENT OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

5.1 Proposed Subproject details as per Feasibility/ DPR Report

The new STP with 424 MLD capacity is proposed (Sequential Batch Reactor (SBR) technology) under the G-ACRP project. This STP to meet the future flow requirements and treated effluent norms prescribed by NGT. Details of the sub-project are provided in the section 1.3 of this report.

FR has suggested 3 alternatives, (refer to chapter 4) for the proposed STP rehabilitation of which Sequential Batch Reactor (SBR) technology has key advantages such as:

- Complete treatment in a single basin: Separate chambers are not required.
- Very Robust and Consistent performance for changing Influent Loads
- Excellent Treated Quality by Biological process alone to BOD_5<10, TSS<10, Total Nitrogen (TN) <10, Total Phosphorus (TP)≤1for municipal sewage of medium to high strength without adding Chemicals.
- Lowest Footprint/ Land required
- Power savings at rated capacity and at lower organic and hydraulic loads with the help of DO control in SBR basin.
- Easy to operate the plant as the design provides for advancing the cycles for storm/heavy monsoon conditions too.
- Separation of Mixing and Aeration equipment for providing separate time zones for Aerobic and Anoxic Process to achieve Denitrification / Phosphorus reduction and BOD reduction and Nitrification respectively.
- As the SBR process is fully aerobic and will work as a perfect reactor which ensures 100% treatment, thereby there is no odour nuisance.

Though DPR suggests SBR as the best alternative, considering its exorbitantly high costs, it is suggested that the DBOT Procurement be Technology Agnostic – to focus on the Best Available Technology Option to explore all possible options and in consideration of the environmental, social and economic considerations.

5.2 Environmental and Social Risks and Impacts of the Subproject

The following list is an outline of the environmental and social impacts that are expected to occur:

- Risks and Impacts on water quality of the river
- Risks and Impacts on air quality
- Noise pollution
- Risks and Impacts on soil
- Risks and Impacts on Biodiversity
- Impact on socio-economic aspects of the surrounding community including impacts due to labour influx, community safety and increased GBV and SEA/SH risks

- Potential impacts on health and safety
- Impacts of discharge from STP on adjoining communities, especially during construction phase

Usually, subprojects involve several interdependent facilities and activities mentioned above. The impacts of allied facilities may become relevant and will be identified during the detailed design stage and C-ESIA/ C-ESMP will be newly prepared/updated then incorporating risks and impacts on these.

This subproject is aimed at improving the environmental quality and overall quality of life of the city by improving the existing STP to ensure the latest standards/guidelines set as per regulations. Hence, the overall impact would be beneficial to the people of Ahmedabad and those downstream of the receiving waterbodies. Most of the risks will be limited and largely localized, temporary i.e., during the construction stage.

5.3 Impact Assessment Methodology

The methodology to assess the impacts at the subproject level is presented here. Impacts are assessed based on Magnitude, Duration, Significance, and Likelihood of the impacts and Sensitivity of the receptors.

5.3.1. Magnitude and Duration of Impacts

The assessment of magnitude is undertaken in two steps. Firstly, the key issues associated with the subproject are categorized as beneficial or adverse. Secondly, potential impacts shall be categorized as High, Average, Low, or negligible based on consideration of the parameters such as:

- Temporal extent (duration) and the likelihood of the potential impact;
- The spatial extent of the potential impact;
- Reversibility of the Impact;
- Likelihood of the impacts

The magnitude of the potential impacts of the subproject is identified according to the categories outlined in **Table 27**Table 27.

Table 27: Aspects for Determining the Magnitude of Impacts

Aspects	**Magnitude**			
Duration of the potential impact	Long term (more than 20 years)	Medium Term - The lifespan of the Program (5 years)	Short Term - 1 to 2 years or less than the lifespan of the project	Temporary - with no detectable potential impact
The spatial extent of the potential impact	Regional – much beyond project boundaries	City - Beyond immediate Project components, site boundaries, or local area	Site - Within project site boundary	Micro - A specific location within the project component with no detectable potential impact

Aspects	Magnitude			
Reversibility of potential impacts	Irreversible - Potential impact (including positive impact) is effectively permanent, requiring considerable intervention to return to baseline	Largely Reversible- Potential impact requires a year or so with some interventions to return to baseline	Reversible - Baseline returns Naturally or with limited intervention within a few months	No change - Baseline remains constant
Likelihood of potential impacts occurring	Certain - Commonly occurs under typical operating or construction conditions	Likely - Usually seen occurring under most situations	Occasional - Occurs under abnormal, exceptional, or emergency conditions	Unlikely to occur

5.3.2. Sensitivity of Receptor

The sensitivity of a receptor shall be determined based on a review of the population (including proximity/ numbers/ vulnerability) and the presence of features on the site or the surrounding area. The criteria for determining receptor sensitivity of the program's potential impacts are outlined in **Table 28**.

Table 28: Criteria for Determining Sensitivity

Sensitivity Levels	*Description*
High	The vulnerable receptor with little or no capacity to absorb proposed changes or minimal/limited opportunities for mitigation
Medium	The vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	The vulnerable receptor with good capacity to absorb proposed changes or/and good opportunities for mitigation
Negligible	Non-vulnerable receptor

5.3.3. Significance of the impact

The significance of potential impacts is established using the impact significance matrix shown in

Table 29 below.

Table 29: Assessment of Significance of Negative and Positive Impacts

Aspects		Sensitivity/ Vulnerability/ Importance of Resource/ Receptor		
		Low	Medium	High
Magnitude of Negative Impact	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major
Magnitude of Positive Impact	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major

5.4 Environmental and Social Risks and Impacts in Local Area

ESS 1: ASSESSMENT AND MANAGEMENT OF E&S RISKS AND IMPACTS

As new site has been selected for the construction of 424 MLD sewage treatment plant, there is a foreseen impact on land use in the form of tree cutting and ground clearance. To address this impact, a mitigation strategy involves considering options for transplanting trees within the site area and planting new trees at a ratio of 1:10. These transplanted and newly planted trees can be accommodated within the greenbelt that will be developed around the sewage treatment plant.

Proposed subproject involves civil, electromechanical and paint work requiring labour intensive works and their stay at site for a period of about 4 years, treatment of sewage, along with new construction for technology upgradation, discharge of treated water and disposal of sludge and other wastes including construction and demolition (C&D) wastes, use of resources such as water and power during construction, pollution generation from storage and handling of material, use of paints and other chemicals for construction activities, transportation of raw materials, wastes and sludge, reuse of treated water for irrigation will pose risks and impacts. Work requires very detailed and clear sequential planning, scheduling as the existing operations shall not suffer during construction works. The activities will be labour intensive with risks of accidents such as working at heights, excavations, construction, site clearance & work in enclosed areas and activities near ponded sewage in large tanks. Impacts and risks are moderate and can be managed by following regulations, adopting best practices for similar projects, training of staff/ manpower; and ensuring implementation of avoidance, monitoring, and implementation of mitigation measures.

No direct adverse impacts are envisaged on communities including on the disadvantaged or vulnerable people. There may be indirect impacts on communities such as increased access to communities due to replacement of kuccha road by resurfaced pucca road, increase in labour due to increased labour opportunities, movement of pedestrian due to road repairs and increased safety due to project related pedestrian movement, availability of lights during evening and nights, discharge from STP on adjoining communities, especially during

construction phase, impacts due to labour influx including increased risk of GBV and SEA. Therefore, project will need to make extra efforts to reach out through stakeholder engagement and effective GRM, to the disadvantaged and vulnerable persons and groups to involve them in both preparation and implementation.

There may also be short term, small magnitude impacts and risks on land use, erosion, sedimentation and biodiversity due to the work of outfall structures. The river is practically dry during most period of the year, and it is modified without any native riparian cover except invasive species.

The risks and impacts of the proposed sludge management facility will also be assessed by AMC in line with WB ESF and applicable national, state regulations once the technology and location is finalised, considering it as an associated facility if applicable.

The proposed subproject involves various activities during the construction and operation phases. The process of identifying potential impacts for each environmental parameter was carried out using quantitative and qualitative methods and will be used as the basis for determining the mitigation that must be carried out to minimize and prevent impacts. The potential environmental and social risks and impacts of the proposed project in the local area on water quality and quantity, air quality, soil, noise levels, and socioeconomic aspects of the area were assessed as part of ESS 1 and are as follows.

Construction and Operation stage impacts and risks under each of applicable ESSs

ESS 2: LABOUR AND WORKING CONDITIONS

AMC will contract agencies on DBOT model i.e., contractor to design, undertake civil works, agencies/ firms to support core-functions; primary suppliers of material/ equipment and other implementation support partners. These agencies contractors or consultants could be from anywhere in the country. Construction works will require labour force and associated goods and services. On the basis of contract sizes and the project implementation schedule, the construction workforce/ manpower has been estimated as 300-350 for proposed Pirana 424 MLD STP. These will be skilled and semi-skilled workforce of contractors who will stay in or near the site mostly (or in the city) for a construction period of 4 years. These DBOT contractor (or usually subcontractors) set up their machinery and plants required at work site/ pre-determined and approved other sites in agreement with AMC. In addition, there will be suppliers, transporters of material and their labour who will float in and out of the site during the work period.

Project shall comprise the following types of workers:

1. ***Direct workers:*** Direct workers will include the project managers and supervisors, who are employees of AMC. As per the structure of PIU and AMC drainage Department, the estimated number of direct workers is not likely to exceed 15.

2. ***Contracted workers:*** Entire work force deployed by the Contractors are considered as contracted workers. The Contractor(s) might further engage multiple subcontractors, whose work force engaged will also be contracted workers. As per the current work scenario in India and in Gujarat, these may also include Migrant workers

   Migrant Workers: The migrant workers are those who are employed for the subproject but do not belong to the Project region and are not normally expected to return to their

places of residence after work hours. The number of migrant workers in any contract package, would depend on multiple reasons including preference of contractors/ subcontractors to source labour, worker unavailability in the area for the purpose, and lack of technical skills and capacity. The migrant workers could be at all levels and include unskilled and semiskilled construction labour and may include male and women labour force. The migrant workers are either directly engaged by the contractor or through labour contractors, who supply the work force to as per the needs of the contractors.

3. **Primary Supply Workers:** No primary supplier or primary supply workers are anticipated as all goods and services essential to the core functions of the project shall be provided by the contractor as per the DBOT contract which will be agreed with AMC.

4. **Community Workers:** Community workers are not envisaged. Implementation of Emergency Action Plans (EAPs) for Disaster Management, will be supported by broader community involvement.

For 424 MLD STP, 79 staff are estimated for operations in the DPR.

Expected Negative Risks and Impacts

With the high population density and the metropolitan nature of the city, it has many vehicles, industrial and commercial activities which results in various sources of urban air pollution in the city. The proposed subproject activities may potentially impact the air quality during construction, operations, and maintenance of sub-projects with the addition of construction vehicles, construction activities, use of machinery, and fuel combustion. In addition, the odor may emanate from STP processes/ release of gases, use of chemicals, sludge, and treated sewage and may impact the communities near STPs, pumping stations, and discharge points.

The most significant Occupational Health and Safety (OHS) hazards associated with Construction of new STPs occur during the construction phase and include activities with moderate risk for workers if not managed adequately are listed below. These are applicable to workers/labors engaged in implementation of the subproject. Expected negative impacts and risks due to various components of the proposed subproject are as follows:

Construction of new 424 MLD STP

Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SOPs.

- Use of heavy machinery, cranes, JCB, electrical equipment with non-compliance to safety procedure and SOPs for hazards like physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving.
- Slip and fall associated with poor housekeeping, such as excessive waste debris, loose construction materials, tools, liquid spills, and uncontrolled use of electrical cords and ropes on the ground
- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and noncompliance with SOPs.

- Working in confined spaces, for example, during deepening of tanks; especially when water table is low. Confined spaces include: sewers, pipes, and access shafts, ditches and trenches
- Working with electricity/ electrical installations, appurtenances
- Signages for proposed construction areas and operation areas to prevent access of restricted area by untrained labor/ workers.

Construction of TSPS

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SOPs.
- Working with heavy machinery like cranes, electric cutters during tree cutting and tree transplantation work.
- Working with electricity/ electrical installations, appurtenances

Solar Rooftop and connection to Grid

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SoPs.
- Working with risk of fall/ drown, odor nuisance, gaseous emissions (toxic gas inhalation), pathogenic agents
- Works near hazardous/ electronic/ electrical constituents, chords, appliances
- Generation, Storage and Disposal of end-of-life solar panels which contains hazardous constituents
- Handling of broken solar panels during repairs
- Lack of use of PPEs/ protection measures

Construction of Rising main

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SOPs.
- All other common OHS hazards applicable to Construction as above.

Construction of Outfall facility

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SOPs.
- Working in confined spaces, for example, during deepening of tanks; especially when water table is low.
- Use of heavy machinery/ heavy vehicles for filing, excavation etc. with requisite permissions and implementing SOPs for specific activity.

Labour camp

- Inadequate or lack of facilities and amenities at worker camp, including drinking water, sanitation, fuel, proper ventilation, crowding, lighting, etc.
- Safety and Security issues
- Lack of medical facilities for injuries, accidents, ill health and pandemic related facilities such as treatment, isolation, testing, medical care, sanitizing quarters, etc.
- Stray animals, snake and scorpion bites related aspects for health and safety.

Common Risks & Impacts

- inadvertent or intentional trespassing, including potential contact with hazardous materials, contaminated soils and other environmental media, buildings that are under construction, or excavations which may pose falling and entrapment hazards
- Using vehicles on public and project roads, resultant accidents/ injuries
- Exposure to dust, noise (resulting in disturbances and hearing loss), the sun, heat and wet weather
- Working with hazardous materials such as chemicals (if in excess quantity), fuels, cement.
- Long term effects on life due to exposure to chemical/ hazardous wastes
- Exposure to illnesses, communicable diseases, COVID-19
- Exposure to mental or physical harassment, SEA/SH, and injury from interpersonal conflicts.
- Exposure to floods, earthquakes, and other natural and manmade disasters
- Considering the vegetation growth, snake or scorpion bite may occur during construction or operations. Presence of any other wildlife during any construction or demolition activities.
- Inadequate accommodation facilities and amenities at labour camps, including inadequate sanitation and health facilities at work site.
- Non-payment of wages and lack of compliance to mandatory labour related requirements
- Discrimination in Employment (e.g., abrupt termination of the employment, working conditions, wages or benefits etc.)
- Sexual harassment at work
- Security of women work force
- Absence or inadequate or inaccessible emergency response system for rescue of labour/ workforce in situations of natural calamities.
- Health risks of labour relating to HIV/ AIDS and other sexually transmitted diseases

Other risks that would be applicable for all types of workers would be as follows:

- Unclear terms and conditions of employment
- Discrimination and denial of equal opportunity in hiring and promotions/ incentives/ training opportunities
- Denial for workers' rights to form worker's organizations
- Absence of a grievance mechanism for labour to seek redressal of their grievances/ issues

Wastewater treatment facility operators may be exposed to physical, chemical, and biological hazards depending on the design of the facilities and the types of wastewater effluents managed. Examples of these hazards include the potential for trips and falls into tanks, confined space entries for maintenance operations, and inhalation of VOCs, bioaerosols, and methane, contact with pathogens and vectors, and use of potentially hazardous chemicals, including chlorine, sodium and calcium hypochlorite, and ammonia.

Project workers are likely to be exposed to the above identified risks over the estimated 4 years of construction. Workers with low experience of working on large scale construction project are expected to be more vulnerable as their skillsets, experience and understanding of health and safety will probably be limited compared to the skilled workers who will have

worked on similar projects and have sufficient training. However, the project site in the city of Ahmedabad with many health care facilities near the site. Here, services from emergency first-aid response to Quaternary care are available within 2 km distance.

All engagement of laborers will follow the project level Labor Management Procedure (LMP). Child labour and forced labour will be prohibited. All workers will have access to project's worker's grievance redress mechanism (GRM).

Area and site under AMC for labour camp within accessible distance from STP to be identified by DBOT contractor and necessary permission/ approval to be taken from AMC. Workers in the labour camp will need sanitary facilities such as toilets, washing areas, and sanitary waste disposal areas. Adequate and safe accommodation with proper ventilation, comfortable stay, sanitation, first aid facilities, water, fire safety, protection from weather conditions and extreme events, facilities including cooking and lighting is essential. Covid- 19 precautions for such camps to be planned and implemented.

Each Contractor for each package will be expected to conduct a hazard and risk identification and create a risk register using the Hazard Identification, Risk Analysis, and Risk Control (HIRARC) method. The Risk Register will identify controls such as elimination, substitution, modification, and preventive and protective measures.

OHS Risks of common construction activities during various work stages is presented in **ANNEXURE VI**.

Positive Impacts

The subproject will provide opportunities for workers and improve their economic and overall development. It will also give fillip to economy through its upstream - downstream linkages, especially, material procurement, job opportunities in the surround area by triggering the establishment of many small local shops, and service providers during construction period, some of which may continue after this period. Unskilled and semi-skilled labour work can be sourced from the settlements as per availability and willingness of labour. Women can also be hired for specific tasks from the settlements. Since the settlement is nearby some women may be willing to work on-site as labour. 150 to 200 women from Gyaspur go out for some work in the industries.

It will also trigger improvement in working conditions (Use of safe work practices, Fire Safety and Disaster Management, awareness on the need to follow safe practices, health camps/ check-ups, covid appropriate behaviour, labour camp management and facilities), overall odour and air quality of the local area, thus influencing the work culture of the area positively and improving health of workers in this site and neighbouring STPs, and metro depot and other facilities.

OHS Risk management strategies

- Training of workers in Critical Controls for High Energy Hazards
- Training on lifting and materials handling techniques including the placement of weight limits above which mechanical assists or two-person lifts are necessary
- Planning work site layout to minimize the need for manual transfer of heavy loads

- Selecting tools and designing workstations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable workstations
- Implementing administrative controls into work processes such as job rotations and rest or stretch breaks Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
- Cleaning up excessive waste debris and liquid spills regularly
- Locating electrical cords and ropes in common areas and marked corridors
- Use of slip retardant footwear If fall hazards exist, a fall protection plan should be in place
- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 100 Kg, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface
- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 2250 kg as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 2250 kg
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces
- Using a designated and restricted waste drop or discharge zones, and/ or a demarcated lift/ chute for safe movement of wastes from upper to lower levels
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap
- Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as handrails and toe boards to prevent materials from being dislodged
- Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes
- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, planning traffic movement with Local traffic Police Department, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
- Ensuring moving equipment is outfitted with audible back-up alarms
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
- PPE, such as dusk masks, should be used where dust levels are excessive the use of excavation dewatering, sidewalls support, and slope gradient adjustments that eliminate or minimize the risk of collapse, entrapment, or drowning
- Providing safe means of access and egress from excavations, such as graded slopes, graded access route, or stairs and ladders
- Avoiding the operation of combustion equipment for prolonged periods inside excavations areas where other workers are required to enter unless the area is actively ventilated
- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated materials (as in STP tanks, pumps)
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements Prior to dismantling or demolition for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection
- Awareness and Use of PPEs while working with Solar panels
- Storage of end-of-life solar panels, without impact on communities
- Description of response activities for life and fire safety, in the event of a spill, release, emergencies, disasters especially floods
- Definition and implementation of permitted maintenance activities, such as hot work or confined space entries
- Provision of suitable personal protection equipment (PPE) (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities
- Monitoring and record-keeping activities, including audit procedures designed to verify and record the effectiveness of prevention and control of exposure to occupational hazards, and maintaining accident and incident investigation reports on file
- Fire resistant, noise-absorbing materials should be used for cladding on ceilings and walls of offices, rest areas on site
- Create safe refuges on site for people to gather safety in case of emergencies, shut down construction activities during heavy floods/ disasters and wait for authority's advice
- Provide required facilities on site and ensure livable conditions in labour camp if any: lighting, ventilation, safe structures, water, sanitation (with water supply), first aid, food/ potable water, awareness and workers shall be well trained, and emergency contacts/ support, and health checkups shall be arranged
- Proper design measures to prevent OHS impacts (example: on rotating moving, oscillating, other equipment)
- Leachate management from sludge, ventilation of Greenhouse facility and health checkup for workers
- L&FS Master Plan to be prepared, implemented

ESS 3: RESOURCE EFFICIENCY AND POLLUTION PREVENTION AND MANAGEMENT

Impact on Physiography

Expected Negative Risks and Impacts

As per current DPR, the construction work of 424 MLD STP will be carried out on new greenfield site of 25 hectares, also the proposed location for TSPS, outfall and approach road has presence of trees and other vegetation, and hence the process will include clearing jungle including uprooting of rank vegetation, grass, brush wood, cutting of trees. The process will also include excavation and levelling of the site. During detailed design stage, considering the lack of available space on site, it is important to see if any nearby site would be required/ used for material storage, demolition waste or setting up of labour camp. Site for material storage and labour camp shall be identified by DBOT contractor and get approval from AMC based on the quantum, duration and type of material required to be stored. The contractor shall identy the land for labour camp in consultation with AMC. Any area under AMC/AUDA possession nearby shall be identified for labour camp. Impacts will be accordingly analysed for such sites. Temperature increase and impacts on Micro-climate due to spread of solar panels for solar roof top on site is also a concern.

Positive Impacts

There will be no significant impact on physiography of the region. This is important considering the proximity of the site to River Sabarmati.

Impact on Land/ Geology

Expected Negative Risks and Impacts

Risks and impacts on land and geology will be limited to sourcing of construction material or related to disposal of demolition and construction waste, sludge, and other wastes only. The civil works will require different materials such as earth, aggregate, boulders, and sand, in specified quantities and will be sourced from already operational and approved quarries and suppliers. Large extent of the land dedicated for solar panel-based drying of sludge is a concern, there may be impacts on ground cover, and chances of contamination due to leachate/Slurry/ Sludge in case of improper handling or spill if not properly collected and treated.

Positive Impacts

Overall positive impacts of the subproject include better resource efficiency in material sourcing; The various 'resource efficiency' considerations during design stage will include recycling and optimize usage of material, use of alternate energy, construction and other waste generated from rehabilitation activities and thereby reduce potential impact due to dumping (example: recycling and reuse of demolished materials in the C&D waste management facility of AMC, use of recycled products from the C&D waste management facility for proposed works). These will ensure overall minimal land impacts. In addition, all wastes will be managed in line with applicable regulations and best practices.

Impact on Soil

Expected Negative Risks and Impacts

The soil will be excavated during the construction activity which will generate soil as waste and may also result in soil erosion. There will be minor impacts on soil due to rehabilitation and demolition works especially spillage of, materials, oil, chemicals, and wastes generated including contaminated parts. There is also possibility of contamination of soil from leakage and spillage during handling and storage of fuels and chemicals. During monitoring, if hazardous content is detected, sludge will be sent to TSDF. Contractor shall discuss with AMC the monitoring results & manage sludge as per Sludge & Waste Management plan. Sludge will be transported to Sludge management facility which has been proposed by AMC & present plan shall be upgraded in ESIA after finalization.

Construction and Operation of STP

- Spillage of sewage, materials, oil, chemicals, and wastes generated.
- Contamination of soil due to solid waste disposal inappropriately, improper storage of construction materials, and goods.
- Excess chlorination may affect aquatic biota.
- Discharge of slurry from the facility and spillage into drainage channels or river Sabarmati may harm water quality and thus biodiversity.

Construction at TSPS

- Spillage of sewage, materials, oil, chemicals, and wastes generated. Contamination of soil due to C&D waste
- Contamination of soil due to solid waste disposal inappropriately, improper storage of construction materials and goods.

Solar rooftop

- Land/Soil contamination during maintenance and cleaning of panels, and storage of damaged solar panels used in solar roof top

Construction of Rising main

- Underground nature of rising main will result in excavation and generation of top soil as waste.
  Improper storage of materials and equipment required for construction leading resulting in soil contamination

Construction of Outfall facility

- C&D waste generated will affect the river sediment.
- Improper filing leading to disturbed flow in the river.

Labour camp

- Contamination of soil due to inadequate facilities/amenities and unhygienic practices in labour camp

Common Risks & Impacts

- Leakage/ leachate from storage of raw material and chemicals

Positive Impacts

Wastes generated from works will be sludge (Quantity of Wastes-61 cum/day and dried sludge 123 cum/day), screenings, dust, wastes (biodegradable and non-biodegradables, hazardous, e-wastes etc), nevertheless, all the construction debris needs to be stored well not to contaminate the soil and disposed of in a planned manner to avoid adverse impacts on soil. Waste storage, storage area for construction material and labour camp shall be identified by DBOT contractor and get approval from AMC. In the Final Detailed Project Report, details on storage areas for various wastes are not available. Hence, during detailed design stage, considering the limited space on site, it is important to see if any nearby site would be used for material or waste storage or setting up of labour camp. Impacts will be accordingly analysed for such sites by DBOT contractor and updated in ESIA & ESMP.

Impact of Material Handling and Waste Generation

During construction and maintenance, it is important to manage construction and demolition wastes, e-wastes (as in electrical parts), hazardous wastes (as in asbestos of old pipes, sheets used), or chemicals.

Expected Negative Risks and Impacts

Construction of STP

- During construction phase, construction materials will be stockpiled within the Proposed site. This might leach into nearby environment through storm water, or wind and pollute the air, nearby buildings (as dust), water bodies or land.

Operation of STP

- Waste screenings, bio and non-biodegradable wastes, sludge are the wastes generated during operation phase. This will also be pertinent during construction phase, as existing STP will be operating.

Construction of TSPS

- During construction phase, construction materials will be stockpiled within the existing 180 MLD campus. This might leach into nearby environment through storm water, or wind and pollute the air, nearby buildings (as dust), water bodies or land.
- There is possibility of accidental flow of sewage while working in TSPS

Construction of Rising main

- During construction phase, construction materials will be stockpiled within the existing campus. This might leach into nearby environment through storm water, or wind and pollute the air, nearby buildings (as dust), water bodies or land.
- There is possibility of accidental flow of sewage while connecting the rising main

Solar Rooftop

- Land/ Soil contamination during maintenance and cleaning of panels, and storage of damaged solar panels
- Damaged and End-of-life solar panels which contains hazardous constituents

Labour camp

- Workers, especially migrants may reside in the area during peak construction period. It is important that the camp is not set up in Pirana STP premises. It is suggested that stay arrangements are made at least at a distance of 20m from existing STPs complex and 150m from river edge. Camp, from where it is easier to access the site preferably without crossing the road or using vehicular transport. It is recommended to arrange sanitary and solid waste management facilities at the labour colonies to avoid water and land pollution, odour issues and health impacts. There will also be an influx of labourers and other service providers into the project area.
- It is essential that from the planning stage, sewage management and solid waste disposal facilities should be conceptualized to maintain the health of the people and the environment.
- Solid waste generated from the labour camps and work sites during construction phase will be segregated and properly stored, collected, transited, treated and disposed as per Solid Wastes Management Rules, 2016, in AMCs existing facilities for bio and non-biodegradable wastes.
- Contractor shall arrange first aid box at site and shall arrange medical facilities, medical check-up/ camps to labour at site especially during accident/ emergency or routine works with sewage which is likely to generate bio-medical waste. Though the quantity is not expected to be significant, this needs to be channelised to Biomedical waste management facility at appropriate intervals to avoid indiscriminate dumping.

Positive Impacts

The project would also need to address the management of materials (such as construction materials, chemicals used for STP operations, fuels, paints etc.) solid (screenings, wastes, sludge, construction and demolition (C&D) wastes, e-waste from electro-mechanical equipment) and liquid waste (from construction activities, run-offs, waste water/ sewage from labour camp, leachate from sludge, treated sewage, accidental leakage of untreated sewage) generated during the construction and operation phases. Contractor will prepare management plans (OHS, CHS, Waste Management etc) and implement the same.

All wastes will be managed following National regulations and WB EHS: C&D wastes will be sent to the AMC C&D waste management facility where it is converted into useful products for recycling back for construction purposes; some of those will be used in the construction purposes and site development for this subproject thus ensuring resource efficiency. Screenings, plastics and wastes will be treated and disposed at AMCs solid waste management facility. Machines/equipment's will be auctioned to authorised recyclers. E-waste including Solar panels will be sent to GPCB approved e-waste recyclers and all these requirements will be made part of DBOT contract. Site and material storage areas will be provided with cut off drains to collect and treat liquid wastes. Standards suggested by national guidelines for sludge quality and WB EHS will be followed. Sludge will be handled by AMC as per regulations. Sludge

quality will be monitored and sent to AMC's Proposed Sludge Management facility that would be in operation by the initiation of STP operations If it is non-hazardous where it would be treated as required for identified end use. Or else it shall be used for permitted uses as per National Regulations. If tested hazardous it shall be sent to the nearest appropriate Hazardous Waste TSDF for disposal following the Hazardous Waste Management Rules of Govt of India, 2016.

Contractor will have the responsibility to store, test, transfer sludge for disposal appropriately based on the monitoring results & existing regulations, as agreed in writing with AMC.

Impacts on Water Resources and Quality

The proposed subproject is not expected to impact drainage pattern or water resources (ground or surface) largely. The water for construction will be sourced from existing supply by AMC and as such requirement will be limited. However, use of water resources will be optimised before start of work through application of Resource Efficiency and Pollution Prevention techniques which will include optimal use planning, recycle and reuse option. Possible reuse of treated wastewater for construction after chlorination will be explored.

The DBOT contractor will prepare project specific water use and water balance analysis based on detailed design and prepare an action plan for water conservation, recycling/ reuse, and management and submit to PIU for approval.

No construction activity will be carried out on the river and hence physical changes on the river are not expected. Minimal disturbance to river is expected due to outfall construction. No water will be sourced from river or wells for construction.

Expected Negative Risks and Impacts

Construction and Operation of STP

- Possible flow of improperly stacked construction materials and its packaging into river
- Sediment (fine) in stormwater run-off from in and around open/exposed work areas, roads into the river.
- Sediment (fine and coarse) from soil disposal and stockpiles (in areas selected for stock piling & soil disposal) carried by stormwater run-off
- High pH suspended solids from cement storage and concrete batching areas
- Hydrocarbons, heavy metals, and nutrients, from spills, deliberate discharge, and poor storage, handling and disposal of hazardous materials, fuels, and waste oils, including those that may induce pH changes.
- Mixing of sewage with flood waters

Construction of TSPS

- Possible flow of improperly stacked construction materials and packaging into river
- Sediment (fine) in stormwater run-off from in and around open/exposed work areas, roads into the river.
- High pH suspended solids from cement storage and concrete batching areas
- Hydrocarbons, heavy metals, and nutrients, from spills, deliberate discharge, and poor storage, handling and disposal of hazardous materials, fuels, and waste oils, including those that may induce pH changes.

- Mixing of sewage with flood waters
- contamination from construction machinery in use near water bodies

Construction of Rising main

- Sediment (fine) in stormwater run-off from in and around open/exposed work areas, roads into the river
- Contamination from construction machinery in use near water bodies

Construction of Outfall facility

- works on outfalls or river edge strengthening, if any, may lead to erosion due to inappropriate implementation.
- Mixing of sewage with flood waters
- discharges and disturbance of soil and sediment that drain into surface waters
- Contamination from construction machinery in use near water bodies

Labour camp

- Solid waste from littering and poor handling of waste in workplace, labour camps
  - Organic material, pathogenic bacteria and nutrients from poor siting and management of the Contractor's sewage treatment facilities, including siting of septic tanks that could lead to seepage to rivers, ground water
  - Organic material, pathogenic bacteria and nutrients from untreated sewage from informal settlements, camp followers and open defecation affecting host villagers Common Property Resources

Positive Impacts

Positive Impacts on water quality include:

- Minimal bypass of sewage without treatment
- Better quality of treated sewage discharged into the river
- Better ground water quality downstream for irrigation
- No impact of mixing of sewage during floods
- Proposed new STP would improve the quality of treated sewage, by making it more suitable for recycling. Good quality treated sewage will be available for irrigation and recycling for other uses on site after disinfection and improves water availability in the water scarce region.

After the construction of the NEW 424 MLD plant, the sewage from the existing 180 MLD plant will be diverted to this newly constructed plant to avoid diversion of untreated sewage directly into the river.

Reduction in Pollution Load on River Sabarmati due to construction of new Pirana 424 MLD STP

Currently, the quality of treated effluent is suboptimal. AMC aims to achieve the stringent quality of treated effluent in its new STPs and those proposed under G-ACRP, and at the same time recycle and reuse of treated effluent would reduce the burden on fresh water resources

ensuring their long-term sustainability [38] to ensure resource efficiency and reduce BOD load on receiving water bodies.

Three scenarios are considered for evaluating the cumulative impacts on the water bodies:

- Scenario 1: Strategy towards Decentralized Sewage Management - No STP Scenario: when there are no STPs to treat sewage generated in the zone, with all sewage going to toilets with/ without appropriate septic tanks. In this case, total diffused pollution load ultimately reaching Sabarmati, would be high mainly as the soil is alluvium. With increased draining through open disposal, disposal into canals, septic tanks, and soak pits leaching of polluted water to the river will be high and from multiple areas. This also increases chance of leaching of pollutants from land disposed pollutants.
- Scenario 2: 'As is' scenario – No Project Alternative: If the existing STP continue to maintain same performance levels and standards. In this case pollutant levels will be high in Sabarmati. This will continue to impact agricultural users downstream, near riverside.
- Scenario 3: Proposed STPs follows stringent discharge norms – Technology/ Capacity of new STPs: If the STP follows NGT norms and are well maintained, as envisaged by G-ACRP the pollution load in Sabarmati will reduce. Better quality of treated water will be available for agriculture, and this will improve overall health of the region.

The subproject with capacity of 424 MLD can ensure around 95 percent reduction in BOD, SS, and TP pollution load due to this facility if implemented.

Impact on Ambient Air Quality

With the high population density and the metropolitan nature of the city, it has many vehicles, industrial and commercial activities which results in various sources of urban air pollution in the city. The proposed subproject activities may potentially impact the air quality during construction, operations, maintenance and decommissioning of units with the addition of construction vehicles, construction/decommissioning activities, use of machinery, and fuel combustion. In addition, the odor may emanate from STP processes/release of gases, use of chemicals, sludge, and treated sewage and may impact the communities near STPs, pumping stations, and discharge points.

Expected Negative Risks and Impacts

Air quality may be affected in the form of dust, particulate matter and gas emissions from exhausts.

Dust emissions: Construction activities can give rise to dust emissions if not effectively managed and have the potential to affect receptors near to the main construction sites due to dust generated from demolition, excavation, operation of construction equipment and machinery, increased movement of vehicles, on unpaved access roads. Since the proposal is for the construction of the new 424 MLD STP plant on the greenfield site large scale earth works are expected, and hence there can be a possible impacts of wind during night or inactive construction periods.

[38] FR, section on Provision of Sustainable Green Interventions

Dust mainly comes from the use of roads, cleared land in the work area, material stockpiling. Particulates (other than dust) and gas are emitted from vehicles, heavy machinery, diesel generators and asphalt processing sites for access road. The impact of air contaminants, such as dust, can disrupt local communities (deposition in water supplies and on buildings and other facilities), while it can also affect public health. The communities most at risk are those close to the main access road as this is most exposed to dust and vehicle emissions. The main mitigation measures are covered by the Environmental Management Plan and associated sub-plans and include the management of dust, exposed soil and material emissions; maintenance of vehicles and equipment to control emissions; avoid burning vegetation and trash; and managing a complaint and resolution service system. Average wind is 6-8 km/hr, but the dust impact due to demolition or on-site construction is less severe as the predominant wind direction is away from the settlements nearby.

Gaseous emission during construction and operation of STP will be from machinery, equipment and vehicles used for material transportation. The operation of vehicles and equipment mostly with diesel fuel will result in emissions of carbon monoxide, sulphur dioxide, and oxides of nitrogen. The impact on air quality due to emissions from vehicles and plant will be in the areas immediate to the work area. There are multiple sources of pollution near around existing STP site. Generally, additional vehicle movements generated during the construction and operations will have the potential to influence local air quality at sensitive receptors located at close proximity to road and pollutant concentration is likely to reduce with increase distance from road. The impacts will therefore apply mostly to the settlements next to the site boundary and access roads. Air emissions from wastewater treatment operations may include hydrogen sulphide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (e.g., chloroform generated from chlorination activities and other volatile organic compounds (VOCs) from industrial wastewater), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols. Odors from treatment facilities can also be a nuisance to workers and the surrounding community Impacts due to operational stage gaseous emissions and odour including H2S and SO4, CH4 etc. also would continue during construction stage. However, due to better facilities and performance such impacts ware expected to reduce when operations of the rehabilitated STP commences. Fugitive VOC emissions are associated with VOC-containing liquids or gases where the material is under pressure, exposed to a lower vapor pressure, or displaced from an enclosed space, tanks. Equipment leaks include valves, fittings, and elbows which are subject to leaks under pressure.

Determination of the amount of exhaust emissions generated by heavy vehicles is calculated using the basis of emissions generated by trucks. Transportation during the operation phase is estimated to be carried out by 30 heavy diesel vehicles i.e., trucks per day. Emission coefficients for trucks from CPCB[39].

- CO = 1.5 g/km,
- NOx = 3.5 g/km,
- HC = 0.96 g/km
- PM = 0.02 g/km

[39] *https://cpcb.nic.in/vehicular-exhaust/*

Based on the emission coefficient and traffic density mentioned above, the number of emissions by transport vehicles, for each air quality parameter, is as follows:

- CO = 0.045kg/day/km
- NOx = 0.105kg/day/km
- HC = 0.029kg/day/km
- PM= 0.0006kg/day/km

The main access roads and construction sites had a moderate impact significance. Mitigation to reduce the risk of negative impacts from reducing air quality is described in ESMP.

Construction of STP

- Dust & gaseous emission due to transportation & machinery
- Issues and concerns to release of noxious gases/ chemicals during storage and commissioning of new units.

Construction of TSPS

- Dust & gaseous emission due to transportation & machinery

Construction of Rising main

- Dust & gaseous emission due to transportation & construction activities.

Labour camp

- Dust & gaseous emission due to unhygienic practices in labour camp
- Improper ventilation and lack of separate and proper cooking facilities in the labour camp.

Positive Impacts

Access road improvement will help in reducing dust emissions. Odor emissions are expected to reduce considerably during operations with improvement in STP process and adoption of modern technology and replacement of existing machinery, which will reduce stagnation, wastes and sludge.

Ambient Noise and Vibration

Noise is a common problem in urban areas as compared to the villages because of the mechanization and more vehicles on the road. All types of noise altogether affect the same irrespective of the sources and cause headache to the high blood pressure and other heart diseases.

Expected Negative Risks and Impacts

The site is bounded by Sabarmati Riveron north; south by Gyaspur village & Abellone Clean Energy Ltd (Goodwatts Ahmedabad Pvt. Ltd); east by existing STP plant of 180 and 155 MLD and west by CETP NTIEM & Sabarmati river. Most important receptor is the settlements next to STP site and access roads.

Sources of noise will be the, site clearance activities, ongoing operations of the STP, vehicles and equipment for construction at the project site. Noise levels will increase during the period of construction. Additionally, noise levels will increase on approach roads due to increased traffic.

Noise can impact officials and workers on site and others who reach the site for supply of materials or equipment's or other services; and those residing and working nearby. Such impacts can become significant if they are exposed to high noise for long hours continuously.

The ambient air quality standards in respect of noise in different areas/ zones have been notified by the Ministry of Environment & Forests, Government of India vide 'The Noise Pollution (Regulation and Control) Rules, 2000. The Schedule of ambient air quality standards in respect of noise notified in the above 'Rules' is reproduced below:

Table 30: Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area/ Zone	Limits in dB(A) Leq	
		Day time	Night-time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

The subproject noise sources consist of, land clearances, earthworks, demolition of some existing facilities, construction new structures, and vehicle movements along the access roads.

Note:

1. Day time shall mean 6.00 a.m. to 10.00 p.m.

2. Night-time shall mean from 10.00 p.m. to 6.00.a.m.

3. Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions and courts. The silent zones are zones which are declared as such by the competent authority.

4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

5. dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A, Leq being energy mean of the noise level over a specific period.

Current noise levels at Pirana STP site are 60.63 dBA and 52.55 dBA respectively during day and night times. The operation of a motor vehicle/ truck that transports materials will contribute to a noise increase of ±70 dBA. The estimated noise in a residential area (settlements along access/ boundary/ or in between STP boundary and Canal) within ±10 m from the main road through calculations with a single point spread is as follows: Ts1-Ts2 = 10 log r2/r1. Allowable further noise levels exposure for existing noise exposure of near around 60 dBA (rounded to nearest decibel) as per FTA manual is 57 dBA, which will produce combined level of 62 dBA. This is within the permissible noise levels for a mixed-use area with Metro depot, STPs etc. (if considered industrial limit is 75dBA, if considered commercial, it is 65dBA, considering residences in settlements, this is 55dBA). Upto <61 dBA of combined noise impact exposure is considered no impact, while 61 to 66 is moderate impact and >66dBA is severe impact.

Work activities which may generate continuous noise need to be curtailed. Impulsive or impact noise is not expected from proposed works. Permissible exposure in cases of continuous noise is presented in below.

Total time of exposure (continuous short-term exposures)	Sound pressure level in or a number of dBA per day, in hours
6	87
4	90
3	92
1 ½	97
1	100
¾	102
½	105
¼	110

1. No exposure in excess of 110 dBA is to be permitted.
2. For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column 1, the permissible sound pressure level is to be determined by extrapolation on a proportionate basis.

Amount of Noise Level at 10 m from access road is 60 dBA, and from 30m is 55 dBA. Already truck carrying materials ply through this road, for operations and maintenance of STPs in the area, and to nearby mixed land uses. All machines operating in an area should produce noise within the acceptable level to maintain the well-being of people around. Adequate awareness/ information shall be provided to all nearby communities and users on possible increase in noise levels. Tools and mechanisms which generate less noise shall be preferred, night-time restrictions on construction, Mufflers, screens and site buffers shall be engaged. Mitigation measures are presented in next Chapter on ESMP.

Construction of STP

- Noise emission due to use of heavy vehicles, construction activities & machinery

Construction of TSPS

- Noise emission due to use of heavy vehicles & machinery

Construction of Rising main

- Noise emission due to use of heavy vehicles, excavation activities & machinery

Construction of Outfall facility

- Noise emission due to use of heavy vehicles & machinery.

Positive Impacts

Replacement of old machinery and pumps as part of proposed activities will reduce noise emanating from STP operations.

Vibration

Expected Negative Risks and Impacts

As per the Detailed Project Report the subproject does not involve quarrying or blasting and hence, vibration impacts are limited:

- to operation of vehicles along accesses only during work hours of the day
- Site clearance, & demolition activities
- Installation of machinery (Thickener cum Dewatering machine (COTDM) feed sump, transformer, UV channel, Belt filter press, Construct MC3 (1 no.) consists of Transformer, Blower room, MCC Room etc.)

Vibrations will be monitored during construction activities, and the contractor will execute the complaint management service. The contractor is expected to develop a construction method or schedule for activities that generate noise in accordance with the results of monitoring the vibration level (exceeding the noise standard limit in residential areas) or complaints from the public.

At this stage, quantity of material which need to be transported is unknown as design will be finalised aby design consultant. The contractor can estimate vibration impact based on quantity of material to be transported to arrive at impact magnitude. vibration generated by the dump truck operation on the main road is relatively small for the receptor distance of more than 7.62m. So, this will cause impacts on immediate row of houses along the access road. DPR reports presents the reconstruction and demolition activities expected at TSPS, which are at a distance from the nearest sensitive receptor - the settlement and adjacent to the road. The magnitude of the impact of the noise will decrease as the distance of the receptors gets further.

Sensitive receptors (settlement) are present near the proposed area, but the impact is categorized as a moderate negative impact with a medium intensity because it is estimated that there will be a mobility of trucks considering the type of construction proposed. Vibration generated from the project activities will be very negligible and will not travel through the substratum as the soil is alluvial in nature.

Positive Impacts

Proposed surfacing of the access road will reduce road irregularities which in turn reduces vibrations due to all vehicle movements. Further, as the proposed construction would ensure stronger STP parts resistant to disasters like earthquake, vibrations in those elements will be further reduced.

GHG Emissions and Climate Benefits of the Proposed construction of Pirana 424 MLD STP[40]:

Baseline emissions have been estimated for present year 2021. Further, two situations are examined. Situation A, which is Business as usual scenario for 2039, with no intervention for process and capacity augmentation at the STP, and Situation B, where the proposed Project Intervention has been implemented for the year 2039.

[40] *AMC, February 2024. Final Detailed Project Report Rev 1 for Construction of New 424 MLD STP With construction of New 424 MLD Terminal Sewage Pump Station with allied infrastructure at Pirana, prepared by RH-DHV, unpublished.*

Table 31 Carbon emissions from conveyance of sewage from TSPS

Scenario	G_1 tCO_2e/yr
Baseline Scenario 2023	6332
Business-as-usual 2041	6332
Project intervention 2041 SBR	8071
Project intervention 2041 A2O	8071

Table 32 Carbon emissions from operation of STP

Scenario	G_{E2} $tCO_{2e}e/yr$	G_{CH41} $tCO_{2e}e/yr$	G_{N2O1} $tCO_{2e}e/yr$	G_2 $tCO_{2e}e/yr$
Baseline Scenario 2021	2166	52605	25352	80124
Business-as-usual 2039	2166	98542	32986	133694
Project intervention 2039 SBR	18584	2480	3872	24936
Project intervention 2039 A2O	22496	2480	3872	28849

Table 33 Carbon emissions from handling and disposal of sludge

Scenario	G_D tCO_2e/yr	G_3 tCO_2e/yr
Baseline Scenario 2021	17	17
Business-as-usual 2039	31	31
Project intervention 2039 SBR	21	21
Project intervention 2039 A2O	24	24

Table 34 Comparative Analysis of GHG emissions

Scenario	G_1 tCO_2e/yr	G_2 tCO_2e/yr	G_3 $tCO_{2e}e/yr$	G $tCO_{2e}e/yr$
Baseline Scenario 2021	6332	80124	17	86473
Business-as-usual 2039	6332	133694	31	140047
Project intervention 2039 SBR	8071	24936	21	33029
Project intervention 2039 A2O	8071	28849	24	36944

In a business-as-usual scenario, where the plant is not upgraded, the carbon emissions due to methane from treated and untreated wastewater alone would be 98,542 tCO2e/yr. With the proposed technologies, carbon emissions would reduce to 2, 480 tCO2e/yr from the biological treatment alone. The carbon emissions due nitrous oxide would also reduce from 32,986 tCO2e/yr to 3,872 tCO2e/yr through the biological treatment process.

In a project intervention scenario, despite the more than two-fold increase in sewage treated, the emissions from treatment process and sludge handling are estimated to be significantly

less. The methane and nitrous emissions from treatment of wastewater would significantly be reduced due to improved methane correction factors in the proposed technologies. Furthermore, project intervention would ensure that there is no discharge of untreated sewage into the water bodies, thus reducing emissions from untreated wastewater discharged into the water bodies. The improvements in sludge waste management under the overall project will also help reduce emissions. Through the project intervention, 100000 tCO2e/yr of GHG emissions can be saved on an average.

Increased plantation will aid in carbon sequestrations. The proposed STP has a green belt around the plant with minimum of 30% - 33% of area devoted to tree plantations. The internal roads shall have plantation. With this increased tree cover, 6800 tCO2e/yr of emissions can be reduced.

Pollution Risk management strategies and encourage Resource Efficiency

- Follow the discharge standards based on NGT suggested and additional parameters and limits suggested in this ESIA, which is more stringent than the existing (EP Rules, 1986) standards which is suggested by WB EHS and considering the intended use of receiving water body
- For reuse for agriculture, consent shall be sought from GPCB, and standards shall be fine-tuned based on additional study through Agricultural University based on the CPCB guidance on reuse of treated water for irrigation (and preparation of irrigation Management Plan) considering the stakeholders views, requirements, and quality, quantity aspects
- Demolition of one of the structures at the proposed TSPS location is required which may have some wastes, and the contaminated area shall be well restored, after testing for contaminants and pathogens. Cost for this shall be included in Detailed estimate. C&D waste can be used for land filling for proposed STP site.
- Store materials wastes and chemicals away from flood prone areas, or elevate such areas, and provide cut off drains
- Various wastewater streams are segregated; and it is suggested to install sensors to be alert on industrial pollution ingress
- Prevent or reduce wastewater pollution through such measures as recycle/reuse within their facility, process modification
- Open burning of solid wastes, whether hazardous or non-hazardous should be avoided, as the generation of polluting emissions from this type of source cannot be controlled effectively
- Reduce, Recycle, Reuse C&D and other wastes
- Pollution impacts of Solar panels is important, and storage, handling and disposal shall be clearly agreed. No panel shall be found stacked on site without adequate protection to prevent pollution
- Get permits for plants from GPCB under Air Act, and follow consent conditions

- Implementing a leak detection and repair (LDAR) program that controls fugitive emissions by regularly monitoring to detect leaks, and implementing repairs within a predefined time period
- Use of dust control methods, such as covers, water suppression, or increased moisture content for open materials storage piles, or controls, including air extraction and treatment through a baghouse or cyclone for material handling sources, such as conveyors and bins
- Use of water suppression for control of loose materials on paved or unpaved road surfaces
- Implement recommended engine maintenance programs
- Drivers should be provided awareness on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits
- Enhancement of energy efficiency measures
- Protection and enhancement of sinks and reservoirs of greenhouse gases (such a green belts)
- Limitation and/ or reduction of methane emissions through recovery and use in waste management, using better technology such as SBR
- Implement air, water, soil, biodiversity Monitoring program during construction (including project roads, and on site) and operations
- Use LED bulbs, fans/ star rated pumps/ equipment
- Use Solar energy as; Solar lighting/ use of solar energy as much as feasible (provided disposal of panels at TSDF is arranged, proper storage and use of PPEs while working with damaged panels are ensured)
- Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD)
- Ensure sewer system capacity
- NO reuse to be permitted before chlorination
- Sludge to be stored, disposed in hazardous facility and in compliance with local regulatory requirements, if tested so; else to be sent to Sludge Management Facility.
- Use or handling of hazardous material, including asbestos to be avoided
- Training of operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training
- Implementation of inspection programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valve systems, containment infrastructure, emergency shutdown systems, controls and pumps, and associated process equipment
- Preparation of written Standard Operating Procedures for safe transfer and filling of the hazardous material, and in spill prevention and response

- SOPs for the management of secondary containment structures, specifically the removal of any accumulated fluid, such as rainfall
- Identification of locations of hazardous materials and associated activities on an emergency plan site map
- Documentation of availability of specific personal protective equipment and training needed to respond to an emergency
- Documentation of availability of spill response equipment sufficient to handle at least initial stages of a spill and a list of external resources for equipment and personnel, if necessary, to supplement internal resources
- Description of response activities for life and fire safety, in the event of a spill, release, emergencies, disasters especially floods
- Select equipment with lower sound power levels, use silencers, mufflers on engine exhausts and compressor components, acoustic enclosures (minimum surface density of 10 kg/m2) to prevent noise impacts from sensitive receptors
- Re-locating noise sources to less-sensitive areas to take advantage of distance and shielding and Siting permanent facilities away from community areas if possible, or taking advantage of the natural topography as a noise buffer during facility design · Reducing project traffic routing through community areas wherever possible
- Green belts to reduce air/ odour pollution impacts

ESS 4: COMMUNITY HEALTH AND SAFETY

Health safety and security risks and impacts on project affected communities especially on vulnerable people are important.

Expected Negative Risks and Impacts

Though work activities would happen on existing STP site; settlement is near the site boundary although access points from Narol Naroda highway is different. The subproject construction works would involve labour, transportation through access roads and handling of material, civil construction and machinery replacement and installation works, and such activities may directly or indirectly impact the community.

Engagement of labour for project work and their stay near the site for a period of about 4 years, will increase the risks of crimes including gender-based violence. Waste generation from labour camps/colony if not handled properly, will pollute the water resources used by community for drinking leading to health impacts. Migratory workforce may bring in infectious diseases not known to area. There can be risks due to COVID 19 in the present circumstances.

Traffic in nearby roads may be affected by increased movement of traffic which in turn places the community at the risk of increased noise, air emissions, and accidents. Traffic and Transport: Increased traffic inconvenience (emissions, congestions, longer travel times, blockage of access)..

Similarly, civil construction and other works will lead to pollution air emissions and noise generation.

Initially Pirana site was demarcated for development and construction sewage treatment plants and related activities, and as and as the city expanded the nearby communities have come up long after the establishment of the STPs at Pirana. Pirana has thus become a mixed-use hub to south of the city, where many public infrastructures such as STPs, also exist near to formal residential estates, commercial areas, hospitals, schools and settlements. This location is surrounded by other STPs, and solid waste processing industries, with minimal impact on communities in formal residential areas, but the settlement near the STP will face health and safety impacts. Possible impacts on health and safety of the nearby communities include:

During Construction of STP

- Noise and vibration due to movement of heavy machinery and construction materials
- Possible spill of chemicals, as they are taken through nearby roads or from the sites
- Working with electricity/ electrical installations, appurtenances
- Exposure to dust, noise (vehicular movement on Kuccha access road, construction works, machinery during construction, operations, generators), the sun, heat and wet weather
- Adverse social impacts on adjacent communities and settlers (e.g. security of women and girls due to labour influx)
- Improper storage of construction material and demolition waste: This will be a cumulative effect of poorly managed construction material and construction activities which will affect working areas and managing of materials and waste on site.
- Traffic disruption or congestion due to movement of heavy vehicles for project related activities.

Construction of TSPS

- Noise and vibration due to movement of heavy machinery and construction materials
- Working with electricity/ electrical installations, appurtenances
- Fire hazard due to any emergency.

Construction of Rising main

- Noise and vibration due to movement of heavy machinery and construction materials
- Exposure to dust, noise (access road repairs and upgradation, vehicular movement, construction works, machinery during construction, operations, generators), the sun, heat and wet weather.

Labour camp

- Improper sanitation and washing facilities leading to odour nuisance and unhygienic conditions.
- Lack of facilities at work site and worker camp, pushing workers to use common areas / facilities and resources.

Operation of STP

- Working with electricity/ electrical installations, appurtenances

Common Risks & Impacts

- Using vehicles on public and project roads, accident risks
- Possible exposure to illnesses, communicable diseases, COVID-19
- Exposure to mental or physical harassment, SEA/SH, and injury from interpersonal conflicts with workers/ operators
- Impacts of flooding in subproject premises or earthquakes, and other natural and manmade disasters

Positive Impacts

Proposed STP will ensure safer and disaster resilient infrastructure which will have overall positive impacts on community health and safety especially during disasters. Proposed surfacing of access road to site will also reduce long term dust emissions, vibrations and accidents.

Disasters (including Fire), Flooding and Dam Safety

Temporary flooding may happen during monsoons in the site. As water table is high along the river edge, excavations may be difficult and safety precautions shall be adopted. It is important to have Disaster Management Plan and Emergency Preparedness Action Plan to deal with disasters, emergencies in case of natural or man-made disasters including Fire, and Dam Safety Considerations given the presence of Vasna Barrage 3 km upstream of the site. These impacts are also applicable to TSPS, rising mains, outfalls etc. Hydrological and flood assessment includes a study conducted on Dam Break Analysis & Flooding Stimulation, by National Institute of Hydrology, Jal Vigyan Bhavan, Roorkee (IIT Roorkee, Uttarakhand), preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that have been considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events. The output of the study will be incorporated in the final design of the project and in the updated CESMP. DMP with essential actions and organisational structure is presented in Chapter 6 on ESMP. Refer to **ANNEXURE X** Emergency Action Plan – Vasna Barrage Volume II prepared by the National Institute of Hydrology, Roorkee as part of the study, Dam Break Analysis & Flooding simulation, Preparation of Inundation Maps and Emergency Action Plan for Vasna Barrage, Ahmedabad, Gujarat, Volume 1.

CHS Risk management strategies

- Assess flood risks and incorporate management/ mitigation mechanisms in designs, prepare Emergency Preparedness Action Plan.
- Incorporate the mitigation and management strategies from Emergency Action Plan Vasna barrage reproduced in **ANNEXURE X**, to the project broadly and specifically to individual project sites.
- Work scheduling taking into considerate floods (proposed STP site, rising main TSPS), improvement to approach road proposed as part of Pirana 424 MLD plant construction etc, to reduce health and safety impacts
- Include TSPSs, outfalls and allied infrastructure in the proposed flood risk assessment study and include EAP and mitigation measures in design. To be assessed in C-ESIA & mitigation measures if required and included in C-ESMP.

- Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high-risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community
- Removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions such as covering openings to small, confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials
- Education and awareness-raising on CHS, and the adoption of procedures for safe use roads
- Prior to dismantling or demolition of the old structure on TSPS, including, for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury
- Recommendations for the prevention and control of communicable and vector-borne diseases
- Use of waste-specific PPE respirators, dust masks, clothing/protective suits, gloves and eye protection, information and awareness to communities adopt safe practices such as closure of windows and doors in case of dust emissions
- Surfacing of roads used for transport to site, and dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements.
- Include SEA/SH GRM in the project GRM.

ESS 5: LAND ACQUISITION, RESTRICTIONS ON LAND USE AND INVOLUNTARY RESETTLEMENT

At present, there is movement of heavy vehicles on the proposed access to the 424 MLD STP. Risks and impacts will be for a moderate period and temporary for TSPS.

The proposed TSPS component shall be carried out within the existing STP boundary measuring 0.82 ha. The previous land used pattern was fallow land allotted for development and construction of sewage treatment plants before construction of existing STPs and at present there is a security cabin (Approximate area 9.95 Sq.m), Scrap yard (Approximate area 187 Sq.m) and abandoned tank (Approximate area 176 Sq.m) which needs to be demolished onsite. The construction activities for the proposed STP shall be carried out within the identified boundary. STP is proposed to be set up on plot of land behind the existing 180 MLD STP premises. The lands belong to the Ahmedabad Municipality as per the land records for both plots of land. Land acquisition is not envisaged for the proposed project. Displacement and resettlement issues are not envisaged for the subproject development.

There are no potential involuntary resettlement issues identified, as there is no land acquisition of private land or alienation of additional government land for the proposed upgradation. There are no restrictions to access river or public infrastructure or change in land use due to proposed rehabilitation of the STP. There may be temporary loss of access during outfall construction which can be remedied though alternative access from other AMC owned lands along the river.

Impact on downstream users due to release of untreated sewage from existing STPs is identified. There is direct release of untreated sewage from villages which were under Panchayats previously (example Kamod)and are proposed to be included in the AMC sewerage

network in the future. After construction of the STP, there will be improvement in the quality of the treated water released in the Sabarmati River which will benefit downstream users.

Loss of livelihood is also not anticipated as there are no livelihood related activities currently being undertaken within proposed project boundary. Local Labor may be accommodated by DBOt contractor in the construction activities as per local labour requirement.

There are existing roads connecting to the proposed STP site to the highway albeit part of the road is kaccha which be resurfaced and made pucca before construction activities are undertaken in the project site.

After DPR finalization, the ESIA and screening to be reviewed to include any such impacts, if additional land requirements is envisaged, AMC will prepare and implement RAP following the methodologies and principles described in the RPF.

ESS6: BIODIVERSITY CONSERVATION AND SUSTAINABLE MANAGEMENT OF LIVING NATURAL RESOURCES

As explained in section 3.4.5 Ecology and Biodiversity, it was observed that the entire stretch of Sabarmati is infested with the Pistia sp. and Eichhornia crassipes which has altered the natural habitat. Sabarmati River stretch is a modified habitat as the water is being sourced from Narmada canal and stored at the river front stretch using the shutters of the Vasna Barrage. The riparian zone of the Sabarmati is converted into the riverfront in the Ahmedabad city. The region around is heavily industrialised, and fast converting into urban land uses, with pollutants reaching the already dry river. However, Hon'ble NGT has constituted River Rejuvenation Committee which has initiated the process of river rejuvenation, but curtailing pollution, monitoring e-flow, undertaking plantations etc, through various stakeholder departments. Tree cutting is envisaged on STP site, TSPS site and approach road , as per FR. Trees majorly include *Peltophorum pterocarpum, senna siamea* and *Azadirecta indica*. List of Flora and Fauna in and near the site are attached as **ANNEXURE IV**. No RET species were observed in the study area. However, The subproject intends interventions to improve the discharge quality and will thereby improve the biodiversity in or near the site and in the river and the region downstream of the discharge point., thus supporting overall biodiversity improvement.

Expected Negative Risks and Impacts

During Construction and operation of STP

- Site clearance will include clearing of rank vegetation, grass, brush wood, cutting of trees during the construction activities. These construction activities can potentially disrupt local ecosystems, leading to habitat loss and the displacement of various faunal species There are a large number of trees within the proposed premises. Number of trees to be cut will depend on the final design. DBOT contractor shall ensure that the minimum trees shall be felled during the construction.
- In case of increased level of noise and vibration, faunal species will leave site. Noise above 60 dB has been reported to interfere with songbird mating call. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species. Dumping of waste into the waterbodies may

impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering in nutrient cycle.

- Excess chlorination may affect aquatic biota.
- Discharge of slurry from the facility and spillage into drainage channels or river Sabarmati may harm water quality and thus biodiversity

Construction of TSPS

- In case of increased level of noise and vibration, faunal species will leave site. Noise above 60 dB has been reported to interfere with songbird mating call. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species. Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering in nutrient cycle.
- For the proposed construction of TSPS, tree cutting may be required based on the design.

Construction of Rising main

- In case of increased level of noise and vibration, faunal species will leave site. Noise above 60 dB has been reported to interfere with songbird mating call. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species. Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering in nutrient cycle.
- Tree cutting may/may not be required for the final alignment. DBOT contractor shall ensure that the minimum trees shall be felled during the construction.

Solar rooftop

- Impacts on Micro-climate due to solar panels on roofs, especially in relation to reflectance and disturbance to fauna/ flora.

Construction of Outfall facility

- Temporary discomfort to the aquatic biodiversity due to construction activities

The Design Build Operate Transfer (DBOT) model is proposed to be implemented and Based on the finalization of the design and components, at a later stage, it may be required to cut some trees and clearing of the shrubs. Tree counting will be done after finalization of DPR for estimation of trees required to be cut. Tree cutting will be done as per The Saurashtra Tree Felling Act, 1951 and permission from AMC/ and/ or Forest Department (as applicable) shall be obtained for the same[41]. Measures to protect old trees and tree transplantation will be considered during designing of the project. Clearing of shrubs will not have any impact on natural vegetation of the region. The proposed project may also require tree planting based on the number of trees cut.

[41] https://forests.gujarat.gov.in/writereaddata/images/pdf/ease-of-doing-business.pdf

Positive Impacts

It is expected that the construction of new 424 MLD STP to match the discharge quality standards suggested by NGT will reduce prevailing BOD, COD, N, P, load from the river which will have overall cumulative positive impacts on the water quality, biodiversity (if discharged into Sabarmati) and downstream users.

ESS 8: CULTURAL HERITAGE

Proposes activities will take place in the 25 ha area identified behind the 180 MLD STP and near the 155 MLD STP, surrounded mainly by other STPs, Gyaspur village, Jindal Urban Waste Management (Ahmedabad) Ltd. and the river. There are no cultural heritage assets (tangible or intangible) in nearby areas. Local congregation areas, party plots, parks, open spaces outside the boundary will not be used for any related activity including material storage, labour camp or parking. This will be further confirmed during Detailed Design Stage and impacts shall be discussed, while updating the ESIA. Chance find procedures shall be included in ESMP. Chance Find Procedure shall be implemented as site is near river.

ESS9: FINANCIAL INTERMEDIARIES

Not Applicable

ESS10: STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

Socio-economic: The existing STP site is surrounded by other STPs at Pirana, a settlement in Gyaspur and industries processing solid waste. Proposed infrastructure developments may have an impact on the immediate residents in Gyapsur near STP Pirana mainly during construction stage.

Consultations were carried out for the preparation of the draft ESIA report and the draft ESMF and SEP. Stakeholder consultation is a dynamic process and consultations will be carried out during the life cycle of the G-ACRP project.

Preliminary consultations have been carried out with various stakeholders including Gyaspur settlement inhabitants and ex sarpanch, ex sarpanch of downstream villages such as Kamod and Nana Vanzar, representation/trustee of few sensitive property in the vicinity, STP operators, AMC officials during preparation of ESIA for sub project and SEP for G-ACRP project. Consultations will also be carried out during the project cycle. Public Consultation shall be carried out for disclosure of ESIA and ESMP.

The summary of consultations is given below:

- The quality of river water and ground water is not good for drinking and for agriculture use.
- People get skin diseases and other problems due to the polluted water.
- Agricultural activities are carried out in some of the downstream villages which have good quality borewell water.
- At present down stream villages depend on borewell.
- People are involved in agricultural labour and to some extent in non-agriculture labour work in industries.

- Upto 10 % are migrants in the villages from other states such as Uttar Pradesh, Maharashtra, Rajasthan, Bihar, etc.
- All downstream villages may not have sewerage network connected to the city sewerage network as the network within village was constructed by Panchayat and outfall was in the river and now these villages are included under the corporation. Therefore, the network coverage is being planned to be extended phase wise to cover all villages which are included in corporation.

The sub-project will implement the project level SEP to engage with relevant stakeholders, including the poor and vulnerable groups. Any grievances regarding the sub-project activities will be processed through the project level GRM as specified in the SEP. AMC will conduct awareness campaign to inform the settlement about the GRM.

5.5 Cumulative Impacts

The cumulative impacts in the region will be mainly due to the discharge of treated sewage into the river. People of downstream villages of Sabarmati depend indirectly on the river for irrigation. Cumulative Pollution levels due to the discharge of various STPs, CETP discharge through Megaline, other ETP, and stormwater discharges in the river are high currently. Vasna barrage across Sabarmati to the South of the city regulates water flow downstream of Sabarmati.

Screening and analysis were undertaken following the IFC Good Practice Handbook for Cumulative Impact Assessment and Management. The Handbook defines this as the process of (a) analyzing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen VECs over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such impacts and risk to the extent possible.

The objectives of the study were to understand the impacts on the Sabarmati River or any other valued ecosystem component due to the project, other developments in AMC and its region, and proposed subproject activities.

Step 1 – VEC's, spatial and temporal boundaries.

VEC's were identified from the baseline environmental and social study work within the project area of influence and using literature review and field visits for the region. Screening questions considered included the following:

Will the construction of new STP affect this VEC?

Would other identified projects/stressors in the area potentially affect this VEC cumulatively within the spatial boundary?

Would the impacts be potentially significant?

CIA was performed through expert opinions, checklists, and spatial analysis.

Discussion on VECs

The subproject activities include Construction of New STP at Pirana, in the urban area of AMC and all works are confined to proposed STP site, to improve the treatment of sewage to fill NGT requirements. The regional linkage is provided by River Sabarmati, which is dry for most

of the year, and is a modified habitat as it receives water not from its source Dharoi Dam, but an irrigation canal – the Narmada Main Canal - intended to carry water from Sardar Sarovar Project to drought-prone areas of Gujarat. Water channelled from Narmada Canal to Sabarmati at Ahmedabad Riverfront is held there for most of the year for the ambiance of the riverfront and released through Fatehwadi canal or Sabarmati River (mainly during floods). None of the subproject works are carried out in the river except disposal of treated sewage. The river had been receiving sub-optimally treated sewage and bypasses, effluents, and stormwater from Pirana STP, and other STPs, and CETP (through Mega Line) since past two decades.

This project which would improve treatment quality to comply with stringent NGT suggested standards are expected to bring in positive impacts on water quality, availability of treated water downstream of the city, through Sabarmati, and hence overall the subproject presents positive regional impacts. As the subproject activities are restricted to the proposed STP site, access road immediate to it, and TSPS site, no heritage feature of the city is considered as an important component for examination.

None of the floral or faunal species are identified as VECs as they are not dependent on the proposed STP site, or Sabarmati to which treated water is discharged. So, there is no impact of the subproject on existing rates of habitat conversion and degradation in the area. No fish, aquatic species, or terrestrial species met the conditions for VEC because those identified through fieldwork and desk-based screening were not RET species of endemic species and the locations fall under the urbanized area and the habitats are already modified. Sabarmati River in the vicinity of the existing STP plants is already polluted and the riparian zone is converted into the riverfront. There are no protected habitats or forests in the immediate region which may be impacted by the subproject. Other VECs do not apply to this subproject considering the distance to these natural areas and intervening urban land use.

Spatial Extent

The spatial boundary has been established based on the Sabarmati, and downstream areas which may be impacted. The length of the river, till Vautha where the river gets tidally influenced and meets another major inflow from Vatrak is considered as the spatial limit.

Temporal Extent

The DPR states that as per the CPHEEO manual, Pumping Station (Civil Works) and Rising Mains are designed for 30 years however Pumping machinery is designed for 15 years from the base year. The temporal boundary was set at 15 years, as STP may need to be upgraded in response to regional/ city growth within this time. The feasibility/DPR also adopted this as the timeframe.

Step 2: Scoping Phase 2 – Other Activities and Environmental Drivers

The other activities and environmental drivers that are relevant were assessed as part of the iterative process of identifying VECs and spatial boundaries. Other activities which impact the river include (i) all discharges from the city and the region into the canal including all other existing and proposed STP discharges into Sabarmati, industrial effluents, treated effluents carried by Mega Line, stormwater drains; (ii) new Sabarmati Riverfront project and newly proposed barrage upstream of Vasna at the beginning of new Riverfront project, (iii) intensive

industrialization of downstream areas of Sabarmati, to the South of Ahmedabad city which is given impetus by the nationally significant freight corridor – the Western Dedicated Freight Corridor (DFC); the mega rail transport project for freight connecting industrial areas to the west of India.

There is a significant reduction in rainfall and water availability in the catchment of Sabarmati, multiple barrages, and increased agriculture and urban uses to the north of the city, which has also resulted in less water availability in this non-perennial river. These already have a pronounced impact on in-river habitat and rendered it modified.

Table 35: Environmental Impacts on VECs (at Regional Level)

VECs that may be affected by the development	*VEC Threshold(s)*	*Spatial boundaries*	*Temporal boundary*	*Impacted by project*	*Impacted by activities and environmental drivers*	*Impacts on thresholds and Project Mitigation/monitoring measures*
River Sabarmati users	Improved water quality and better biodiversity due to better-treated sewage discharged	Till Vautha around 50 km from where it is tidally influenced	15 years is the planning period considered after which STP upgradation would be necessary	Positive impacts, as the dry river will get a well-treated discharge Quality ensured by the ongoing hon'ble high court and task force's action to disconnect all industrial connections from the sewer network	Less rainfall and the proposed (in early stages) new barrage upstream of Vasna, will have no impact on discharged treated water as it depends on the population served	Positive Impacts due to better discharge quality of treated sewage - Monitoring of quality of treated water and measuring quantity of treated water discharged and bypasses if any during construction and operation phases. - Periodic measurement of Trophic Status of the River to understand the improved quality due to the project

A summary of risks and impacts and their significance are presented in **Table 36** below:

Table 36: Cumulative Environmental Risks and Impacts of proposed STP improvements at the Local/near Site Level and Mitigation measures

Aspects	**Potential Impacts**	**Mitigation**	**Significance before Mitigation**	**Geographic Spatial Scale**	**Duration**	**Status after Mitigation**
Development in the city						
Improvement in Sewerage and Drainage	Increase in incoming flow to STP	Mitigation Possible, through long term master planning and	High (negative)	Site/ Local	Long-term	Major Positive

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
(S&D) infrastructure and increase in population in the serving area		planning additional STPs (ongoing)				
New area development and increase in sewage flow	Increase in incoming flow to STP	Mitigation is Possible through Master plan (ongoing) and upgradation activities under G-ACRP	High (negative)	Site/ Local	Long-term	Major Positive
Increase coverage of vulnerable sections especially the urban poor, migrants, slum dwellers with no access in the serving area	Increase in incoming flow to STP	Improvement in the Sewerage network and capacity augmentation with improved technology; full coverage planned through G- ACRP	High (negative)	Site/ Local	Long Term	Major Positive
Reduction in untreated sewage flow into stormwater, river or canals	Increase in incoming flow to STP	Improvement in the Sewerage network and capacity augmentation with improved technology - full coverage and Lake/canal improvement through G-ACRP, Master Plan (ongoing)	High (negative)	Site/ Local	Long Term	Major Positive
Construction Phase						
Cumulative Air Quality Impacts	The subprojects can collectively generate construction and O&M-related air emissions. Emission from nearby industries.	See mitigation measures in the ESMP. Mitigation Possible, through use of buffers, screens, PPEs, awareness, time restrictions/staggering of large	Low (negative)	Site/ Local	Short-term	Minor Positive (as mitigation measures will help reduce

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
		noise/vibration generating activities at sites as detailed in ESMP				baseline impacts as well)
Cumulative Community Health & Health impacts	Health and Safety impacts due to cumulative air quality and noise impacts from dust, air emissions, movement of vehicles, etc. during the construction period. Odor during the construction period is also a major health concern for the settlement and workers of the surrounding.	See mitigation measures in the ESMP. Mitigation Possible through following ESMP, better STP design with ensured aeration, good green belt, PPEs, awareness	Low (negative)	Site/ Local	Short-term	Moderate Positive as access roads, STPs improved
Labour and working conditions	Cumulative impacts due to labor/workers on-site affecting movement of local traffic and pedestrian traffic conflicts with the local population, sanitation, and use of public amenities	See mitigation measures in the ESMP. Worker facilities, safety to be ensured, trained & monitored. Construction-related activities shall be planned to minimize large influx or movement of labor in line with Covid-19 restrictions.	Medium (negative)	Site/ Local	Medium term	Positive
Cumulative Noise Impacts	Noise is a localized issue that diminishes in intensity with distance from the source. Up-gradation and construction of in the subproject area can potentially increase construction-related noise	Such cumulative noise impacts will be temporary and will not likely occur during sensitive nighttime hours. See mitigation measures in the ESMP	Low (negative)	Site/ Local	Short-term	Positive (as existing operational noise levels also gets reduced

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
	impacts on land uses directly adjacent to the construction sites, which is in industrial/mixed-use areas. However, though in an urban area, the expanse of the river on one side reduces noise accumulation from here					due to planned measures)
Impacts due to noise & vibrations: **Movement of vehicles** **Machinery such as boring machine, Concrete mixtures, Trucks, Excavators, Dumpers, etc.**	Increased level of noise and vibration. Faunal species like birds (Red vented bulbul, Tailor bird, Laughing dove, Purple sunbird, etc.), reptiles (Garden lizard), mammals (Five striped palm squirrel) will temporarily leave the site. Noise above 60 dB has been reported to interfere with songbird mating calls.	The impact will be site-specific and temporary. Revisits of faunal species are expected after the completion of the project. Buffers shall be planned and arranged as required. The development of a green belt with native herbs, shrubs, and trees is recommended. Partial mitigation possible	Low (negative)	Site/ Local	Short-term	Minor negative during the construction period
Impact due to Generation of dust & debris **Dust generation due to heavy vehicular movement & excavation**	Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species.	Dust emission measures like water sprinkling, using prefabricated material are suggested. Buffers shall be planned and arranged as	Low (negative)	Site/ Local	Medium-term	Moderate negative during the construction & demolition period

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
Construction & Demolition debris generated due to excavation		required. Partial mitigation possible				
Impact due to Air Pollution Emissions from vehicles and machinery Air pollution due to site preparation, infrastructure development, building construction, and other related activities.	Air Pollutants may interfere with the biological processes of plants. It may also irritate the faunal species.	Dust suppression measures are to be implemented. All the vehicles shall comply with the PUC certification requirements and the vehicles shall be maintained in good condition. Buffers shall be planned and arranged as required.	Low (negative)	Site/ Local	Short-term	Negligible negative during construction period
Dumping of waste into the waterbodies	Dumping waste into the water bodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering with the nutrient cycle	No dumping of any waste generated during the construction in the natural water bodies i.e., lakes, rivers, and streams; as in ESMP. All wastes including during O&M of the existing facility to be managed well.	Low (negative)	Site/ Local	Short-term	Positive
Impact on water birds due to Construction Activities	Noise generated during the construction activities may deter water birds that may use	Acoustic enclosures are recommended for high noise-generating instruments.	Low Negative due to	Site/ Local	Short-term Long term	Positive

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
and Water quality improvement	Sabarmati banks near the STP site as feeding habitat. Water quality improvement of discharge due to technology upgradation will help improve the overall ecology and in turn, will attract the water birds.		construction activities Positive due to water quality improvement			
Impacts due to invasive species **Landscaping and tree plantation**	The site already has exotic species like *Prosopis juliflora*, *Lantana camara,Parthenium hysterophorus Eucalyptus sp., Eichhornia crassipes,* etc. Transfer of topsoil/ manure for landscaping may carry seeds of exotic species. Transfer of sapling bags for plantation may carry seeds of exotic species which can later spread in the area.	Removal of invasive species. Using native species for plantation. Removal of any new growth of invasive species. ESMP to be followed	Low (negative)	Site/ Local	Short-term	Positive
Operation Phase						
Cumulative Air Quality Impacts	The subprojects can collectively result in air emissions, which will be less than baseline emissions due to technology up-gradation.	See mitigation measures in the ESMP	Low (negative)	Site/ Local	Long-term	Minor Positive

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
Cumulative Noise Impacts	Noise is a localized issue that diminishes in intensity with distance from the source. Very minimum noise will be generated during the operation of the STP	Cumulative noise impacts will be minimum also due to upgraded equipment, machinery, green belt. See mitigation measures in the ESMP	Low (negative)	Site/ Local	Long-term	Minor Positive
Community Health and Safety impacts	During operation, cumulative air and noise impacts will be confined to the STP site. Additional measures to reduce noise and air impacts by way of mitigation measures will be undertaken to keep the air and noise impacts to a minimum. Better emergency preparedness plan and facilities reduce impacts	See mitigation measures in the ESMP	Low (negative)	Site/ Local	Short-term	Positive
Cumulative Odor Nuisance	During the operation of STP, Odor nuisance is expected. It will be cumulative from all the STPs in the vicinity, near STP premises, and the water body to which treated sewage is discharged.	Improved technology and prescribed discharge standards will minimize odor emissions. Odor control system/ unit has been planned which will address odor issues after upgradation. Collection treatment and disposal of sludge proposed will reduce the Odor nuisance.	Moderate	Site/ Local	Long Term	Positive (when compared to baseline)

Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
Impacts due to eutrophication, quality of water available for downstream uses	Sabarmati, downstream of Pirana will benefit from overall better discharge standards for treated sewage, which is disposed into these especially due to nutrient removal	Stringent discharge standards, monitoring mechanism	Major	Regional	Long term	Major Positive

A Summary of all Risks and impacts are compiled with impact significance in the following **Table 37,** for which mitigation measures are described in the subsequent Chapter.

Table 37: Summary of Risks and Impacts and their Significance before and after Mitigation

Potential Risks and Impacts	Negative Impacts								Positive Impacts
	Duration	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Before Mitigation of Negative impacts	Negative Impacts after Considerations in the Long-Term Plan/ Mitigation	Significance of Positive Impacts
Preconstruction/ construction									
Land use changes	Long term	Project extent	Irreversible	Likely	Low	Low	Negligible negative	Nil	Negligible Positive
Impact on-site and current users	Short Term	Site	Reversible	Likely	High	Low	Moderate Negative	Minor Negative	Negligible Positive

Potential Risks and Impacts	Negative Impacts								Positive Impacts
	Duration	**Spatial Extent**	**Reversible or not**	**Likelihood**	**Magnitude**	**Sensitivity**	**Significance Before Mitigation of Negative impacts**	**Negative Impacts after Considerations in the Long-Term Plan/ Mitigation**	**Significance of Positive Impacts**
Impacts on Air	Short Term	Regional	Largely Reversible	Likely	Medium	Medium	Moderate negative	Minor negative	Negligible Positive
Impacts on Water Bodies	Short Term	Regional	Largely Reversible	Occasional	Medium	High	Minor negative	Negligible Negative	Moderate Positive
Impacts on Soil	Short Term	Project extent	Largely Reversible	Occasional	Low	Medium	Minor negative	Negligible negative	Minor Positive
Impacts of Noise	Short Term	Project extent	Largely Reversible	Occasional	Medium	Medium	Moderate negative	Minor negative	Minor Positive
Impacts on health of Fauna, Flora (biodiversity)	Short Term	Site	Reversible	Occasional	Low	Medium	Moderate negative	Negligible negative	Moderate Positive
Occupational Health and Safety of workers involved	Short Term	Site	Reversible	Likely	High	High	Major Negative	Moderate Negative	Minor Positive
Community Health and safety	Short Term	Local	Reversible	Likely	High	High	Major Negative	Moderate Negative	Minor Positive
Disturbance to Cultural Heritage, Visual blight/ aesthetics	Short Term	Local	Reversible	Unlikely	Low	High	Negligible negative	Nil	Minor Positive
Resettlement and livelihoods impacts	Temporary	Local	Reversible	Unlikely	Low	High	Minor Negative	Nil	Minor positive

Potential Risks and Impacts	Negative Impacts								Positive Impacts
	Duration	**Spatial Extent**	**Reversible or not**	**Likelihood**	**Magnitude**	**Sensitivity**	**Significance Before Mitigation of Negative impacts**	**Negative Impacts after Considerations in the Long-Term Plan/ Mitigation**	**Significance of Positive Impacts**
Impact on Socio-Economic, Households, communities	Long and short term	Subproject or location-specific	Irreversible and reversible	likely	Ranging from low to high	Medium	Moderate negative	Moderate to minor	Moderate to high
Operations and Maintenance									
Impacts on Air	Short Term	Regional	Reversible	Occasional	Low	High	Moderate negative	Minor Negative	Moderate Positive
Impacts on Water (bypasses in case of eventuality/ discharge during floods/other disasters)	Short Term	Regional	Reversible	Occasional	Medium	High	Major Negative	Moderate Negative	Moderate positive
Impacts on Soil	Short Term	Project extent	Reversible	Occasional	Medium	Medium	Moderate negative	Minor Negative	Major positive
Impacts on health of Fauna, Flora (biodiversity)	Temporary	Site	Reversible	Occasional	Low	Medium	Minor Negative	Negligible negative	Major positive
Occupational Health and Safety of workers involved	Medium Term	Site	Reversible	Occasional	Low	High	Moderate negative	Minor Negative	Major positive

Potential Risks and Impacts	Negative Impacts								Positive Impacts
	Duration	**Spatial Extent**	**Reversible or not**	**Likelihood**	**Magnitude**	**Sensitivity**	**Significance Before Mitigation of Negative impacts**	**Negative Impacts after Considerations in the Long-Term Plan/ Mitigation**	**Significance of Positive Impacts**
Community Health and safety	Temporary	Local	Reversible	Occasional	Low	High	Moderate negative	Minor Negative	Major positive
Flooding and Dam Safety	Temporary	Regional	Largely Reversible	Occasional	Ranging from Low to High	Medium	Moderate Negative	Minor Negative	Nil
Resettlement and livelihoods impacts	Temporary	Local	Reversible	Occasional	Low	High	Minor Negative	NIL	Minor Positive
Impacts on Cultural Heritage, Visual blight	Temporary	Local	Reversible	Unlikely	Negligible	High	Nil	Nil	Nil
Regional Impacts									
Water Quality and Availability	Long term	Regional							Major Positive

5.6 Status of Incorporation of ESIA comments in the Draft FR

During ESIA preparation, there had been regular interactions of FR consultants with ESIA consultants, facilitated by AMC. FR has incorporated the suggestions of ESIA to address climate change and resilience for the sub project, to address aspects as follows:

i) Increased rainfalls, releases from Vasna Barrage and flooding events: Incorporate the findings and recommendations of the Flood Risk Assessment study in relation to Vasna Barrage, and Emergency Preparedness Action Plan and prepare C-ESIA / C-ESMP

ii) Increased temperatures: The temperature increase will raise the likelihood of sewer corrosion and odour problems especially considering the extreme heat conditions in the city. Design shall incorporate mechanisms to reduce such impacts. To tackle the issue with odour, odour control units have been proposed as part of rehabilitating the STP.

iii) Change in flow pattern: Sewage inflow pattern may vary during various times. The Plant shall be designed following a modular approach which shall help in accommodating any changes in sewage quantity load. Equalization storage has been included in the sewage treatment plant for the flow variations to balance out the variability in the flow.

iv) Discharge Quality: The NGT suggested norms (which is stringent than WB EHS suggested India National Standards for Discharge of treated Effluents, as per EP Rules, 1986) will be followed for treatment of wastewater. The proposed treatment train includes some flexibility to allow the system to adapt to slightly different water quality parameters.

v) Reduction of carbon emissions: The opportunities identified under this plan include carbon sequestration through green belt development (Carbon is sequestrated by plants by way of photosynthesis and storing carbon as biomass in their boles), and probable use of Solar technology. A comparation of the GHG emissions reduced through the subproject intervention is included in the DPR.

vi) Reuse and recycle of water: With improved technology resulting in better treated sewage, opportunity to reuse treated sewage increases, also in line with the "Policy for Reuse of Treated Wastewater" announced by the Gujarat government in 2018. Furthermore, treated wastewater may be sold as a reliable source of water supply to industries, and design shall incorporate the features to ensure this.

vii) Reduction in water pollution in the Region: Untreated or suboptimal wastewater discharged in water bodies leads to presence of bacteria, viruses and parasites which can cause a plethora of waterborne diseases. Through treatment, the pollutants in the raw sewage will be significantly removed thus increasing the quality of effluent, discharged into waterbodies.

viii) Under the DBOT, the contractor shall provide a detailed method statement / schedule for the construction of the plant so that no bypass shall be made to the river, without treatment.

ix) The proposed work involves construction of proposed STP. The project shall take into account the disposal of sewage, sludge, sludge and related impacts on surface water quality and soil quality, noise generation and air emission due to running of DG sets, pumps and equipment, sourcing of material, and damage to artefacts/ archeologically important items during excavation, Tree cutting, if required for any additional units'

construction. The construction of new of STP will incorporate technologies and take steps to make the assets created/ upgraded and resilient to climate changes such as increased rainfall and floods, increased temperatures and change in flow pattern.

x) Energy efficient design and components: The designs adopted for 424 MLD STP construction shall be energy efficient or energy saving such as Solar lighting and or Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD) to reduce the energy consumption and achieve better energy efficiency. The selected equipment, installations, pumps & other machinery shall be energy efficient

xi) Source of Raw Material: Material used for the construction of subproject components such as DI pipes, HDPE pipes, sand, coarse aggregate, fine aggregate and gravel for construction works shall be outsourced from authorised vendors and authorised quarries to ensure that appropriate procedures are followed for extraction of material and sustainable practices are involved in such process. It is also suggested to source materials from AMC's C&D facility to ensure circular economy and resource efficiency.

Additional suggestions to be considered in Final DPR:

xii) Optimal Design: Design shall ensure minimal rehabilitation/ reconstruction requirement to ensure the suggested discharge standards. Technology suggested shall be weighed in terms of environmental, social performance as well in addition to economic and other criteria. Upgradation of existing ASP technology with mechanisms to improve nutrient removal, MBBR, shall also be considered as an option in addition to the proposed SBR technology considering the technical difficulties in undertaking large scale modifications in the existing site.

xiii) Treated sewage is not proposed for drinking purposes. Any reuse of treated water (on or off site), will be only after Chlorination

xiv) DPR proposes that the sludge from Biological unit shall be thickened and dewatered by using thickener and centrifuge. The dewatered sludge shall be transferred to AMCs sludge management facility. Since it open technology, the DBOT contractor will update the ESIA/ESMP after finalizing the technology. Need arrangements to segregate, collect, store and dispose broken and full (end-of-life, damaged, to be repaired) solar panels from Solar roof top as per applicable regulations, without an assurance on this solar roof top shall, not be encouraged.

xv) Vibration impacts of proposed trunk main crossing the elevated metro track shall be studied, and mitigation measures shall be included in design

xvi) Impacts due to flooding and discharge through the Vasna Barrage Report have been considered in design as per the HFL provided in final report of "Dam Break Analysis & Flooding simulation, Preparation of Inundation Maps and Emergency Action Plan for Vasna Barrage, Ahmedabad, Gujarat" by NIH. Disaster Management and Emergency Preparedness Plan shall be prepared by AMC and requirements incorporated in the design by the DBOT contractor; for main site and all allied infrastructures including proposed and existing rising mains, TSPSs etc.

xvii) Useful by-products: Sewage sludge in significant quantity is generated from primary and secondary treatment tanks during treatment. This by-product shall be tested for

hazardous components if any, and either sent to Facility of AMC for treatment ; or in case of hazardous content, sent to Hazardous waste TSDF arranged by AMC.

xviii)Consents and Permits:

a. AMC shall obtain the Consent to establish before implementing the project and the consent of Operate for the operation phase.

b. In case of agreement with GPCB and receipt of Consent to discharge the treated sewage, option of the reuse of water to be considered which is scarce in the region. However, the following are important in this regard and DBOT contractors Detailed Design and AMC should work together on the following for this:

- AMC & Irrigation Department shall discuss & decide on the quantity of water required for such discharge after obtaining permit.
- AMC with the support of Irrigation Department shall undertake a study on reuse of treated effluent for irrigation in line with the Central Pollution Control Board's Guidelines of Reuse of Treated Water for Irrigation, 2018, through reputed Agricultural University with stakeholder consultations as per the Guidelines and after agreement with stakeholders and permit from GPCB, discharge the treated sewage so as to avoid any negative environmental and health issue on downstream communities.

xix) Discharge Standards for treated sewage into Sabarmati:

The discharge standards which sub-project shall comply with for discharge into Sabarmati is presented in **Table 38**Table 38**.**

Table 38: Suggested Discharge Standards

Parameter	Treated Effluent Discharge Quality (mg/l) - ESIA suggestion for Sabarmati Disposal only	Remarks
Biochemical Oxygen Demand (BOD)	Not to exceed 10	NGT suggested limits, an improvement over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – limit is 30 mg/l)
Chemical Oxygen Demand (COD)	Not to exceed 50	NGT suggested limits, an improvement over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – limit is 250 mg/l)
Total Suspended Solids (TSS)	Not to exceed 10	NGT suggested limits, an improvement over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL

Parameter	Treated Effluent Discharge Quality (mg/l) - ESIA suggestion for Sabarmati Disposal only	Remarks
		POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – limit is 100 mg/l)
pH	Between 6.5 to 8.5	PH 5.5 to 9 as per NGT. As against the FR, treated water is not proposed for drinking. Considering the need to improve flora/ fauna of Sabarmati, and outdoor bathing pH should be 6.5 to 8.5; irrigation 6 to 8.5 (as downstream users use for irrigation) – within NGT suggested limits, an improvement over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A: EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – limit 5.5 to 9 (as in NGT norms))
Total Nitrogen (TN)	Not to exceed 10	NGT suggested (also takes care of Ammonia (for wildlife and Fisheries), for Sabarmati discharge) limits, an improvement over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A: EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – limit (as N) 50mg/l, NH3 – 100mg/l)
Total Phosphorous (TP)	Not to exceed 1	NGT suggested limits, an improvement over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – Dissolved Phosphates – 5mg/l)
Fecal Coliform (Most Probable Number per 100 milliliters)	Not to exceed 100 – preferred; Not to exceed 230 - desirable	NGT suggested limits, an improvement over MoEFCC Regulations 2017 (limit 1000 MPN/100ml) which was a revision by the Government of India over EP Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS)
Additional Parameters for monitoring		
TDS	Less than2100 mg/l	Norms prescribed for irrigation under Environment (Protection) Rules, 1986; also, for Class E (CPCB) – Irrigation Use

Parameter	Treated Effluent Discharge Quality (mg/l) - ESIA suggestion for Sabarmati Disposal only	Remarks
DO	Min 5mg/l	To be ensured (DO is expected to be taken care of by BOD; but a standard for DO ensures aerators run for at least 5mg/l minimum; for reducing odour, necessary for preventing the production of anaerobic gases (obnoxious gases) from sediments, [42]; for Propagation of Wildlife and Fisheries (Class D); and Class B: Bathing; suggested by NGT as the immediate target for polluted river stretches (Sabarmati: Kheroj (upstream of Gandhi Nagar & Ahmedabad) to Vautha)
Residual Chlorine at the outlet	0.1-0.2 mg/l	If chlorination is proposed
All other parameters	As per EP Rules 1986, General discharge standards, suggested by WB EHS	In case of updating of standards by regulators, the subproject shall comply with the same. In case of use in irrigation, Consent Conditions of GPCB and proposed Study on Use of Treated Sewage will inform any additional parameter limits
Sodium absorption Ratio	Max. 26	For Class E: Irrigation (River mostly used for drawing water for Irrigation) [43]
Boron	Max. 2mg/l	For Class E: Irrigation (River mostly used for drawing water for Irrigation)

[42] https://cpcb.nic.in/NGTMC/T_1_a.pdf: HON'BLE NGT Orders:19.12.2018, 20.09.2018, 08.04.2018 & 06.12.2019, Prepare action plans: 351 identified polluted river stretches - Target : To fit at least for bathing purposes by 31.03.2021

[43] WB EHS on W&S: " … the receiving water body use (e.g., navigation, recreation, irrigation, or drinking) needs to be considered together with its assimilative capacity to establish a site-specific discharge quality that is consistent with the most sensitive use". Here the most sensitive uses are taken as bathing (Class B), propagation of wild life and fisheries, and irrigation (Class E) as AMC confirms that there is no withdrawal of water from Sabarmati for drinking.

CHAPTER 6. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

6.1 Scope of ESMP

Primary objective of environmental and social management and monitoring is to identify environmental and social impacts and risks as a result of project activities and identify the mitigation measures.

ESMP presents the anticipated impacts and risks, its mitigation measures, and responsibilities for the mitigation activities. Environmental management and monitoring activities for the subproject is devised for all stages of the subproject - (a) design, (b) pre-construction (including site development and demolition of existing structures for site preparation), (c) construction, and (d) operation & Maintenance phases.

ESMP is developed to ensure the subproject is implemented in an environmentally and socially sustainable manner where all stakeholders understand the risks/ impacts of the subproject and take appropriate actions to manage the impacts adequately.

Proposed project components should be designed, constructed, and operated in full compliance with National and state regulations and standards, Consent Conditions, local building codes, local fire department regulations, local legal/ insurance requirements, and in accordance with an internationally accepted good practices including Life and Safety (L&FS) standards. ESMP will be incorporated in the bid documents while bidding out DBOT contracts so that the contractor allocates the required resources and mechanisms to implement these measures.

The DBOT & EPC Contractor, through his Environmental expert, and OHS person who is also a suitably qualified L&FS professional shall prepare and submit a L&FS Master Plan based on proposed design, including preliminary drawings and specifications, and certify that the design meets the requirements of National and State Regulations, WBG General EHS guidelines, AMC Building Byelaws, and National Building Codes (Part IV Fire and Life Safety) of the Bureau of Indian Standards and others. This professional should conduct a review of L&FS systems as part of the commissioning tests for new and renovated buildings and certify that construction of the L&FS systems has been carried out in accordance with the accepted design.

6.2 Proposed Environmental and Social Management Plan

The objective of the environmental management plan is to achieve the following objectives:

- Design and Technology implementation: Best available technologies to be implemented at site with minimum environmental and social impacts such as all equipment should adhere to environmental norms of water, soil, noise and vibrations, air emissions etc.,
- Good engineering practices are followed during construction and operational phases and to minimize environmental impacts, e.g., barricading of construction areas, signboards for hazardous area and excavated areas etc.
- To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the surrounding,
- To ensure that rehabilitation and resettlement of the affected communities if any, due to the project shall be done properly,

- To ensure good occupational health and safety practices during construction and operation phases at the project. This can be implemented by regular training and SOPs at the site.
- The pollutant concentration in the workplace does not exceed the NAAQS at given time. Regular monitoring of workplace and surroundings to be carried out and record needs to be maintained.
- To monitor impacts on the environment and the effectiveness of mitigation measures during operation,
- To ensure that the solid waste generated by workers during project construction and operation, is handled and disposed of in an approved manner; and the construction site is maintained free of wastes, excavation debris, concrete waste, wood, litter, plastics, and metal scraps by periodically segregating, collecting, storing, transporting, and disposing of them appropriately. The Construction and Demolition (C&D) waste should be utilised to the extent possible and rest of it to be sent to the C&D facility for conversion to building materials.
- Use of recycled material to be promoted at site to the extent possible.
- To ensure that all non-hazardous wastes (such as excavation debris, concrete waste, wood, plastics, and metal scraps) are segregated at source, recycled, and reused to the extent possible,
- Quantum of waste generated across various types and categories of wastes is estimated and reported to statuary authorities as and when required.
- Energy-efficient fittings, pumps, etc; and solar drying and rooftop solar may be adopted, only in case suitable maintenance and scientific disposal of end-of-life panels are ensured.
- Rainwater harvesting and conservation mechanisms are integrated with the design,
- Use of fly ash bricks wherever, possible,
- Modern construction technologies are adopted such as pre-cast construction to reduce time and cost.
- During O&M period for TSPS & STP maintenance: Provision to hold untreated sewage or diversion to other STPs is required to be made so that during any maintenance activities, breakdown/ shutoff, the untreated sewage does not flow into the water body or nearby premises. Works shall be carried out during non-peak period / hours. Required arrangements shall be discussed by the design consultant while preparing the design.
- Environment, Health, and Safety required for the subproject are recommended to be followed during the construction and operational phases of the project. ESMP for construction phase and operation phase of the project is given in **Table 39** below. DBOT contractor will revise ESMP based on C-ESIA studies post design finalization and get it approved from AMC. DBOT contractor will implement C-ESMP during project implementation.
- The Plan specifies measures for addressing the significant negative risks and impacts and for enhancing the beneficial impacts. In addition, proposed institutional capacity and capacity building requirements, to check and ensure effectiveness of the plan throughout the lifecycle of the project have also been discussed.

Proposed Environmental and Social Management Plan

Table 39: ESMP for 424 MLD STP including TSPS, Pipeline, Outfall and Approach Road

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
PLANNING, DESIGN, & PRE-CONSTRUCTION PHASE:					
Design of Proposed 424 MLD STP	ESS 1, 3, 6 & 10	Pollution Prevention & Management Adverse social impacts on the neighbouring settlements mainly Gyaspur or plants of AMC for waste management located near the proposed site of 424 MLD STP Risk of exclusion of HHs from being engaged or covered by sewerage services in the design phase	Design shall conform to all existing national/ state regulations, NGT orders and GPCB consent conditions as applicable for existing STPs in the vicinity at Pirana. The treated sewage quality for discharge into Sabarmati shall comply with the standards suggested in this ESIA (NGT prescribed standards) and/ or most stringent standards prescribed by the GPCB/ NGT/ regulators at any point of time. Incorporate the safety measures and emergency preparedness measures to protect from flooding; based on the Hydrology and Flood Risk Assessment Study related to Vasna Barrage, prepared by National Institute of Hydrology (NIH) Roorkee Get all permits from GPCB based on Water act/ and all other applicable agencies for construction and operations. Provision to hold untreated sewage or diversion to other STPs is required to be made so that during any STP breakdown/ shutoff, the untreated sewage does not flow into the water body or nearby premises. Pumping station to ensure minimum noise generation from equipment like pumps, motors, blowers and DG set by locating	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			within a noise containing structure or in an enclosed space (such as concrete/ brick structure). TSPS to STP rising main has been planned to avoid/ minimize any damage to natural features of the area. The rising main alignment given in the DPR is tentative and shall be finalized by DBOT Contractor after survey and investigation. ESIA and ESMP updation will be done by DBOT Contractor based on final alignment. Construction of new TSPS in the existing Pirana Campus 1 and maintenance to be carried out in lean period with alternative arrangement and prior permission from PCB. Regular cleaning/ removal of sludge and solid waste to minimize odour, nuisance and its disposal. Sludge will be handled by AMC as per regulations on quality for the end use. During monitoring, if hazardous content is detected, sludge will be sent to TSDF. Contractor shall discuss with AMC the monitoring results & manage sludge as per Sludge & Waste Management plan. Sludge will be transferred to the proposed Sludge management facility of AMC where it will be treated and disposed following the consent conditions. Sludge Management Facility will be in operation by the time the STP is in operation & generate sludge, and it will be ensured that there will be no harm to environment and human health due to the SMF. The risks and impacts of the proposed sludge management facility on community health and safety will also be assessed by AMC once the technology and		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			location are finalised, considering it as an associated facility if applicable. All waste shall be collected, stored & transported to relevant approved facilities for treatment and disposal in line with regulations Plan will be prepared to collect sludge at constant intervals, stored properly without contaminating any environmental components, and disposal in a scientific manner or sale of sludge as manure or any other appropriate end use (only if found permissible after quality tests). Provide proper drainage arrangements and landscaping to avoid water stagnation on the site during and post construction. Equipment's to be selected shall meet the noise standards as prescribed by CPCB. Use of less noise generating equipment such as submersible pumps, enclosed generators, etc. Pumping station to ensure minimum noise generation from equipment like pumps, motors, blowers and DG set by locating within a noise containing structure or in an enclosed space (such as concrete/ brick structure). Proposed treatment technology shall take consideration of high phenolic compounds in the sewage water and additional treatment system needs to be employed.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Treatment, disposal and management of sewage sludge shall confirm to all applicable national/state regulations, NGT orders and GPCB consent conditions. Site layout planning before design shall clearly demarcate areas for primary and ancillary uses. Before starting the design plan for TSPS after demolition of minor structures in the identified land. Required studies and measures must be finalised at design stage and preconstruction stages. Labour colony location to be identified and site demarcated. Site clearance to be undertaken wherever required. Ready mix concrete plant layout to be prepared and clearance taken. Special attention to include vulnerable groups in project benefits and continuous stakeholder engagement to ensure such inclusion		
Design to improve resource efficiency and pollution prevention	ESS3	Efficient use of resources, adoption of high energy efficient systems.	The designs adopted for 424 MLD STP & TSPS for energy efficiency and savings such as Solar lighting, Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD) to reduce the energy consumption and achieve better energy efficiency. The selected pumps, equipment, appurtenances shall be energy efficient.	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			The design of STP shall also consider reuse of treated sewage (also as per Gujarat government policy on reuse of treated sewage) Sludge generated from the STP process shall be treated in the Sludge Management Facility proposed to be developed for the purpose by AMC. AMC shall ensure that the timing of the projects shall match so that no sludge is disposed untreated. Design the outfall and rising main pipelines to avoid unnecessary excavation by selecting shortest route. Solar lighting/ use of solar energy as much as feasible (provided disposal at TSDF is arranged, proper storage and use of PPEs while working with damaged panels are ensured) Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD)		
Submission of updated ESMP, Monitoring Plan, and reporting schedule	ESS 1	Unsatisfactory monitoring of environmental and social aspects	DBOT contractor will revise ESMP based on CESIA studies post design finalization and get it approved from AMC. DBOT contractor will implement CESMP and monitoring Plans based on detailed design, before initiating any work or preparatory activity on any of the project related sites Appoint environmental, health and safety (EHS) Supervisor and social specialist by Contractor to ensure ESMP implementation & providing training on management and monitoring.	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Prepare and implement waste and sludge management plan in coordination with AMC, L&FS Plan and other SOPs. Timely submission of monitoring reports including documentation of ESMP implementation (such as photographs, standardized formats for each of the monitoring parameters, GR status, etc.)		
Preparatory work for fulfilling mandatory/statutory compliances	All relevant ESS	Non-compliance with essential environmental, safety, labour requirements, special laws and associated legal repercussion and cost and time overruns	Shifting of underground utilities in the proposed land for TSPS and STP and related components (if any). Updating of CESMP and CESIA after finalization of design and risk prevention/ mitigation plan during implementation. Preparation of Plans as specified in the ESMP and ESMF as required by WB ESF and national regulations. Allocation of roles and responsibilities at AMC, Contractors, and sub contractors' levels Legal register for subproject will be formulated and implemented. Preparation of plans as required under applicable regulations/requirements Obtaining Consent to Establish (CTE) and Consent to Operate (CTO) from GPCB.	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Obtaining No Objection Certificates required from mandatory and statutory bodies for construction and implementation of project. Review of contractor's licenses for various purposes under various laws for mandatory and statutory compliances Preparation of Standard Operating Procedure (SOP) for various activities which includes training, PPEs use, templates for permissions, recording and reporting, by contractors/ PIU. IEC materials shall be planned, printed, and displayed during construction, creating awareness, display of posters etc. Training and capacity building of the designated persons for implementing of various plans		
Preparatory work at Proposed TSPS and STP	ESS 1, 2, 3 & 4	OHS risk	Rising mains are planned for carrying flow from the Proposed TSPS to the Proposed 424 MLD STP. Necessary signages shall be installed during preparatory work. Designated storage area shall be provided. Records of waste volume shall be maintained. Designated area for grit storage shall be provided and records shall be maintained. Disaster management plan shall be prepared and implemented. AMC to ensure complete removal of demolition wastes from TSPS area. construction and demolition waste management	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			plan shall be prepared and approved to collect, store, transfer, dispose C&D waste in line with regulations and good practices Sludge management facility has been proposed by AMC to be ready to manage sludge before commissioning of this proposed STP. Contractor shall prepare C-ESIA and C-ESMP which includes sludge disposal at the AMC's proposed sludge management facility. Contractor will bear the responsibility for storage, and transfer sludge for disposal appropriately based on the monitoring results during operations & existing regulations, as agreed in writing with AMC, in a manner not to cause any negative risks or impacts on the environment or the communities. The contractor shall prepare waste and sludge management plan in consultation with AMC and GPCB and in line with consent conditions, and all applicable national rules & regulations, and NGT orders and shall be implemented. Sludge Management facility shall be considered as an associated facility if applicable and ESIA/ ESMP shall be prepared by AMC & followed in line with ESF. OHS, CHS for contractors' & AMC personnel for sludge management shall be included in C-ESIA, C-ESMP Contractor shall handle and manage the sludge as per these documents after approval by AMC as mentioned in Chapter		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			5.3.4.3 section on Impact of Material Handling and Waste Generation. For sludge management and sewer/ pipe maintenance, mechanical cleaning is recommended strongly, and any manual cleaning will be avoided, considering workers' health and safety. Ensure that the land being prepared for the proposed TSPS and STP, is filled and made safe for further construction as existing land has excavated patches and higher elevations which will require levelling		
Sourcing of raw material	ESS 3	Degradation of natural resources	For sourcing of material, contractor shall obtain construction materials only from the existing government approved quarries or other approved sources with prior approval of PIU. PIU to review and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval. Use recycled material from C&D facility	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Accidental leakage, breakdown or failure of unit	ESS 1, 3 & 4	Untreated flow to river	Alarm system should be designed in the STP & TSPS, which may indicate any sudden emergency or accident or breakdown or power failure. Provision of emergency diversion shall be made for the operation phase.	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
Chance Find Procedure	ESS 8	Loss/ damage of valuable, historic artifacts	Chance finds are anticipated mainly during excavations considering the Heritage of the city. Prepare and implement Chance Find Procedure, create awareness among the workers, supervisors and engineers about the chance finds during excavation work. Stop work immediately and inform the PIU & concerned Department. to allow further investigation if any finds are suspected. Follow chance find procedures. Inform State Archaeological Department/ Department of Culture/ District Magistrate if a find is suspected to taking any action, to ensure its removal or protection in situ. Contractor protects the site and reports to the Engineer/ PIU and refers to local museums and the Heritage Department of AMC for advice. Hand over artefacts to museum/ cultural management agency Review to determine if the excavation can be continued Director of Culture and Information office in the locality will be responsible for managing objects	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Snake and scorpion bite	ESS 2	Accidental snake/ scorpion bite injury during site	Training/ awareness programs at all the stages of the project shall be conducted. Awareness signages at all critical points and availability of first aid on site	DBOT Contractor & to be	DBOT Contractors Cost for Design

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		works/preparatory studies	Contact details of fire brigade, nearest hospital and forest department shall be provided on site	supervised by AMC and PMC	
Stakeholder engagement	ESS10	Exclusion of stakeholders in consultative process or inadequate consultations	Undertake consultations in accordance with SEP	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors ESMP Cost
Construction impacts					
Tree cutting	ESS 1 & 6	Impact on flora and fauna	After finalization of design by DBOT, no of trees required to be cut will be finalized and must be mentioned in the CESMP. Minimize removal of trees by adapting the design to site conditions of TSPS and STP and with appropriate layout design/ alignment, Obtain prior permission for tree cutting from AMC[44]. Plant and maintain (for Project duration) 10 trees for each tree that is removed. Alignment of TSPS pipeline shall be planned to avoid/ minimize the tree cutting	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design

44 https://forests.gujarat.gov.in/writereaddata/images/pdf/ease-of-doing-business.pdf

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
Water logging	ESS 1, 3 & 4	Temporary waterlogging due to poor housekeeping, uneven dumping of construction waste	Waste materials to be stored on the higher elevations/ storage areas which would not get flooded; with proper cut off drains. Avoid storing near storm water run-off channels or any low-lying areas. It shall be made sure that excavated areas for laying of pipeline shall not result in water logging	DBOT/ Construction Contractor	Contractor's cost for site preparation and waste/ construction material storage
Excavated debris, soil disposal and management	ESS 1, 3 & 4	Stockpile areas, storage areas and disposal areas	The excavated soil shall be removed from construction area at the earliest for beneficial reuse such as land raising/ filling of excavated areas. Soil shall be covered with tarpaulin sheets during transportation. Soil transportation shall not be done during peak hours and should avoid narrow and heavy traffic routes and important religious or tourist sites etc. Earthen bund, to be provided around the storage areas for excavated soil and other construction material. Completed earthworks to be sealed and/ or re-vegetated at the earliest with the help of landscape expert	DBOT/ Construction Contractor	Contractor's cost for site preparation and waste/ construction material storage
Topsoil conservation	ESS 3	Erosion of topsoil/ stockpiles	Stockpiles shall be stored with tarpaulins to avoid erosion. Stockpile areas to be bordered by berms. Stockpile to be done in high/elevated areas to avoid flow in storm water run-off channels and erosion.	DBOT/ Construction Contractor	Contractor's cost for site preparation and waste/ construction

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
					material storage
C&D waste management	ESS 1 & 3	Impact on solid and water quality	The generated C&D wastes from TSPS shall be stored at a designated area inside the plant premises. In case any other area is selected for such storage, mitigation measures shall be incorporated in site specific C-ESMP The waste shall be covered with tarpaulin to avoid emission and runoff from stored wastes to prevent water contamination. It shall be tried to reuse C&D waste to the maximum extent within the site for other construction works which may need additional approvals based on type of materials/ purposes. The remaining C&D waste shall be disposed as per the C&D Waste Management Rules 2016 and after consultation and approval of AMC. Prepare C&D waste management plan with clear scheduling on storage, transfer, recycling, disposal considering cumulative quantities. Check for contamination and adopt appropriate cleaning, storage, and transport (C&D waste of sewage tanks)	DBOT/ Construction Contractor	Contractor's ESMP cost
	ESS 1 & 3	Generation of debris, muck during construction	Topsoil shall be stored properly and used for agricultural purpose or development of city parks. Soil and debris may be managed for planned backfilling of the site and landscaping.	DBOT/ Construction Contractor	Contractor's ESMP cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Debris may be suitably stored for backfilling the excavated areas and disposal of surplus excavated material at a lead up to 50m suitable site as per direction of Engineer for following depths, below natural ground/ Road top level. Remaining quantity will be sent to the C&D waste treatment plant.		
Air quality	ESS1, 3 & 4	Dust generation and emission	Prepare and implement dust and noise management plan for proposed demolitions. Regular Water sprinkling to be done in the construction and excavation areas in dry seasons. Water sprinkling to be undertaken for kuccha access road to prevent dust and air emissions impact on industries and settlement. Wetting and covering of excavated material transported by trucks. Provide dust containment enclosures to the site and at pipeline route where excavation is expected. All the transportation vehicles shall be PUC checked and maintained in good condition.	DBOT/ Construction Contractor	Contractor's cost for works, material transport
Impact on biodiversity due to Generation of dust & debris	ESS 6	Dust generation due to heavy vehicular movement & excavation Construction & Demolition debris	Dust suppression through sprinkling of water is recommended, though no water should be sourced from the lakes/ river in the area. It is suggested to provide proper covers and enclosures to prevent debris and excavated material to be air borne or flow into the water bodies while working near them. Also, a suitable	DBOT/ Construction Contractor	Contractor's cost for works material transport

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		generated due to excavation. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species.	management plan must be provided to ensure that no debris are left about on the site so that risk of airborne dust and surface run-off into the nearby waterbodies is reduced. No debris shall be dumped in waterbodies or any other area than designated for the purpose by AMC		
Impact on biodiversity due to change in air quality	ESS 6	Emissions from vehicles and machinery Air pollution due to site preparation, infrastructure development, and other related activities. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species.	All the vehicles used during the construction stage to have valid PUC certificate. Vehicles running on cleaner fuel such as CNG are recommended. Traffic management shall be carried out to avoid any congestion which may cause increase in pollution level Sprinkling of water at appropriate interval shall be carried out to control construction dust	Contractor	Contractor's cost for site preparation, construction works, material transport

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
Noise and vibration	ESS 1, 3 & 4	Impact on local people	Prepare clear plan and schedule for Demolition of the existing structure in the TSPS land, especially parts which will create more noise/ vibrations. Construction activities to be done in daytime after giving prior intimation to locals, mainly the Gyaspur settlement. The village is located at a distance from the site which will reduce the impact, but mitigation measure should be implemented to prevent and reduce impact on the local people. Night work shall be avoided, wherever possible, which may create noise and vibration. Use of low noise and low vibrating equipment and provision of enclosures for such equipment on site to be encouraged. Instruments need to meet standards of CPCB. Provision of PPEs to construction workers; like earmuffs and plug.	Contractor	PPE under Contractor's ESMP cost Less sound emitting equipment under Equipment cost
Community and Labor Health and Safety (GBV/SEA/SH)	ESS 2 & 4	Impact on local people	Increase risk and insecurity of women and girls. Increased risk of GBV/ SEA/ SH due to labour camp, influx of labour and inadequate safety and security mitigation measures. Night work for women labour should be avoided. Proper lighting should be arranged in areas where women labours are working, and as far as possible women should be part of work groups as a safety measure.	AMC/ Contractor	PIU Implementation cost Contractors Cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Complaints and grievances made by women on safety and security issues and concerns should be addressed promptly. Implement POSH Implement GBV COC on contractors, workers, AMC		
Impact on biodiversity due to noise and vibrations	ESS 6	Movement of vehicles, machinery such as boring machine, concrete mixtures, trucks, excavators, dumpers etc. Laying of pipeline may temporarily affect the avifauna in the vicinity. Increased level of noise and vibration. Faunal species like birds (Black Naped Ibis, Purple Rumped sunbird, Asian Green Bee-eater, Black Drongo, Cattle egret, Red vented bulbul, Indian Robin etc.) and mammals (Grey mongoose, Five-	Workers to be pre-sensitized to ensure reduction of noise and vibration to the least possible levels. Machinery employed should have been pre-serviced to ensure no more than usual noise is generated during their operation. All equipment must be provided with acoustic enclosures and silencers. Provision of suitable noise barriers should be made. Prevention of interference with songbird mating by ensuring no noise during dawn and dusk (when songbirds usually make their mating calls) and attempting to keep the noise level low	Contractor	Contractors' cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		striped palm squirrel etc.) will leave site temporarily. Noise above 60 dB has been reported to interfere with songbird mating call.			
Water quality	ESS1, 2, 3 & 4	Flooding and stagnation of water	Excavation and deep excavation are to be avoided to maximum extent during monsoon to prevent water stagnation and flooding. Water stagnation can increase incidence of disease related to polluted water and spread of vector borne disease. Therefore, during construction period training of workers and, supervisors for management of such stagnation, if and regular spraying for prevention of vector borne diseases, to be conducted through AMC health dept to prevent health risk for workers and inhabitants of the settlement.	Contractor	Contractors' works cost
Impact on Biodiversity due to change in water quality	ESS 6	Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of	While working in the river area measures should be taken that no construction waste, oil etc. shall affect the rivers water. Skimming of floating waste is recommended. Use of oil & grease absorbent pads is recommended.	Contractor	Contractors' works cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		macrophyte by interfering in nutrient cycle			
Soil and water quality	ESS 1, 2, 3 & 6	Impact on soil quality and fertility. Water quality degradation	Care to be taken to store fuel and oil (as and if required at site) at a place away from any drainage channel/ nalla preferably to be stored in drums mounted on a concrete paved/ impervious platform with slightly raised edges (or suitable arrangements) so that drums do not get overturned. There shall be proper channels for any spill to flow to a secure containment. Prepare and maintain inventory of the hazardous material and quantity. Also mention safety risks for fire and other incidents. PPE required for handling such wastes shall be mentioned in inventory. There shall be regular checks to determine any spillage of oil or fuel. Workers will be trained to handle the same and train in safety and addressing incidents and accidents. Mutually reactive/ hazardous material shall be kept away from each other. Material Data Sheet shall be checked and precautions to be followed.	Contractor	Contractors' cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Regular cleaning/ removal of sludge and solid waste to minimize odour nuisance and its disposal shall be ensured by AMC, in their facilities as per existing regulations.		
Aquatic life	ESS 6,	Impact on aquatic habitat	Prevent discharge of untreated sewage, leachate, and chemicals into surface water bodies Preservation of aquatic habitats by restricting movement of people/ equipment into them and preventing entry of sediments into water bodies Keep noise level (e.g., from equipment) to a minimum level, as certain fauna is very sensitive to loud noise. Keep only appropriate light levels in areas near nesting sites/ flight pathways. It is recommended that dawn and dusk time when avifaunal movement is high shall be excluded from construction schedule	Contractor	Contractors' material storage, equipment and works cost
Impact on nearby communities	ESS 1, 2, 3 & 4	Land acquisition and involuntary resettlement is not envisaged. Community health and safety issues due to pollution caused by air pollution due to vehicle movement on kuccha	Air quality improvement measures to be implemented. Include SEA/ SH grievance mechanism in project GRM. Include SEA/ SH related clauses in contractor's CoC.	Contractor & AMC	Project Cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		road in construction phase. Poor water quality in downstream villages due to poorly treated sewage Land acquisition and involuntary resettlement is not envisaged. Community health and safety issues due to pollution Poor water quality in downstream villages due to poorly treated sewage. Increased risk of insecurity as well as SEA/SH for women and girls due to labour influx			

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
Occupational health and safety	ESS 1, 2, 3 & 4	Occupational Health & Safety hazards to labours and public Labour camp management, Adopting EHS best practices	Comply with the Occupational health and Safety aspects of various labour related acts of India, WB EHS guidelines and OSHA guidance. Critical controls for all hazards including High Energy Hazards shall be in place before initiating any activity on site. Ensure work permit mechanism, for specialized work; especially demolition of existing structure, gas evacuations, enclosed spaces, depths, foundations, tanks, works on rising main, TSPS etc. which may be risky. Prepare and implement EHS plan approved by AMC/PIU which include measures as: (i) excluding the public/ unauthorized staff/workers from worksites; (ii) ensure all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at working times; (iii) providing (H&S) training for construction site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records Workers who may be exposed to all High Energy Hazards and other Hazards - working at height, confined spaces, gaseous spaces, and closed environments need to be given appropriate training and proper PPE before undertaking work. Critical Cobtrols and SOP shall be prepared for ensuring work is carried out as per SOPs.	Contractor	Contractors Design works cost. PPEs under each work costs (additional emergency PPEs under ESMP costs)

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Adequate care and training for precautions to be taken to avoid and treatments in case of scorpion and snake bites during construction activities. Ensure that anti venom is available for treatment at site or in the nearest hospital/ health care centre. Power tools not in proper condition should be replaced or prepared. Workers should use face shield or Goggles while welding and cutting work. Tagging shall be displayed in the Steel Scaffolding and shall be checked by safety engineer weekly, and the working platform should be at least 400 mm width for working at heights. Ensure Electrical DB are kept inside closed shed to prevent damage from water/dust, keep CO2 fire extinguisher outside the shed for electrical fire fighting. Lifeline shall be provided at the edges of slab and worker should wear safety harness at height work. Proper standard ladder should be provided for access to areas at a suitable/appropriate length. Crane shall only be used to lift the materials not human being which is very unsafe practice. Safety Posters must be posted at site to motivate the worker for safe work.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Safety Engineer should be available at site to give daily pep talks and submit the report daily. Ensure that labour colony should be periodically sanitized and kept clean and hygienic. Workers near high noise equipment to be provided with PPEs like ear plugs and earmuffs. Handrails on both sides of walkways close to deep tanks and STPs need to be ensured. Ensure that the contact details of the police or security company, fire brigade, nearest hospital, forest department and ambulance services are displayed on site (in languages which are comprehensible for the workers), and workers are trained to look at them and reach out for help when required. Smaller switches at STP units to be installed with protection from rainwater to minimize electrical short circuit. Proper housekeeping should be done at site and all materials should be properly stacked with display board. Records shall be maintained for the same. Cleaning/ maintenance, the inlet line and area of confined spaces like underground pumping stations shall be adequately vented to ensure that no toxic or hazardous gases are present in the line.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Ensure that there is no accumulation of solid/ construction or hazardous wastes on site, following proper plan for each for collection, treatment and disposal as per applicable rules and as agreed by the local body and PCB. Provide shaded areas for rest, mealtimes, drinking water and sanitation facilities. Medical emergency facilities such as para medical staff. First aid facilities, isolation centre for Covid -19/ pandemic or contagious health issue, ambulance service for incidences and accidents, tie up with government or private hospital for emergency services, etc. Maintain necessary living accommodation and ancillary facilities in functional and hygienic manner in work camps. Ensure (i) uncontaminated water for drinking, cooking, and washing, (ii) clean eating areas where workers are not exposed to hazardous or noxious substances; (iii) providing fire extinguisher at construction site and camps iv) fuel and cooking facilities in a safe and appropriate area (v) sanitation facilities are158vailablee at all times and (vi) waste management and segregation of wastes at camp and site. Segregation of labour camps from worksite and restricted entry to site of excavation and buildings to prevent entry of children, outsiders and stray animals.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			CHS of workers on the fields through which treated effluent will be disposed in Pipes is important in case of pipe bursts, leaks etc and hence monitoring shall be done to ensure no contamination. National Regulations and Policy & SOPs on prevention of manual Scavenging shall be followed & works involving sewage handling or manhole cleaning etc; shall be carried out by machines.		
Storage of Chlorine and polyelectrolyte	ESS 1, 2, 3 & 4	Land & water contamination by spilling	Designated safe area for the storage of chlorine and polyelectrolyte shall be defined. Log for use of these chemicals shall be maintained. Chemical spill contingency plan shall be prepared and implemented. Obtain consent under Explosives Act 1884 from Petroleum and Explosives Safety Organization (PESO) for storage of chlorine cylinders	Contractor	Contractors' cost
Community Health and safety	ESS 4	Community Health and safety risk during construction due to air pollution (dust & air emissions), traffic movement, congestion & Safety, noise, others) apart from sludge	The Contractor should abide to all National, State regulations, GPCB consent Conditions, NGT recommendations, including specific guidance on bypassing untreated sewage, and others for the critical river stretches of Sabarmati. Use separate storm water and wastewater systems and provide capacity sufficient to treat peak flows (Sufficient hydraulic capacity will be ensured to accommodate peak flows)	Contractor/ Sub-contractors	Contractors' cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		disposal, impact of bypassing untreated water during construction phase on neighbouring settlements and dependent communities downstream of Sabarmati River Environment and safety risk during demolishing of the existing structures in the proposed TSPS site	Provide safety signage at construction sites & pipeline alignment visible to public. Provide signages for traffic movement and traffic related aspects such as speed limit, height requirements, noise restriction, etc. Assign Traffic wardens for heavy movement of traffic. Advance intimation to the local communities especially Gyaspur about increased traffic movement and its duration Ensuring movement of vehicular traffic to and from worksite at non- peak hours. Provide safety barriers near any trenches, and cover trenches with planks during non-work hours. Contractor's activities and movement of staff will be restricted to designated construction areas. Water sprinkling on kuccha access roads and construction areas within the STP premises. Vehicles used for the construction activities shall have the necessary PUC certificates and regular checks for ensuring compliances as per local laws. Recycling and the provision of separate waste receptacles for different types of waste shall be maintained.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Grievance registers at entry gate of the proposed site with security. Training to be provided to, contractors, PMC & AMC staff to handle grievances with respect to community. Training of drivers transporting material to site on safety precautions, speed restrictions, other issues. The contractor's LMP and the condition will include clauses regarding non-tolerance of GBV and SEA. Any cases of GBV and SEA will be referred to the appropriate authority following the GBV Action Plan prepared for the project. Alternate traffic routing to be adopted in consultation with traffic police authorities. This shall be properly displayed well ahead of diversion areas. Commuters/ citizen shall be informed through signages, print and social media.		
Land acquisition Socio economic status, Labour/ employment opportunities & procurement	ESS 4, 5 & 10	Impact due to Land Acquisition, restriction on movement or access, livelihood	There are no potential involuntary resettlement issues identified, as there is no land acquisition of private land. Land proposed for the TSPS is located within the boundary wall of the Pirana Campus 1 premises. Land for proposed STP is situated behind the 180 MLD STP plant and belongs to the AMC and is free from encumbrances as per land record. Land for the out-fall channel parallel to the existing 180MLDs STP, from proposed STP to Sabarmati River is also owned by AMC. Ensure timebound restoration of access roads to support vehicular traffic, so as to minimize inconveniences or livelihoods	Contractors' scope	Contractors' cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			related impacts on neighbouring settlements and others using these access roads. Periodic consultations and information sharing with the local communities to ensure their engagement with the process and to manage all land and livelihoods related adverse impacts. Labor and employment opportunities will be generated during the construction period. Absorption of daily labour currently working in plant site for any construction activities in the proposed upgradation Unskilled and semi-skilled labour work can be sourced from the Gyaspur settlement as per availability and willingness of labour. Since the settlement is in close proximity some women may be willing to work on site as labour Continued access to access road/rivers will be available. There will be no restrictions on movement of people on access road. Traffic management plan will be planned and implemented to prevent any traffic congestion due to movement of vehicles transporting materials and labour. Ensure implementation of health and safety measures for all workers working on site given the nature of activities The contractor's LMP and the Condition will include clauses regarding non-tolerance of GBV and SEA. Any cases of GBV and SEA will be referred to the appropriate authority following the GBV Action Plan prepared for the project.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Pipeline from the TSPS shall be planned in such a way to avoid any disturbance to any private land.		
Labour camp	ESS 2	Undignified living conditions of labour Improper toilet facilities/ amenities Conflict with locals	Labor camps/ stay facilities shall be of acceptable living conditions and safe structures. If a camp is required, stay shall be arranged at appropriate distance from STPs. Construction of labour camp shall not be started before it is approved by the Engineer. Required facilities shall be arranged at the laborers' accommodation facility. Construction of separate toilets for labour at work site and labour camp Separation of camp from worksite is important. Separate toilets/ bathing/ washing facilities for women labour, and those with families. Code of Conduct for workers Regular inspection and health check-ups and sanitization Adoption of Covid appropriate behaviour, distancing norms, and signages/ messages Regular training & awareness programs to the workers Regulated movement of the workers to work site. GRM awareness creation and orientation; availability of boards, registers, complaint boxes at camp	Contractors; to be approved by Engineer, AMC PIU	Contractors' cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Fire-extinguishers, first-aid kits, emergency numbers at different locations in the camp		
Landscaping and tree plantation	ESS 6	Impact due to introduction of Invasive species Site already have exotic species like *Pistia* sp. *Lantana camara*, *Eucalyptus* sp., *Eichhornia crassipes* etc. Transfer of topsoil/ manure for landscaping may carry seeds of exotic species. Introduction of unwanted seeds/ sapling during transfer of sapling bags for plantation.	Removal of exotic species from the area to be developed shall be undertaken. Use indigenous varieties for plantation of green belt in discussion with Garden Department of AMC Plantation of local species Topsoil/ manure required for landscaping shall be used from the local region. Saplings bags for plantation shall be checked for presence of any exotic species, if present shall be discarded.	Contractors' scope	Contractors ESMP cost
Snake and scorpion bite	ESS 2	Accidental snake/ scorpion bite injury	Training/ awareness programs at all the stages of the project shall be conducted.	Contractors' scope	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Contact details of fire brigade, nearest hospital and forest department shall be provided on site		
Operation Impacts					
Post-construction clean-up	ESS 1 & 3	Damage due to debris, spoils, excess construction materials. Impact on soil and water quality	Remove all spoils wreckage, debris, rubbish, or temporary structures from the TSPS site. All excavated roads shall be reinstated to original condition. Road repairs in case of damage during construction works. Restoration of the surface dug for pipeline from TSPS. All disrupted utilities restored. All affected structures to be rehabilitated/ compensated. The work sites to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. The contractor must arrange the cancellation of all temporary services. Request PIU to report in writing (using prepared format) that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work. Seek feedback from neighbouring settlements on clean up	Contractor	Contractor cost
Existing sewage treatment plant (STP) operation	ESS 1 & 3	Non-compliance with government regulations – no valid consent to	Obtain CTO or amendments to existing CTO from Gujarat Pollution Control Board (GPCB) immediately.	AMC	Operating costs

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		operate (CTO) for STP operation			
Operation of STP	ESS 1 & 3	Release of untreated sewage into water bodies impacting water quality	There shall be daily and monthly monitoring of the treated sewage/ parameters and ensuring compliance with PCB standards for effluent disposal into surface water bodies. Periodically seek feedback from neighbouring settlements on STP operation and any unidentified/ unintended impacts Prevent spillage of sludge/slurry into water bodies	O&M Contractor/ AMC	Contractor cost
Screening waste	ESS 1 & 3	Unscientific storage & disposal of screening/ floating waste	Screening/ floating waste shall be stored in the closed containers and shall be disposed through AMC with written consent. Record of the waste generated and sent for disposal at AMC designated appropriate place shall be maintained	O&M Contractor/ AMC	Contractor cost
Solid waste & E-waste, Batteries	ESS 1 & 3	Unscientific storage & disposal of wastes	Wastes shall be segregated and stored in closed containers. Disposal shall be according to the Solid Waste Management Rules 2016, E-waste Management Rules 2016, Hazardous Waste Management Rules, or Batteries Rules as applicable. Records on wastes generated and disposed shall be maintained on site	O&M Contractor/ AMC	Contractor cost
Sludge disposal	ESS 1	Disposal of sewage/ sludge/ slurry in improper manner	Contractor will prepare sludge management plan, which will be approved by AMC. Sludge quality will be monitored and sent to AMC's Sludge Management facility during operation. If it is non-hazardous, where it is to be treated and disposed as per consent	O&M Contractor, AMC	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		Spillage during transit	conditions. If tested hazardous it shall be sent to the nearest appropriate Hazardous Waste TSDF for disposal following the Hazardous Waste Management Rules of Govt of India, 2016. Contractor will have the responsibility to store, test, transfer sludge for disposal appropriately based on the monitoring results, CPHEEO guidelines & existing regulations, as agreed in writing with AMC. Sludge shall be transported in covered containers to avoid any spillage during transit. Manual handling of sludge is prohibited as per regulations. WB EHS will be followed for sludge handling. Arrangements for management of sludge (with reduced odour, no spillage of sludge or leachate) shall be made in case of equipment break down/emergencies etc. in line with regulations and included in sludge and waste management plan.		
Release of unauthorized industrial effluent	ESS 1 & 3	Impacting STP operation efficiency	No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers. Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with GPCB	O&M Contractor/ AMC in coordination with GPCB	Contractor cost
Accidental release or malfunctioning of units	ESS 1 & 3	Discharge of untreated water into the river	Alarm system should be provided in the STP, which may indicate any sudden emergency or accident or breakdown or power failure.	O&M Contractor/ AMC in	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Emergency diversion facility shall be used	coordination with GPCB	
Air and noise environment	ESS 1 & 3	Odor and noise from STP	Strictly follow standard operating procedures/ operational manual for operation and maintenance of STP and terminal Pumping station Ensure that operating staff is properly trained and have clear understanding of odour issues vis a vis its relationship with operational practices. Ensure that pumping cycles are properly followed and there is no build-up of sewage beyond design volume in the wells. Proper handling and regular maintenance of operating machines including pumps, blowers, generators, air diffusers, etc. The STP and pumping station shall have sufficient buffer zone in form of greenbelt to reduce the odour and noise impacts. Seek feedback from neighbouring settlements/ establishments. Cover emission points as needed to reduce odour and meet applicable national/state requirements	O&M Contractor/ AMC	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
General safety	ESS 2 & 4	Occupational health of workers of STP and residents around STP	Cleaning/ maintenance, the inlet line and area of confined spaces like underground pumping stations shall be adequately vented to ensure that no toxic or hazardous gases are present in the line. Ensure that there is no accumulation of solid/ construction or hazardous wastes on site, following proper plan for each for collection, treatment and disposal as per applicable rules and as agreed by the local body and PCB. Safety Posters must be posted at site to motivate the worker for safe work. Confined spaces permit consistent with national/internationally accepted standards for lifeline and personal protection devices and special PPEs against hazards from gases and chemical spillages. Licenses and permits for storage of chemicals. Orientation of operators will be conducted involved in work with chlorine regarding safe handling practices and emergency response procedures i.e., run towards safety equipment installed at site for this purpose (safety shower, eye wash station) and call emergency number. Appropriate personal protective equipment (including, for example, self-contained breathing apparatus) will be provided and training on its proper use and maintenance to be ensured.	O&M Contractor/ AMC	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			Escape plans for areas where there might be a chlorine emission will be prepared. Safety showers and eye wash stations will be installed near the chlorine station and other areas where hazardous chemicals are stored or used. Gas detection equipment will be ensured at site. Air quality monitoring will be conducted as per monitoring plan in work areas for hazardous conditions (e.g., explosive atmosphere, oxygen deficiency). Chlorine system safety a) Alarm and safety systems will be installed, including automatic shutoff valves, that are automatically activated when a chlorine release is detected. b) Containment and scrubber systems will be installed to capture and neutralize chlorine leak if occur. c) Storage of chlorine will be ensured away from all sources of organic chemicals, and protect from sunlight, moisture, and high temperatures. d) Sodium hypochlorite will be stored in cool, dry, and dark conditions for no more than one month, and use equipment constructed of corrosion-resistant materials.		

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
			e) Ammonia storage and feed areas will be isolated from chlorine and hypochlorite storage and feed areas to avoid any incident. f) Amount of chlorination chemicals storage will be minimized on site while maintaining a sufficient inventory to cover intermittent disruptions in supply. Recommendations for the Sabarmati critical stretch & Consent conditions of SPCB shall be followed.		
Not using PPE	ESS 2	Workers may get injured due to not using PPEs at workplace. Worker's eyes may get injured due to not using of safety goggles and ace shield while welding	PPE' s (Safety shoes, Safety helmet, Full body harness, Safety jacket, Gloves) must be provided to the workers while working at site. Power tools which are not under proper condition should be replaced or prepared. Worker should use face shield or goggles while welding and cutting work.	O&M Contractor/ AMC	Contractor cost
Electrocution & Fire	ESS 2	Electrocution may occur due to using of joint electrical cable at STP & TSPS.	Standard operating Procedures (SOP) for working with electric instruments and facilities shall be defined and implemented. Ensure Electrical DB must be kept inside closed shed to prevent from water/dust with a gate outside. Keep CO2 fire extinguisher outside shed for electrical fire fighting. Contact details of nearest fire brigade and hospital shall be provided on site	O&M Contractor/ AMC	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
House keeping	ESS 2 & 4	Worker may get injured due to poor housekeeping at site. Vector borne disease may occur due to lack of poor housekeeping	Regular housekeeping shall be conducted. Records shall be maintained for the same. Storage area for raw material and waste shall be defined and appropriate signages shall be informed. Working area shall be periodically sanitized and kept clean and hygienic	O&M Contractor/ AMC	Contractor cost
Lack of awareness	ESS 2 & 10	The incident may occur due to non-awareness of workers at danger zone, without displaying safety sign board.	Safety Engineer should be available at site to give daily pep talks and submit the report daily. Training/ awareness programs at all the stages of the project shall be conducted. Mock drills shall be conducted frequently. Records of training/ awareness programs/ mock drills shall be maintained	O&M Contractor/ AMC	Contractor cost
Accidents due to working conditions	ESS 2	Persons fall from height, fall, slip, trip, fatality, property damage due to access and worker working without appropriate safety harness, Floor openings. Unsafe scaffolding has the potential to result to	SOPs for working conditions shall be defined and implemented. All the necessary PPEs shall be used, and checklist/ permit shall be approved prior to working at dangerous areas. Tagging should be displayed in the Steel Scaffolding and should check by safety engineer weekly, and the working platform should be at least 400 mm width. All the openings should be properly closed at walkway area and railing shall be provided.	O&M Contractor/ AMC	Contractor cost

Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsible Agency	Source of Funds
		death or serious injury of person.	Lifeline should be provided at the edges of slab and worker should wear safety harness at height work		
Snake and scorpion bite	ESS 2	Accidental snake/ scorpion bite injury	Training/ awareness programs at all the stages of the project shall be conducted. Contact details of fire brigade, nearest hospital and forest department shall be provided on site	O&M Contractor/ AMC	Contractor cost

6.3 Emergency/ Disaster Management Plan

The purpose of the DMP is to identify potential foreseeable accidents/ emergency situations and establish and maintain procedures to address or prevent such situations, as well as to test the effectiveness/review/revise such procedures periodically.

The proponent will insist on development and implementation of an individual emergency response plan or disaster management plan by every contractor/ stakeholder that will be involved in the project development. This will be made as a pre-requisite for engagement in the project.

The plan for emergency and disaster preparedness contains the modalities, roles, responsibilities and overall implementation of protocols and action plan in the case of emergencies and disaster. The procedure given in the DMP is also integrated for disaster preparedness.

The basic approach towards preparedness for any major disaster or emergency situation will comprise of the following activities:

- Identify the potential disasters likely to occur.
- Establish a Disaster/ Emergency Response Team (ERT) to implement emergency procedures.
- Develop a detailed Emergency/ Disaster Response Plan with details regarding the course of action to be followed in order to minimize personal injury and property damage in the event of fire, flood, loss of ground, or natural disaster.
- Incorporate the findings and emergency action plan Vasna Barrage Volume 2 prepared by the by National Institute of Hydrology, Jal Vigyan Bhavan, Roorkee (IIT Roorkee, Uttarakhand) reproduced in **ANNEXURE X**.
- Train the personnel in planning and responding to an emergency.
- Carry out audits of individual establishments on a regular basis to monitor the Emergency Response Plans and the corresponding procedures. The audits will include review of the following:

– The roles and responsibilities of the respective ERT and support organizations.

– Adherence of individual project activities to safe practices; and

– Resource requirements, condition of equipment's and their availability.

Identified Emergency Situations

The potential hazards identified for the project include the following:

- **Natural Hazards:**
  - Floods
  - Earthquakes
  - Fire hazards
- **Technological or Social Hazards**
  - Transportation accidents
  - Hazardous materials releases

- Social disorder
- Food and water supply contamination

Disaster management plan of Ahmedabad District shows following identified vulnerabilities for Ahmedabad which also apply directly to this project.

Table 40 Disaster Vulnerability.

Type of hazard	Vulnerability Ranking as per DDMP[45]	Vulnerable Area as per DDMP	Sub-project related risk
Earthquake	15 (High)	Entire District	Entire plant area
Flood	9 (Moderate)	Ahmedabad, Daskori, Dholka, Dholera, Dhandhuka	Entire plant area
Fire	9 (Moderate)	Ahmedabad City, Bavla, Daskroi	Plant units
Industrial Accidents i.e., Accidental gaseous emission (chlorine)	6 (Moderate)	Ahmedabad City, Bavla, Daskroi	Plant units
Droughts	6 (Moderate)	Viramgram, Detroj, Mandal	Not applicable
Food Poisoning	4 (Low)	Entire District	Construction workers & STP staff
Epidemic	4 (Low)	Entire District	Construction workers & STP staff
Building Collapse	2 (Moderate)	Mainly in city area	Plant units

6.4 Proposed Organizational Structure for Disaster Management

Disaster Management Committee

Client shall constitute a Disaster Management Committee (DMC) for sub-projects under G-ACRP. This committee will be headed by Commissioner, Ahmedabad Municipal Corporation and Urban Development. The DMC will be the apex planning body and will play a major role in preparedness and mitigation of any disaster. The cell will have the following key functions:

- Preparation of sub-project specific Disaster Management Plan;
- Setting up of Emergency Control Centre during emergency situations;
- Coordination with District Disaster Control Room of Ahmedabad district;
- To supervise emergency response measures in case of any emergency;
- Keep track of predictable natural hazard events such as floods etc.;

[45] *DDMP Ahmedabad District 2021*

- Organize training and capacity building programs on disaster management for individual establishments in the Project Region;
- Periodic monitoring of Emergency Response Plans and the corresponding procedures of individual establishments;
- Organize post –Disaster evaluation and update DMP accordingly;
- Prepare reports and document on Disaster events and submit the same to District Control Room. The documents shall include:
  - Source & cause of Disaster
  - Description of the response efforts.
  - Recommendation for preventive & mitigation measures.

Plan for upgrading emergency preparedness and response plan

The DMC will have the following members of AMC staff:

- Unit Supervisor
- Administration Department
- Disaster management/ Safety Department
- Electrical Department
- Civil Department
- Environment Department

STP plant during construction and operation phase shall have following assets in admin building to control and communicate the disastrous conditions,

- Intercom, telephone;
- P and T telephone;
- Breathing apparatus;
- Goggles/ gloves/helmets;
- Public address megaphone, hand bell, telephone directories (internal, P and T);
- Emergency lamp/ torch light/ batteries;
- Emergency shut-down procedures;
- List of key personnel and list of Emergency coordinators;
- Duties of key personnel;
- Address with telephone numbers and key personnel & departments i.e., police, fire brigade, hospital etc., emergency coordinator, essential employees;
- Important address and telephone numbers including Government agencies, neighboring industries, and sources of help, outside experts, chemical fact sheets, population details.

6.4.1. Emergency Response:

The following five steps are involved in an emergency response plan of the plant:

- Discovery and Notification: An event with an imminent threat of turning into an accident must first be discovered and the discoverer quickly notifies the same to the plant safety officer.

- Evaluation and Accident Control Initiation: Based on the evaluation of available information, the safety authority makes a rapid assessment of the severity of the likely accident and initiates the best course of action.
- Control Measures: Action is first taken to control the accident by eliminating the causes which may lead to the spread of accident. Measures are also taken to minimize the damage to personnel, property, and environment.
- Cleanup and Disposal: After the accident is effectively contained and controlled, the cleanup of the site of the accident and safe disposal of waste generated due to the accident are undertaken.
- Documentation: All aspects of accidents, such as its occurred sequence, control steps and the extent of the damage and injury, must be documented for subsequent analysis of accident for prevention in future, damage estimation, insurance recovery and compensation payment. It may be noted that some aspects of documentation, such as photographs of the site of accident and main objects involved in the accident, survey for damage estimation, etc. may have to be carried out before the cleanup and disposal phase. However, the effort in all cases is to recommence production as soon as possible.

Following are the list of identified disasters and proposed management plan:

Table 41 Disaster Management Plan (DMP) for 424 MLD STP including TSPS, Pipeline, Outfall and Approach Road

Type of disaster	Precautionary measure	Emergency response	Post disaster response	Records to maintain
Earthquake	Earthquake compliant design. Responsibility of Design consultant Prepare SOP: Responsibility of DBOT contractor. Training & mock drills: Responsibility of DBOT contractor	Gather in Common refugee area. Head count Follow protocol/ SOP prepared for earthquake related situation. Communicate to fire brigade. Communicate to hospital in case of any injury. Communicate AMC head office. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues
Flood	Design considering flooding history and impact of barrage: Responsibility of Design consultant. Prepare SOP: Responsibility of DBOT contractor	Gather in Common refugee area. Head count Follow protocol/ SOP prepared for flood related situation. Communicate to fire brigade. Communicate to hospital in case of any injury. Communicate AMC head office. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues

Type of disaster	Precautionary measure	Emergency response	Post disaster response	Records to maintain
Fire	Fire compliant design: Responsibility of Design consultant Prepare Fire Safety Procedures SOP: Responsibility of DBOT contractor. Provide fire management system. • Hydrant system for the entire plant area. • Automatic water spray deluge system for the transformer area • Manually operated water spray system for pumps and sludge press. • Automatic sprinkler system for STP units. • Automatic fire foam system for the fuel oil storage. • Automatic inert gas flooding fire extinguishing system for the control rooms. • Portable fire extinguishers for the entire plant area; and • Fire detection and alarm system for the STP units	Gather in Common refugee area. Head count Follow protocol/ SOP prepared for fire related situation. Communicate to fire brigade. Communicate to hospital in case of any injury. Communicate AMC head office. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues

Type of disaster	Precautionary measure	Emergency response	Post disaster response	Records to maintain
Industrial Accidents i.e., Accidental gaseous emission (chlorine)	Leak proof design: Responsibility of Design consultant, DBOT contractor Prepare SOP: Responsibility of DBOT contractor.	Gather in Common refugee area. Head count Follow protocol/ SOP prepared for accident-related situation. Communicate to hospital in case of any injury. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues
Accidents on Site	Implement ESMP OHS measures: Responsibility of DBOT contractor. Prepare SOPs: Responsibility of DBOT contractor.	Provide First Aid Move to nearest Hospital, preferably considering the type of accident and injury, inform nearest kin. Provide assistance and support for treatment, hospitalisation and transport. Arrange insurance claim	Root cause analysis Prepare Corrective Action Plan	Incident/ Accident Register marking all accidents – indicative, serious, severe
Food Poisoning	Prepare SOP: Responsibility of DBOT contractor.	Follow protocol/ SoP prepared for accident-related situation. Communicate to hospital. Communicate to AMC head office. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues
Epidemic/ Pandemic	Prepare SOP, Guidelines: Responsibility of DBOT contractor.	Follow protocol/ SOP prepared for accident-related situation.	Audit for loss and damage	Add loss and damage Register

Type of disaster	Precautionary measure	Emergency response	Post disaster response	Records to maintain
		Communicate to hospital. Communicate to PIU, AMC head office. Provide first aid		
Agitation/ civil disorder	Prepare SoP: Responsibility of DBOT contractor.	Follow protocol/ SOP prepared for accident-related situation. Communicate to hospital. Communicate to AMC head office. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues
Building Collapse	Prepare SOP: Responsibility of DBOT contractor. Training & mock drills, Responsibility of DBOT contractor	Gather in Common refugee area. Head count Follow protocol/ SOP prepared for accident-related situation. Communicate to fire brigade. Communicate to hospital in case of any injury. Communicate with PIU, AMC head office. Provide first aid	Audit the plant for loss and damage.	Add loss and damage Register. Root cause analysis Submit report stating actions taken to response or rectify the issues

DBOT contractor shall prepare the SOPs for identified disaster situations and update the DMP. DMP shall be integrated with AMCs disaster management strategies and all the concerned documents shall be submitted to AMC by DBOT contractor.

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6.5 Proposed Monitoring Plan

Environmental monitoring during construction and O&M phase is an important step to assess the impacts of the proposed project and it will be help in suitably changing/ strengthening the mitigation measures in terms of air quality, water quality, noise quality etc. Following are the major impacts identified based on which the monitoring plan is prepared,

1. Air pollution due to construction activities
2. Noise pollution due to construction activities
3. Contamination of river due to diversion of untreated sewage, drainage & oil spill
4. Sourcing raw material from unauthorised sources
5. Chance finding of historic artefact.
6. Disposal of C&D waste generated.
7. Disposal of Solid waste and sludge generated.
8. Removal of topsoil
9. Impact on local biodiversity due to construction activities
10. Tree cutting
11. Impact on water quality due to improvement of treatment of sewage
12. Soil contamination due to spill and pollutants
13. Occupational Health & Safety impacts during construction & operation phase
14. Community health & Safety
15. Employment opportunities
16. Landscaping & plantation

The project will require statuary clearance, i.e., Consent to Establish (CTE) and Operate (CTO) from, State Pollution Control Board (SPCB). The CTE and CTO conditions are to be complied and report submitted to GPCB every half yearly or as suggested in Consent Conditions.

Following **Table 41** gives the details of monitoring plan for CTE (during construction phase) and CTO (O&M phase) to be followed for the project:

Table 42: Environmental and Social Monitoring Plan: Construction Phase

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety	Project site, all TSPS & pipeline alignment	Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures.	Weekly during construction	Contractor's staff and environmental specialists of PIU	Staff and consultant costs are part of incremental administration costs
Ambient air quality	1 location in STP, 1 location at each TSPS, 2 locations along alignment of pipeline from TSPS	SO_2, NOx, RSPM 10µm, PM 2.5µm, CO, Volatile organic compounds (VOCs), Methane, Ammonia, H_2S, Hydrocarbon (HC)	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Inlet sewage and outlet treated water parameters. **Surface water**	Five (5) locations (Intake and outfall of STP). One (1) Location downstream to outfall in Sabarmati River	**Physical parameters:** Colour, Odor, Temp, pH, turbidity, Total Hardness (Mg & Ca), TSS, TDS **Chemical parameters:** Total alkalinity, Chloride, Total Residual Chlorine, Sulphate, Nitrate, Fluoride, Na, K, Salinity, Total	Once before start of construction. Quarterly (except monsoon) during construction (*Monitoring to be carried out for all the parameters*	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		Nitrogen, Total Phosphorus, DO, BOD, COD, Ammoniacal Nitrogen, Total Kjeldahl Nitrogen, Free Ammonia, Phenol, Oil &Grease, Heavy metals (Copper, Nickel, Lead, Zinc, Manganese, Cadmium, Hexavalent Chromium, Total Chromium, Mercury, Cobalt, Arsenic, Cyanide, Iron) **Biological Parameters:** Total Coliform, Faecal Coliform, Phytoplankton, and zooplankton	*for inlet and at outfall)*		
Ambient noise	1 location in STP, 1 location at each TSPS, 2 locations along alignment of pipeline from TSPS	Day time and night-time	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ground water quality	Four (4) locations (Inside plant and outfall of STP)	**Physical parameters:** Colour, Odor, Temp, pH, turbidity, Total Hardness (Mg & Ca), TSS, TDS **Chemical parameters:**	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		Total alkalinity, Chloride, Total Residual Chlorine, Sulphate, Nitrate, Fluoride, Na, K, Salinity, Total Nitrogen, Total Phosphorus, DO, BOD, COD, Ammoniacal Nitrogen, Total Kjeldahl Nitrogen, Free Ammonia, phenol, Oil &Grease, Heavy metals (Copper, Nickel, Lead, Zinc, Manganese, Cadmium, Hexavalent Chromium, Total Chromium, Mercury, Cobalt, Arsenic, Cyanide, Iron) **Biological Parameters:** Total Coliform, Faecal Coliform, Phytoplankton, and zooplankton,			
Soil quality	1 location in STP, 1 location at each TSPS & 1 location along pipeline alignment	**Physical parameters:** Bulk density, Salinity, Porosity, Texture Class (Percentwise silt, clay & sand), **Chemical parameters:** pH, Electrical conductivity, Cation exchange capacity, Sodium, Potassium, Nitrogen, Magnesium, Phosphorous, Sodium Absorption Ratio (SAR), Water holding capacity, Iron, Copper, Zinc, Manganese,	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		Nickel, Permeability, physicochemical analysis and relevant metals.			
Sludge analysis	**1 location in STP** **Follow applicable national regulations and latest recommended methodologies.**	**Physical parameters:** pH, Bulk Density, Conductivity, Moisture Content and Water Holding Capacity, Colour & Texture, Odor **Chemical parameters:** Oil & Grease, Total Volatile Solids, Total Kjeldahl Nitrogen, Total Organic Carbon, Phenolic Compounds, Calorific Value, Total Phosphorus, Total Coliform, Faecal Coliform, Arsenic (As), Nickel (Ni), Zinc (Zn), Cadmium (Cd), Copper (Cu), Chromium (Cr+6), Lead (Pb), Mercury (Hg), Toxicity Characteristics Leaching Procedure (TCLP)	**Once before start of construction.** **Once in six months during construction**	**Construction Contractor**	Cost for implementation of monitoring measures responsibility of contractor
Biodiversity assessment	Four (4) locations One (1) at Site area Four (4) locations at Downstream of Sabarmati River Four (4) locations at upstream of Sabarmati River	General vegetation profile, floral diversity & Faunal diversity A species wise list Flora & Fauna under RET categories should be documented using International Union for the Conservation of Nature and Natural Resources (IUCN) criteria and Botanical Survey of India's Red Data list along with economic significance. Species diversity curve for RET species.	**Annual**	**Construction Contractor**	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
	Four (4) locations – TSPS and Pipeline alignment –	Migration information of fauna present Exotic/ Invasive species list Aquatic ecology – Fish diversity & Fisheries, Macro invertebrates, zooplankton, phytoplankton, benthic organisms, aquatic plants'			
ESMF Compliance & Status report	**-**	ESMF Compliance, Status Report, including any issue with screening results, the status of conduct of ESIAs including required plans like CHMP, BMP; and actions taken for compliance on site	**Monthly**	**Monitoring by Construction contractor, submission by PMC/ E&S auditor**	Cost of monitoring by Construction contractor and cost of submission by PMC
Site visit report	**-**	Site audit	**Monthly**	**PMC**	PMC
Compliance to the CTO	**-**	Compliance to the conditions stipulated in the CTO	**Monthly**	**PMC**	PMC
Community Consultations	1 location – nearest residential area, 2 locations downstream of Sabarmati River, 1 location near TSPS & along pipeline	Issues due to project construction activities	**Yearly twice**	**Construction Contractor**	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Grievance Redressal	Project area and surrounding	Registered grievances	**Monthly or as soon as grievance registered**	**PMC**	PMC & PIU
Areas with water stagnation	Project area and surrounding	Areas with water stagnation	**Monthly**	**Construction Contractor**	Cost for implementation of monitoring measures responsibility of contractor
Health & Safety	Project area and surrounding	No: of worksite incidents in various project sites (during Construction and O&M)	**Monthly**	**Construction Contractor**	Cost for implementation of monitoring measures responsibility of contractor
Environmental & Social Audit of existing 180 MLD STP for it is proximate to proposed project location	Project area and surrounding	Physical monitoring and working of all the units of STP viz., screens, grit chambers, clariflocculators, aeration tanks, secondary clarifiers, chlorine contact tank, sludge thickeners, digesters, and gas holder tanks. And units like pumps, motors, blowers etc., Any Issues due to rehabilitation works in parts of STP.	Annual	**Construction Contractor**	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		STP inlet – outlet and unit wise quality parameters tested. Any abnormalities like leakage and spillage of oil, grease, sludge etc., Assessment of quality of implementing ESMP/ environmental management practices Health and safety risks for workers and communities Complaints received from civilians/ neighbouring people. General work safety records of the plant Compliance to CTE (in construction phase) and CTO (in operation phase) conditions or other regulatory conditions. Compliances to ESS, National, State and Local laws and mandatory and statutory compliances including permissions, consent conditions, labour health, safety, security, welfare, etc. Implementation of OHS, GRM, various action plans at site. Maintenance of documents, records, and reports requisite for site			

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		LMP compliance Assessment of capacities, technology in achieving NGT/ suggested standards and for design specification Environmental monitoring analysis pre and post treatment Sludge generation, quality, treatment, and disposal Generation of wastes, all biproduct and their reuse Resource efficiency Availability of staff for E&S at all levels Monitoring of Corrective Action Plan implementation in case of incidents if any Review of Training/ Capacity Building			

Table 43: Environmental and Social Monitoring Plan: Operation Phase

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Ambient air quality	1 location in STP, 1 location at each TSPS	Same as construction phase	Quarterly (except monsoon) during construction	O&M Contractor	O&M Contractors scope
Inlet and outlet parameters	3 locations (Intake and outfall of STP)	Same as construction phase	Monthly	O&M Contractor	O&M Contractors scope

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Ambient noise	1 location in STP, 1 location at each TSPS	Day time and nighttime	Quarterly	O&M Contractor	O&M Contractors scope
Ground water quality	4 locations (Inside plant and outfall of STP)	Same as construction phase	Quarterly (except monsoon)	O&M Contractor	O&M Contractors scope
Soil quality	1 location in STP	Same as construction phase	Quarterly (except monsoon)	O&M Contractor	O&M Contractors scope
Sludge analysis	1 location in STP	Same as construction phase	Quarterly (except monsoon)	O&M Contractor	O&M Contractors scope
Biodiversity assessment	3 Locations	Same as construction phase	Annual	O&M Contractor	O&M Contractors scope
ESMF Compliance & Status report	-	Same as construction phase	Monthly	Monitoring by Construction contractor, submission by PMC/ E&S auditor	Cost of monitoring by Construction contractor and cost of submission by PMC
Site visit report	-	Same as construction phase	Monthly	PMC	PMC
Compliance to the CTO	-	Same as construction phase	Monthly	PMC	PMC

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Community Consultations	1 location – nearest residential area, 2 locations downstream of Sabarmati River	Same as construction phase	Yearly twice	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Grievance Redressal	Project area and surrounding	Same as construction phase	Monthly or as soon as grievance registered	PMC	PMC & PIU
Areas with water stagnation	Project area and surrounding	Same as construction phase	Monthly	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Health & Safety	Project area and surrounding	Same as construction phase	Monthly	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Environmental & Social Audit	Project area and surrounding	Same as construction phase	Once a year	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor

6.6 Estimated Budget for Implementation and Supervision of ESMP

Table 44: Budget for ESMP Implementation

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
A	**Monitoring staff & Updating of ESIA**						
1	Environmental specialist (Civil/ Environmental Engineer) with minimum 5 years of experience in Operation & construction phase.	Pre-construction, Design	Per month	12	50,000	600000	Contractors Cost- annual HR

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
2	Social specialist with minimum 5 years of experience in Operation & construction phase.	Pre-construction, Design	Per month	12	50,000	600000	Contractors Cost- annual HR
3	C-ESIA/ CESMP preparation/ updating based on detailed design, including results of Flood Risk Assessment Study, preparation of EAP, mitigation measures	Pre-construction, Design				3000000	To be included in Design Cost of DBOT contractor
	Subtotal (A)					**42,00,000**	
B	**Monitoring measures-**						
	Pre-Construction Phase						
1	Air quality monitoring during pre-construction phase at locations mentioned in Environmental Monitoring Plan of report. The parameters to be monitored are SPM, RPM, SO2, Nox and CO, Lead. Each monitoring schedule shall be over a duration of 24 hours (in 8-hour shifts), once	Pre-Construction	Nos.	5	8,000	40000	Monitoring Cost
2	Inlet and outlet parameters of STP	Pre-Construction	Nos.	3	10,000	30000	Monitoring Cost
3	Ground Water quality monitoring during pre-construction phase at locations mentioned in Environmental Monitoring Plan of report. The sampling shall be carried out once and cover all parameters as per IS: 10500 including heavy metals.	Pre-Construction	Nos.	2	10,000	20000	Monitoring Cost

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
	2 locations at site and 1 near labour camp						
4	Noise quality monitoring during pre-construction phase at locations mentioned in Environmental Monitoring Plan of report. Each monitoring schedule shall be over a duration of 12 hours (6AM to 6PM), once. The monitoring shall be carried out in accordance with CPCB norms.	Pre-Construction	Nos.	5	2000	10000	Monitoring Cost
5	Biodiversity assessment – Once in preconstruction stage	Pre-construction	LS	-	-	200000	Monitoring Cost
6	Sludge analysis during pre-construction phase	Pre-Construction	Nos.	1	15000	15000	Monitoring Cost
7	Soil quality as per the list of parameters mentioned in report	Pre-Construction	Nos.	1	10000	10000	Monitoring Cost
8	Revision of ESMP, Monitoring plan & reporting schedule	Pre-construction	LS	-	-	10000	Monitoring Cost
9	Consent to Establish	Pre-Construction	Nos	1	350000	350000	Statutory fee by AMC & application by DBOT contractor cost
10	Training, capacity building of staff, Finalization of ESMP (contractors, sub-contractors). Training for 20 workers/ quarter.	Pre-Construction	Nos.	4	2500	10000	ESMP residual Cost
11	IEC material (pamphlets, poster, banners, etc.)	Pre-Construction	LS	-	-	9050	ESMP residual Cost

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
12	GRM (display boards/banners, details of website, documentation, etc. for Construction and operation)	Pre-Construction	Nos.	50	2000	100000	ESMP residual Cost
13	Material covers, sprinkling for dust suppression, preparation of cut off drains, platforms etc.	Pre-construction	LS			100000	To be included in Project Costs, but including here for extra coverage in case of an emergency
	Subtotal (B)					904050	
Construction Phase							
1	Air quality monitoring during construction phase at locations mentioned in Environmental Monitoring Plan of report. The parameters to be monitored are SPM, RPM, SO_2, Nox and CO, CO_2, CH_4 and Lead. Each monitoring schedule shall be over a duration of 24 hours (in 8-hour shifts), once	Construction	Nos.	15	10,000	150000	Monitoring Cost
2	Water sprinkling for dust mitigation	Construction	LS	-	-	500000	Monitoring Cost
3	Ground Water quality monitoring during construction phase at locations mentioned in Environmental Monitoring Plan of report. The sampling shall be carried out once and cover all parameters as per IS10500 including heavy metals.	Construction	Nos.	6	10,000	60000	Monitoring Cost

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
4	Noise quality monitoring during construction phase at locations mentioned in Environmental Monitoring Plan of report. Each monitoring schedule shall be over a duration of 12 hours (6AM to 6PM), once. The monitoring shall be carried out in accordance with CPCB norms.	Construction	Nos.	15	2000	30000	Monitoring Cost
5	Biodiversity Assessment	Construction	LS	-	-	800000	Monitoring Cost
6	Sludge analysis during construction phase	Construction	Nos.	2	15000	30000	Monitoring Cost
7	Soil quality as per the list of parameters mentioned in report	Construction	Nos.	12	10000	120000	Monitoring Cost
8	Consultations (quarterly basis)	Construction	Nos.	40/yearly	1000	40000	Monitoring Cost
9	Tarpaulin for covering soil, storage of raw material etc.	Construction	LS	-	-	30000	Monitoring Cost
10	Solid waste management including C&D waste, MS, Plastic waste & e-waste: Contingency Cost	Construction	LS	-	-	200000	Actual Cost To be included in Works Cost. Allocation in ESMP residual Costs is for emergency/contingencies
11	PPEs & safety instruments for workers	Construction	LS	-	-	200000	Actual Cost To be included in Works Cost. Allocation in ESMP residual Costs is for emergency/ contingencies
12	Labour Facilities and Camp	Construction	LS	-	500000	500000	To Be included in Contractors Project Work Costs. This amount here is lumpsum for any contingencies

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
13	Consent to Operate	End of the construction	LS	1	350000	350000	Statutory fee by AMC & application by DBOT contractor cost
	Subtotal I					3010000	
	Operation Phase - Per year cost						
1	CTO Renewable Fee	Operation Phase	Nos	1	5000	5000	Statutory fee by AMC to be included in Project Cost application & liaising by O&M contractor cost
2	Air quality monitoring during O&M phase at locations mentioned in Environmental Monitoring Plan of report. The parameters to be monitored are SPM, RPM, SO_2, NOx and CO, CO_2, CH_4 and Lead. Each monitoring schedule shall be over a duration of 24 hours (in 8-hour shifts), once	Operation Phase	Nos.	3	10,000	30000	Monitoring Cost
3	Inlet and outlet parameters of STP	Operation Phase	Nos.	6	10,000	60000	Monitoring Cost
4	Ground Water quality monitoring during O&M phase at locations mentioned in Environmental Monitoring Plan of report. The sampling shall be carried out once and cover all parameters as per IS10500 including heavy metals.	Operation Phase	Nos.	6	10,000	60000	Monitoring Cost

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
5	Noise quality monitoring during O&M phase at locations mentioned in Environmental Monitoring Plan of report. Each monitoring schedule shall be over a duration of 12 hours (6AM to 6PM), once. The monitoring shall be carried out in accordance with CPCB norms.	Operation Phase	Nos.	3	2000	6000	Monitoring Cost
6	Biodiversity Assessment	Operation-annual	LS	-	-	800000	Monitoring Cost
7	Sludge analysis during O&M phase	Operation	Nos.	3	15000	45000	Monitoring Cost
8	Soil quality as per the list of parameters mentioned in report	Operation	Nos.	3	10000	30000	Monitoring Cost
9	Green Belt Maintenance	Operation Phase	Nos	LS	-	1000000	Greenbelt is to be included in Project Cost. Here only monitoring cost & emergency support costs included
10	Solid waste management including C&D waste, MS, Plastic waste & e-waste	Construction	LS	-	-	100000	Actual Cost To be included in Works Cost. Allocation in ESMP residual Costs is for emergency/contingencies
11	PPEs & safety instruments for workers	Construction	LS	-	-	200000	Actual Cost To be included in Works Cost. This allocation in ESMP residual Costs is for emergency/ contingencies
					Subtotal (D)	2336000	

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
	One time cost - Preconstruction & Construction Phases (B+C)					**12944050**	excludes consent/ permit fees which shall be included in project cost
	O&M Cost - Annual					**2336000**	excludes HR cost
	Recurring cost O&M period of 10 years					**23360000**	excludes consent/ permit fees which shall be included in project cost
	TOTAL ESMP COST including all subproject phases: Monitoring Costs and ESMP Residual Costs (other than those included in Contractors Works Costs, Permit/Licence Costs and Human Resources Cost)					**36304050**	

Note:

1. DB period is considered as 4 years (refer G56)
2. Pre-construction phase is considered as 1 year (Refer G26)
3. O&M Period is considered as 15 years (Refer G58)
4. HR cost for Environment and Social persons for Contractor is considered for 1 year (Refer G3 and G4)

6.7 Environmental and Social Commitment Plan (ESCP) Compliance

Key measures and timeframes required for the project to meet the requirements of the ESSs are as follows: i) AMC will establish and maintain an E&S organizational structure in PIU with qualified staff to support the management of E&S risks including Environmental, Biodiversity, Heritage, OHS/ CHS, &R, Gender experts as required to prepare E&S mitigation/ management measures; ii) AMC to prepare draft ESIA; iii) Disclose Draft Environment and Social Impact Assessment (ESIA) in AMC website and WB external website; iv) Disclose Draft Stakeholder Engagement Plan; v) AMC to develop and include the project grievance mechanism in SEP and vi) disclosure of the approved ESCP, vii) prepare bid documents incorporating the approved ESMP requirements, before initiating the bidding process. These actions will be completed before Project Appraisal begins. Final ESIA and ESMPs will be disclosed before project negotiations.

- Prepare, and disclose ESIAs for Proposed Pirana 424 MLD STP subproject for new STP based on the Detailed Project Report to initiate DBOT Contractor procurement following ESMF procedures.
- DBOT contractor to update/ prepare ESIAs based on the proposed detailed design before initiating any work-related activities.
- Identify “Associated Facilities” as per ESF by screening all sub-projects during the DPR stage. Ensure that all Associated Facilities meet the requirements of the ESSs, to the extent that AMC has control or influence over such Associated Facilities. In cases where the requirements of the ESSs cannot be followed, the Bank will require AMC to demonstrate the extent to which it cannot exercise control or influence over the Associated Facilities by providing details of the relevant considerations, which may include legal, regulatory, and institutional factors. The Bank team will review each case and make a final decision based on available facts and information.
- Design should be responsive to the quality of sewage received at the inlet, and measures shall be incorporated to meet the suggested standards.
- Bidding documents and contracts to include ESMP and Monitoring Plan to enable the DBOT contractor to allocate appropriate time, resources (manpower and budget) for implementing ESMP.
- Update as required, get approvals, disclose and implement the Environmental and Social Management Plan (ESMP) for Proposed Pirana 424 MLD STP subproject.
- Obtain environmental clearances, licenses/ approvals, and permits under the existing legal framework that apply to the subproject and all its activities from relevant national and/ or local authorities.
- Incorporate the relevant aspects of the ESCP, ESMS, ESIAs, ESMPs, including the relevant E&S documents and /or plans, and the Labour Management Procedures, into the ESHS specifications of the procurement documents with contractors. Thereafter ensure that the contractors comply with the ESHS specifications of their respective contracts.

- Incorporate the findings and recommendations of the hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events to prepare C-ESIA / C-ESMP
- Preparation of Contractors-ESMP will include Hazardous and non-hazardous waste management plan, Sludge and Waste Management Plan (including bio-degradable/ non-biodegradable, C&S, biomedical, E-waste, Hazardous wastes), OHS Plan, SEA/ SH Action Plan, Community Health and Safety Plan, Labour Management Plan, Traffic Management Plan, Waste Management Plan, Workers' Camp Management Plan, L&FS Plan, etc. that will be acceptable to AMC, and the World Bank
- Prepare, adopt, and implement occupational, health, and safety (OHS) measures specified in the LMP.
- Monitor and Supervise OHS at all sites through supervision contractor as an integral part of construction supervision and Conduct OHS Audit and implement suggested actions to improve work safety.
- Contractors EHS person shall have qualification in Life & Fire Safety, and prepare L&FS plan and implement the same
- Monitor all emissions/ discharges/ disposal of wastes from project facilities during construction and operation stages and ensure that the discharges from project facilities into the environment are as per the latest limits suggested by MoEFCC, GPCB, and National Green Tribunal whichever is stringent for each parameter. The technology shall be upgraded to meet the directions of GPCB in the consent orders, and any stringent standards suggested by regulators.
- Ensure that pollution from project facilities does not negatively impact the environmental components and downstream communities. Undertake annual Pollution audit and OHS audit as part of E&S Audit and confirm this.
- Contractor to monitor and ensure continuous and as required by consent conditions or any regulation or guidance; quality of treated sewage discharged from the facility or recycled and reused.
- Prepare, adopt, and implement measures and actions to assess and manage specific risks and impacts to the community arising from Project activities (including risks related to the behaviour of the project workers, labour influx, increased traffic, increased social interactions between project workers and communities, increased construction activities, etc.). Incorporate these measures in the Community Health and Safety Plan as part of Contractors ESMP.
- Conduct disaster evaluation and extreme weather conditions assessment considering earthquake proneness, and flooding/ other risks if any due to presence of Barrage or any disasters; and incorporate avoidance, mitigation, and management measures and Prepare Disaster Management Plan including

Standard Operating Procedures for each STP (as part of DPR, ESIA). Operations shall also follow the latest Disaster Management Plan for Gujarat

- Prepare and implement chance finds procedure described in the ESMPs and include as a requirement in ESIA/ ESMP and also in the procurement documents for civil works.
- Training Calendar in ESMF and specific training aspects in ESIAs to be followed. Additional training will be identified during the project implementation period. Provide training for Project workers on occupational health and safety including on disaster prevention.

CHAPTER 7. INSTITUTIONAL ARRANGEMENTS

7.1 Proposed Institutional Arrangement for Implementation of ESMP, Supervision, Monitoring

The implementing agency for this project will be Ahmedabad Municipal Corporation (AMC). The subproject will be implemented on DBOT mechanism. Compliance with the Environmental and Social requirements established in the ESMP will require a sustained intra and inter agency coordination efforts among key agencies, consultants and other project related stakeholder.

For G-ACRP, considering the need to manage E&S aspects for sewerage, it is recommended to create a Separate ESF Cell in AMC named the **Sustainable Urban Development Unit (SUDU) in the PIU of AMC**, to integrate environmental and social aspects well into all operations of the drainage Department, those under G-ACRP and all other activities carried out by AMC in this sector to ensure long term sustainable outcomes and health benefits to the inhabitants. For overall project support, the services of a Project Management Consultant (PMC) will be used. The proposed Institutional Framework for E&S Management under G-ACRP is presented in **Figure 12** .

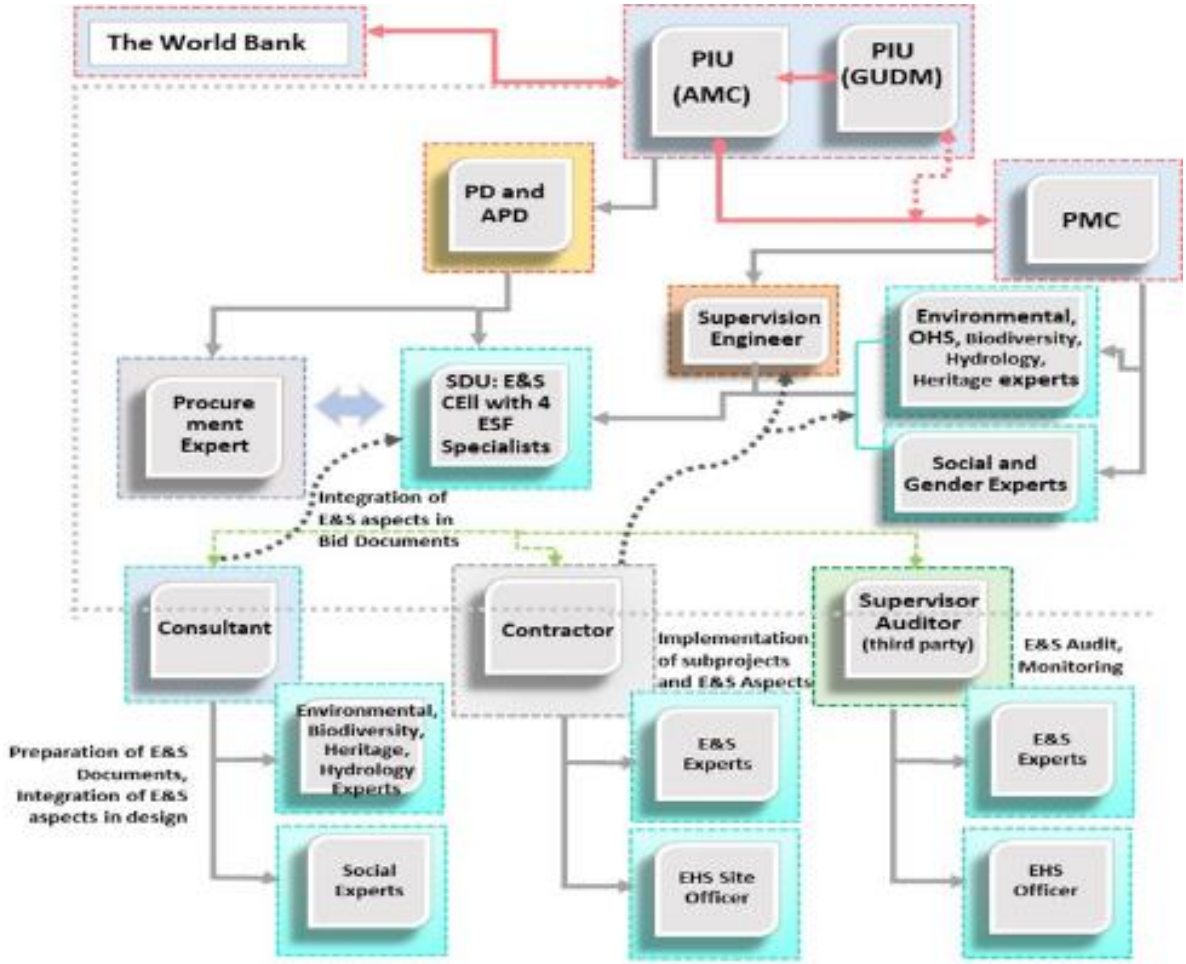


Figure 12: Proposed Institutional Framework for E&S Management

- Planning and implementation of ESMP
- Ensuring that the social and environmental protection and mitigation measures in the ESMP are incorporated in the Contractors ESMP and Construction Environmental and Social Management Plan (CESMP);
- Ensuring dedicated staff for social and environmental managers to oversee CEMP implementation
- Supervision and monitoring of the progress of activities of the consultants and contractors for the implementation of different components of ESMP
- Provide guidance to AMC, contractors in conducting subsequent monitoring and reporting and in undertaking corrective options
- Responsible for modifications to the ESMP when unforeseen changes are observed during implementation.
- Ensure submission of periodical environmental and social management and monitoring reports to the steering committee
- Submit semi-annual monitoring reports on ESMP implementation
- Ensure the establishment and implementation of an environmental and social management system;
- Implementation of environmental monitoring measures (such as environmental quality monitoring, tree plantation, landscaping, wildlife monitoring) during the O/M stage of the Project.
- Implementation of compliances for labour related aspects such as health, safety, welfare, payments, amenities, incidents and accidents, labour camp, etc
- Implementation for community health impacts a result of the project related activities such as dust, traffic movement, noise, etc during construction and operation phase.
- Implementation of management plans prepared for various aspects Chance Find Procedure, plan for SEA/SH.
- Implement Grievance Redressal Mechanism appropriately.
- Ensure that contractors have displayed all information regarding GRM, Health and safety, SEA/SH, etc at site/labour camp and at other designated sites.
- Promote improved social and environmental performance through the effective use of management systems;
- Maintaining documentation and reporting of all implemented action/management plans.
- Conducting consultations from time to time as required under implementation.

- External communications with other government, semi-government and non-government organizations, universities, research institutes in the country on the matters of mutual interest related to environmental management and filming of activities to be carried out under the project development.

Contractor:

The contractor will be primarily responsible for preparing implementing the CESMP. Each contractor will be recommended to have one Environmental Specialist and one Occupational & Social, Health and Safety (OHS) Specialist, who will be working in close coordination with the environmental staff of Supervision Consultant of PMU and PIU. The main functions of the contractor with regard to environmental and social management and monitoring are to:

- After detailed design and prior to the start of construction, prepare the C-ESIA and CESMP and other method statements and management plans according to requirements of this ESIA/ESMP. This shall include the requirements / findings of the Flood Risk assessment study for Vasna Barrage
- Recruit qualified environmental and social safety officers (ESO) to ensure compliance with environmental and social contractual obligations and proper implementation of CESMP;
- Provide sufficient funding and human resources for proper implementation of CESMP;
- Prepare monthly reports related to environmental and social management and monitoring for review and verification by the PIU;
- Prepare and implement an Environmental Management system according to the requirement specified in ESIA, WG EHS and ISO 14001.

The PMC will have two Environmental experts (one Environmental Engineer and EHS specialist, and another Environmental Planner/Specialist) and two (2) Social Development and Gender Experts who will coordinate and support ESF specialists of PIUs during the preparation, implementation, monitoring, and reporting of E&S aspects. Experts on Cultural Heritage, Biodiversity Conservation, Hydrology and EHS shall also be made available by the PMC as required. They will ensure that all records on E&S aspects are up to date and well maintained and easily accessible in hard and soft form.

Contractors who will implement subprojects on site will have E&S experts and EHS Site officers to prepare, update ESMPs to reflect actual site/ design aspects, to monitor, ensure, report, and maintain up-to-date documentation on the implementation of E&S aspects on site regularly. DBOT contractor or the Consultant who updates E&S documents for DBOT contractor and deliver capacity building activities shall have Environmental, Biodiversity, Heritage, R&R, Gender experts as required to update ESIA, ESMP, E&S mitigation/ management measures and work with design consultants on integrating E&S aspects in design ensure that ESMPs and other aspects are well updated.

Considering the Occupational and Community Health and Safety (OCHS) issues which would be important while upgrading existing STPs, PMC OCHS specialist / supervision team will monitor E&S aspects and OHS aspects on-site and report regularly to PIU as part of CSQA. Annual E&S audit will be conducted through third party E&S auditors who will monitor

compliance to ESMF, OCHS on-site (may be same consultants or separate for ESMF compliance and OHS) and report with suggestive corrective actions for non – compliance.

Three types of monitoring and reporting are envisaged here including Third Party, external, and Internal. Internal monitoring is a continuous process undertaken by contractors E&S persons, PMC (who will carry out regular monitoring on all E&S aspects and special monitoring on OHS and CHS hand in hand with Civil Work Monitoring) and PIU; and a third party will undertake an annual E&S audit. Subproject level monitoring is given in Table 45:

Contractors E&S Experts and EHS specialists will monitor daily ESMP compliance on-site at the subproject level, and report weekly to the site engineer. The site Engineer will submit this to PMC E&S experts who will verify every week or as required, and compile these to prepare monthly monitoring reports to PIU. PIU also undertakes site visits to monitor once a month or as appropriate, and compile E&S reports over the quarter and submit to the Bank as part of the project's Quarterly Project Monitoring Report (QPR) or as a standalone E&S quarterly monitoring report highlighting key issues, how issues were managed, and any support required on E&S.

Designated E&S Specialists/experts at various levels shall be responsible for overseeing compliance of the sub-projects to Bank ESF, GoI regulations, and applicable ESMF guidelines. They shall also regularly review the timely implementation of environment provisions as per the ESMP. PIUs and the World Bank review and clear E&S documents and hence, ESIA updated during design stage will be reviewed and cleared by these agencies. Updated ESIA documents incorporating the impacts and mitigation measures of the detailed design prepared should only be sent to WB for prior review after PIU's good quality initial review and sign off. It is also suggested that PIU share the ESF documents with WB by mentioning specific areas in which they need clear guidance. PIUs (with PMC support) also report on progress to the Bank during its six-monthly supervision missions. Corrective actions shall be initiated in a planned manner as appropriate to ensure compliance with the ESMF/ESMP measures.

Reporting Formats

Reporting formats shall be developed by PIUs to get progress and results data of the project from the field. This will also help in synchronizing and streamlining reporting requirements from the various work sites. These should be part of the Project Operations Manual

Table 45: Subproject Monitoring Schedule

Subproject Stage	Category	Internal Monitoring			External Auditing		
	Agencies	**Contractor/ Consultant**	**PMC**	**PIU**	**WB**	**Supervision consultant**	**E&S Auditor**
Design Stage	Inclusion of findings of ESIA in Design, Scheduling	Include ESIA findings in Design, BoQ, Bid docs	Design, BoQ, Bid documents	Clear	Design review & suggest corrective actions during semi-annual missions/ technical visits as required	Design Review	Annual E&S Audit, submit to PIU and finalize incorporating PIU, WB comments
Implementation	***ESMP updation***	Prepare before the start of site works	Review	Clear			
	Labour Housing /Camp						
	ESMP, CHMP Implementation						
	OHS Management Plan						
	Labour Camp						
	Traffic Management Plan						
	Waste Management Plan						
	Water, Air, Noise Mgmt Plans						
	Tree cutting, compensatory plantation, and Green belt						
	Enhancement measures						
	ESMP Implementation	Daily monitor; submit a weekly report to PMC	Review weekly report of the contractor, verify on-site quarterly or as required, suggest corrective actions, prepare a	Review Monthly report of PMC, verify on-site monthly or as required, suggest corrective actions, compile	Review QPR, verify & suggest corrective actions during semi-	Review fortnightly and submit a monthly report to PIU	
	OHS & Incident Reporting (Incident Register)						
	Labour welfare, Labour Camp (Labour register)						
	Traffic Management						
	Waste Management (Waste quantity Register)						

Subproject Stage	Category	Internal Monitoring			External Auditing	
	Agencies	**Contractor/ Consultant**	**PMC**	**PIU**	**WB**	**Supervision consultant**	**E&S Auditor**
	Biodiversity, Tree cutting and plantation, Green belt (Green Register)		monthly report with details, corrective actions	QPRs and submit to WB	annual missions/ technical visits as required		
	Enhancement measures	Monitor as required/as per plan, submit as part of the week's report					
	Monitoring of environmental and social parameters						
Construction and O&M Stage	Monitoring of environmental and social parameters	Monitor as per Plan	Verify, suggest corrective actions, monitor			Review fortnightly and submit monthly report to PIU	Compliance Audit Report to AMC, GPCB

7.2 Capacity Building

Proposed Capacity Building Schedule is presented in **Table 46 .**

Table 46: Training & Capacity Building Schedule

Target Group	Subject	Trainers	Method	Time Frame
Planning and Construction Stage				
PIU Project Director/ Assistant Project Directors, other Staff, ESF/E&S Experts of PIU, PMC other project agencies / AMC project staff/ DBOT Contractor	**Environmental and Social Overview:** Environmental regulations, and national standards, process of impact assessment and identification of mitigation measures, importance of EMP & monitoring, and reporting	Reputed ESIA training Organizations	Training session	Half or One-day interactive (Year 1: At Project initiation; Year 2: Before Start of activities; Year 3: Mid Term Corrective) Location: Virtual
Engineers, field officers, contractors, supervision consultants, including inspectors of regulatory agencies	**Implementation of ESMPs:** Basic features of an ESMP, planning, designing and execution of social and environmental mitigation and enhancement measures, monitoring and evaluation of environmental conditions – during construction and operation. ESMP implementation which includes the mitigation measures developed for the management of the social and environmental impacts identified during the impact assessment process, implementation schedule, roles and responsibilities of various parties, reporting and monitoring requirements during construction and operation phase of the subproject. During implementation of project by design build operate transfer (DBOT) model, ESIA and ESMP will also have to be assessed and updated after finalization of the design and revisions in project	Reputed ESIA training Organizations	Workshops and Seminars	One day interactive, Before the Construction begins, and midpoint of approved schedule, Year 2 - end, Year 4 - start and at the close of the Project (Year 5) – near implementation completion stage

Target Group	Subject	Trainers	Method	Time Frame
	footprint, additional land requirements and any other E&S impacts identified at a later stage. Module 1: Environmental Enhancement and Occupational Health and Safety - Clearance/ permits/ regulatory aspects - Cultural Heritage Management on site - Biodiversity Management on site - Occupational Health & Safety Training - Staff & Labour Code of Conduct - HIV/AIDS prevention Training, Best hygiene practices - Emergency Response System - Behavioural Training - Implementation of ESMP provisions Module 2: Review of Subproject Level Environmental Actions - Review of Environmental Actions at each sub-project - Lessons learned Course Corrections			
Environmental Engineers, field officers, contractors, supervision consultants, Supervisors, Line departments, PMC	**Environmentally Sound Construction Practices:** Waste management and minimization in construction, pollution control devices and methods for construction sites and equipment, Environmental clauses in contract documents and their implications, Environmental monitoring during construction	E&S, EHS, Heritage and Biodiversity Specialists PIUs, PMCs, Consultants	Seminars, Training session and Site visits	One day interactive, Before the Construction begins, Year 2 - end, Year 4 - start and at the close of the Project (Year 5) – near implementation completion stage

Target Group	Subject	Trainers	Method	Time Frame
Project staff dealing in social matters	**Social concerns & awareness:** Monitoring consultants/ organizations specializing in social management and monitoring to can provide training on social awareness social awareness concerns community social concerns & awareness including SWM, sanitation, alcoholism, violence, traffic diversion/pedestrian safety; labour (management including Health, safety, security, social, welfare, SEA/SH, etc.) interaction with communities, gender and social inclusion/ citizens engagement, as and if required, grievance redressal mechanisms and addressing grievances. - Stakeholder Analysis Participation models in various projects by CBOs, Communities, Individuals, Private parties, PIUs	ULB/PIU, PMC	Training session, Workshops and Seminars	One day; Before the construction begins and Every Year during construction for refresher training.
Environmental engineers, field officers, contractors, supervision consultants	**Monitoring Environmental Performance during Construction:** Monitoring, Air, Water, Soil Erosion, Noise, and effect on wild life and fisheries, Evaluation and Review of results, implementing and ensuring compliances related to Labour (Health, safety, welfare, labour camp, payment, training, health check, PPEs etc.),Preparation of Contractors ESA, revisions of ESIA and ESMP after finalization of the design for updation and revisions if and as required, Evaluation and Review of results, Performance indicators and their applicability, possible corrective actions, reporting requirements and mechanisms	Reputed National ESIA training Organizations or by hiring adequate experts	Training session, Workshop and site visits	One day; Before the construction begins and Every Year during construction for refresher training.
Contractor's staff, subcontractors	**Community & Occupational Safety and Health:** Monitoring consultants/ Organizations specializing in community & occupational, health and safety issues to provide training on this issue, mandatory and statutory compliances	Reputed National OHS/CHS training Organizations or	Workshops and seminars	One day; Before the construction begins and Every Year during construction

Target Group	Subject	Trainers	Method	Time Frame
	regarding labour, licenses, permissions and information dissemination. SOP for project activities which have identified risks and require specific training, awareness and PPEs before execution.	by hiring adequate experts		for refresher training.
Construction laborers	Occupational health, waste handling and sanitation at construction sites/ labour camps, Health, Safety and medical procedure to be followed and mandatory PPEs required for activities undertaken.	Reputed National ESIA training Organizations or by hiring adequate experts	Training session and Workshops	One day; Before the construction begins and Every Year during construction for refresher training.
Construction labourers	All aspects and compliances related to labour rights, health, safety, security, welfare, code of conduct, amenities and facilities at camp site, labour camp management, mandatory and statutory compliances, awareness on the labour related GRM, overall contractor obligations with respect to labour management, etc. Gender awareness, grievance redressal mechanism, safety and medical services provided, payment made and procedure followed, Gender and gender-based violence awareness during construction and operation activities.		Training session and Workshops	One day; Before the construction begins and Every Year during construction for refresher training.
Construction labourers (Camp & Site)	Safe work practices including precautions to be taken and any procedure that needs to be followed due to Covid-19 or any other health/medical emergencies, PPEs, first aid box, insurance, emergency response for accidents and incidents, EHS officers on site, traffic management and pedestrian safety etc.	Reputed National ESIA training Organizations or by hiring adequate experts	Training session and Workshops	One day; Before the construction begins and Every Year during construction for refresher training.

Target Group	Subject	Trainers	Method	Time Frame
During Operation Phase				
Environmental engineers, field officers, contractors,	**Long-term Environmental Issues in Project Management:** Designing and implementing environmental surveys for ambient air, noise, biological and water quality, data storage, retrieval and analysis, contract documents and environmental clauses, risk assessment and management, contingency planning and management and value addition. Training of staff/ workers engagement in O&M on all labour related issues mentioned above	Reputed National ESIA training Organizations or by hiring adequate experts	Workshops And seminars	One day; Before the construction begins and Every Year during construction for refresher training.
General public and bridge users	Wildlife protection and environmental protection awareness program, citizens engagement.	Reputed National ESIA training Organizations or by hiring adequate experts	Seminars, workshops	Construction and operation stage

7.3 Grievance Redressal Mechanism

One of the main requirements of the ESMP is to implement an effective grievance redress mechanism in respect of the environmental and social issues of the stakeholder. The types of grievances stakeholders may raise include, but are not limited to:

- Construction related impacts – cracks, damages to structures; dust damaging crops, trees
- Health and safety risks.
- Negative impacts on the environment
- Negative impacts on communities, which may include, but not be limited to financial loss, physical harm, and nuisance from construction or operational activities and GBV, SEA/SH.

AMC has a functional complaint system (CCRS, http://www.amccrs.com) which includes a web portal and a toll-free number. It records almost 40-50 thousand complaints every month. Any complaint registered in the system is forwarded to respective zones for action. Each complaint has a proper system by which it can be escalated if one is not happy with the resolution. If some complaints come directly to the zonal office (mostly from the urban poor) they are recorded in the main system. The CCRS is synced with the Gujarat Government's CM Helpline and any complaints coming there are also recorded in the system.

- There shall be separate subproject Grievance Redressal Committee (GRC) consisting of following members:
  - Project Environmental/ Social Specialist from AMC
  - Elected member from Ward/ Zone of project implementation
  - Member from PAPs/ workers of the project. Women workers will be encouraged to participate
  - Local NGO working on labour and Gender related issue.
    Women CO/ACO from the Mission Mangalam, Urban Community Development Department of the AMC.

The main responsibilities of the GRC will be to

(i) provide support to PAPs on problems arising from land/ property acquisition;

(ii) record AP 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; noise, traffic, odor, and other grievances related to the environment.

The Environmental/ Social Specialist at the project level shall carry out the following as regard to redressing grievances:

- Ensure that the GRM is in place and is functional
- The GR process/procedure is inclusive and accessible to all stakeholders with project grievances

- GRM is accessible for those with grievance related any of the above-mentioned sub project level grievances.
- The GRM is effective is addressing grievances in a timely and appropriate manner.
- Grievances of PAPs will first be brought to the attention of the site office level of the PIU which shall be redressed within two weeks from the receipt of complaints. The grievances will be received through online registration (phone/ email, etc), grievance register maintained at the security gate. Grievances not redressed by the PIU staff (field level) will be brought to the Grievance Redress Committee (GRC) which shall be redressed within four weeks from the date of receiving the complaint at PIU. The chairperson of the GRC shall communicate the committee's decision to the aggrieved party in writing and maintain a record of all decisions related to each case.

Documentation and recording for grievances shall be maintained with details of resolution at the sub project/ project/ PMU level. Records of grievances will include contact details of the complainant, the date the complaint was received, nature of the grievance, agreed corrective actions, and the date the corrective actions were affected, and the outcome.

Consolidated reports will be submitted to GRC and for status of grievances on monthly basis during construction and quarterly basis during operation phase.

Information about Project/ Sub project GRM shall be published as part of initial disclosure consultations. Brochures will be distributed during consultations and public meetings, and posters will be displayed in public places such as in government offices, project offices, at gate of the project site office, etc. Information about the GRM will also be posted online on the AMC website. The GRM details including manner of filing grievances, Grievance cell officers, Grievance officer at site, etc will be displayed in local language (Gujarati), Hindi, at STP site, in labour camps and in contractors and sub-contractor's office at site and with supervisors. Grievance register will also be maintained at the gate/ security office at gate of the STP premises and labour camp in local language (Gujarati)/ Hindi.

Complainants not satisfied with the GRM process of the sub project/AMC can approach the mandatory body/ authorities such as the CPCB or the Gujarat Government's CM Helpline or take recourse in the legal system and approach the civil courts.

CHAPTER 8. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

8.1 Objectives of Public Consultation

The objectives of the public consultations for the project and for this ESIA is to:

- Inform and disclose the proposed project to the stakeholders.
- Assess the stakeholder interest and involvement with the proposed project
- Enable them to give their views and option with respect to the project.
- Ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format.
- Provide a means for effective and inclusive engagement with project affected parties throughout the project life cycle.

8.1 Legal Requirements

ESS 10 recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

Consultations also have to be conducted for any mandatory land acquisition under The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, and in Scheduled areas or if the displaced/affected population is largely from Scheduled Tribes.

8.2 Approach to Public Consultation

Consultations have been carried out for information, participation and disclosure.

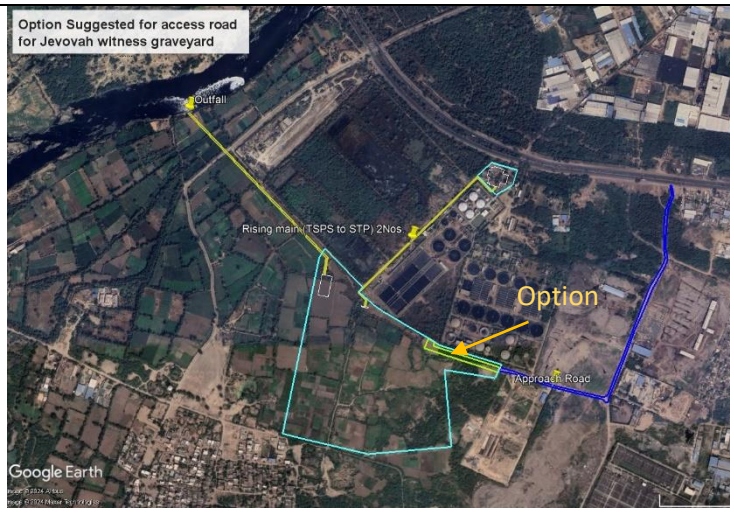
Consultations have been carried out with various stakeholders including settlement inhabitants in Gyaspur, STP operators, AMC officials during preparation of ESIA for sub project and SEP for G-ACRP project. Due to Covid -19 pandemic and restrictions, consultations were carried out, from August to November 2021 for phase 1, online and as well as in person and due precautions were followed for site activities. Public disclosure and consultation was also held in February, March and June 2022. Preliminary consultations for preparation were held in September and December 2023 in Gyaspur, Kamod and Nana Vanzar and with other stakeholders. Consultations will be carried out as per the requirement for pre and post disclosure. Outcome of the consultation is given below **Table 47**.

Table 47: Outcome of Consultations

Group	Key points raised
AMC official meeting held in 155 MLD STP and 180 MLD STP (8)	• AMC creates assets in the treatment systems and lifespan of hydraulic assets is for 35 years and cannot be dismantled before the exhaustion of the life. Therefore, Amc propose to retain the 180 MLD STP which will be

Group	Key points raised
	considered for upgradation and rehabilitation to achieve treatment as per the NGT standards. • Main difference in greenfield or brownfield project: greenfield projects create embodied carbon. The proposed 424 MLD STP is a greenfield project. • In Pirana main issues are of untreated sewage bypass and existing 180 MLD STP does not have the technology of treating sewage as per NGT standards. • Tha main objective is to ensure the treatment of current flows and consider future flows.
Gyaspur village-nearest settlement of proposed project site (7)	• Gyaspur became a part of the Ahmedabad Municipal corporation in 2007 and included in ward no 45/46. • The land rate has increased to about Rs. 30 lacs to Rs. 35 lacs per acre. • People do cultivation and also have livestock. There is private milk business. • Crops cultivated include jowar and bajri. Earlier agriculture activities were undertaken by 90 % of the people and is now reduced to 25% of the people undertaking the same. • Labour is less and people work mainly in nearby industries. The earning in industries is between Rs. 600 to Rs, 1000/day based on the nature of work and skill, labour is less Rs. 300/day. 100 to 150 women go for work to the industries to clothing and similar work. • Decaying in the crops is observed. The borewell water is unsatisfactory and skin diseases are observed due to bad water quality. • Groundwater is pumped into the overhead tank and distributed to the village. • Migrants comprise a significant portion of the village population and mainly come from Madhya Pradesh, Uttar Pradesh and Bihar. • There is no public transport from the village to Ahmedabad forcing people to use private transporters. • The landfill site has affected the village severely.

Group	Key points raised
Somanath Mahadev Mandir at Gyaspur, One of the Trustee and 2 other person (3 males)	• The temple is located under the land allocated for sewage treatment plant and related activities area mandal, Old Shahwadi road at Narol. The area was a jungle earlier. • Swaymbhu temple was located adjacent to the river earlier, at present the shore line is far because of erosion and shifting of the river course. All worshippers including Muslims come to the temple from the area. It is open for all. • During Mahashivratri the temple is visited by 50000 to 60000 worshippers and the road traffic has to be managed and is closed for the purposes of allowing the worshippers. • The temple organizes a Bhandara during the festival and also on Mondays and Amavasya every month which is attended by 4000 to 5000 people. During a year, they have about 2 yagnas for more than 100 couples at one time. On all sharvan Mondays, they received a large number of devotees. This shall be considered during updation of C-ESMP by contractor. • There is major issue and concern with respect to the quality of water from the2 borewells in temple premises. There is an odor from the water and the quality of water is not potable. The temple trustees have installed a RO system for one of the borewells. A few worshippers have sent water samples for testing, privately.
Rev. Dr. Hemilton B. Roy – Church of North India Gujarat Diocese, Ranipur	• The area was under old Shahwadi village originally before it was incorporated into Corporation. Part area was shifted and moved to current location as part of town planning and urban development. The graveyard remained in its earlier location. Since then, they have arranged for another graveyard in Ranipur. The original area was around 2 acres of land, although the current location has a larger area of more than 2 acres. The entry is through the existing 155 MLD STP plant. • There is a requirement for a separate road for ambulance or hearse, which will be held privately by Church for the entry to the graveyard. For the private road, A ROW of 10 feet roughly 3 metres and larger at turning (4.5 metres) is required for entrance to the graveyard. The church will provide entry gate and

Group	Key points raised
	boundary works. Church had passed the budget for gate competing works which has been delayed due to entry related issues for the workers. Various elected leaders have extended their support for providing separate entry to the graveyard. • As per AMC officials, there is a proposed private road access from outside the boundary beyond rising main which is being planned and approval shall be sought for the same from various depts and for budgetary approval through project or PWD.
Option Suggested by TCE based on site visit and satellite image	 Option Suggested for access road for Jevovah Witness graveyard
Ex Sarpanch and Mandir trustee Gyaspur Village AMC	• The village is now under AMC, Ward no. 46, Lambha, Ahmedabad Municipal corporation. • The village is set over 20 acres with a population of around 10 to 12 thousand. 30% area is retained with the village and a large area is with the corporation. • AMC has bought the land for development and construction of Sewage treatment plant, it's related activities and other purposes a few decades earlier. • Agriculture is a major activity in the village and about 4 to 5000 people are involved in the same as cultivators and agricultural labour. • The cropping pattern includes Bajri (pearl millet), flowers, green vegetables, cauliflower, etc. Crop yield is affected because of poor quality. • There are truck owners in the village involved in various activities. 10 % of the population comprises of migrants

Group	Key points raised
	from other states such as Uttar Pradesh, Madhya Pradesh and Maharashtra. • The village according to the ex-Sarpanch is surrounded by polluting industries like the dumping ground, landfill, solid wastes processing industries, abattoir, STPs, etc. • There is a severe water problem in the villages due to pollution by ETP which is located near the village. There is a smell in the water due to the presence of the industries near the village. • There is issue of dead animal waste disposal near Gyaspur village. • A Jungle safari was proposed by Government in the area which was subsequently cancelled. • There are health related impacts such as respiratory diseases. • For drinking water, the source is borewells. There is water quality issue in Gyaspur because of which skin issues are observed in the people of village. • Water treatment measures can be provided in the Gyaspur village under government scheme.
Principal Gyaspur Primary School	• The village is now under AMC, Ward no. 46, Lambha, Ahmedabad Municipal corporation. • The village is set over 20 acres with a population of around 10 to 12 thousand. 30 % area is retained with the village and a large area is with the corporation. • AMC has bought the land for development and construction of Sewage treatment plants and other purposes a few decades earlier. • Agriculture is a major activity in the village and about 4 to 5000 people are involved in the same as cultivators and agricultural labour. • The cropping pattern includes Bajri (pearl millet), flowers, green vegetables, cauliflower, etc. Crop yield is affected because of poor quality. • There are truck owners in the village involved in various activities. 10 % of the population comprises of migrants from other states such as Uttar Pradesh, Madhya Pradesh and Maharashtra.

Group	Key points raised
	• The village according to the ex-Sarpanch is surrounded by polluting industries like the dumping ground, landfill, solid wastes processing industries, abattoir, STPs, etc. • There is a severe water problem in the villages due to pollution by ETP which is located near the village. There is a smell in the water due to the presence of the industries near the village. • There is issue of dead animal waste disposal near Gyaspur village. • A Jungle safari was proposed by Government in the area which was subsequently cancelled. • There are health related impacts such as respiratory diseases. • For drinking water, the source is borewells. There is water quality issue in Gyaspur because of which skin issues are observed in the people of village. • Water treatment measures can be provided in the Gyaspur village under government scheme..
Ex Sarpanch Juna Vanzara Village	• The village was included in ward no. 57 Maktampura, AMC, in 2006 and has approximately 1500-2000 population. • The village shifted after severe flood during one of the years and a significant part of the village which was low lying and near the river was affected. Half of the village was shifted to another area about 10-12 kms away and named as Nava Vanzar. The river was earlier just 1 km from the river. • in 2003-2004 the panchayat undertook the installation of borewells in the village. There are severe water quality issue in village. There is need of providing drinking water through RO or treatment in the village. • People are majorly involved in agricultural activities but they do not own the land. The crops such as bajra, dangar, wheat, cotton, paddy, radish, flowers, green vegetables are cultivated here. • There are migrants from nearby area Patdi side and they also do agricultural labor work in this village. They mainly cultivate greens.

Group	Key points raised
	• 5 to 10 bighas of land near the village is being used for cultivation and use river water. Most of the lands are located away from the village. • Earlier people used to have health related issues due to use of river water. There were 2 cases of cancer and there are some respiratory illnesses. • Odour from the river water based on weather conditions such as heating of water during summer and the direction of the wind flow. Animals get health issues as the animals' graze near the river and drink the polluted water. • At the Narol and Vatva areas, chemical infused water flows into the drain to the river. • There is big issue of illegal sand mining in the village. Excavated areas in the river and banks have resulted in serious incidents. In 2013, 4 youths died due to drowning and the villagers were not able to rescue them due to deep pits or excavated spots in the river. The people tried to stop the activity, but have been largely unsuccessful.
Ex Sarpanch, Kamod village (4 males)	• The village was included in ward no. 57 Maktampura, AMC, in 2006 and has approximately 1500-2000 population. • The village shifted after severe flood during one of the years and a significant part of the village which was low lying and near the river was affected. Half of the village was shifted to another area about 10-12 kms away and named as Nava Vanzar. The river was earlier just 1 km from the river. • in 2003-2004 the panchayat undertook the installation of borewells in the village. There are severe water quality issue in village. There is need of providing drinking water through RO or treatment in the village. • People are majorly involved in agricultural activities but they do not own the land. The crops such as bajra, dangar, wheat, cotton, paddy, radish, flowers, green vegetables are cultivated here. • There are migrants from nearby area Patdi side and they also do agricultural labor work in this village. They mainly cultivate greens.

Group	Key points raised
	• 5 to 10 bighas of land near the village is being used for cultivation and use river water. Most of the lands are located away from the village. • Earlier people used to have health related issues due to use of river water. There were 2 cases of cancer and there are some respiratory illnesses. • Odour from the river water based on weather conditions such as heating of water during summer and the direction of the wind flow. Animals get health issues as the animals' graze near the river and drink the polluted water. • At the Narol and Vatva areas, chemical infused water flows into the drain to the river. • There is big issue of illegal sand mining in the village. Excavated areas in the river and banks have resulted in serious incidents. In 2013, 4 youths died due to drowning and the villagers were not able to rescue them due to deep pits or excavated spots in the river. The people tried to stop the activity, but have been largely unsuccessful.
Geetaben thakur, Baldevvhai and Rameshbhai Chamanbhai. from the other caste group which has roughly 150 houses in Kamod.	• The community have a major issue which sanitation as toilets have not been provided and they are not included in the sewage network of the village. There is flow from the houses and from other places from the area towards the river. They mostly practice ODF and have approached the area corporator of Lambha about 15 days ago. • They want services encompassing both sanitation and resolving gutter line issues which flows from near the houses.
Abellon Clean Energy Ltd	• The plant is under construction with 15 MW capacity which will process 1000 tons of solid waste from Pirana. They also have plants in other areas such as one in Jamnagar with capacity of 7.5 MW and processing 400 Tons/day. They get 200 tons from Jamnagar and additional 200 tons comes from Rajkot. RDF is converted in Rajkot and transferred to Jamnagar plant. Rajkot plant with capacity of 15 MW is under construction. There is another plant at Vadodara with 15 MW capacity.

Group	Key points raised
	• On an average waste to energy plants require 350 tons/day. • The Ahmedabad plant has a mass incinerator Belgium technology and is different from other technologies being used currently. It does not require any pre-treatment or drying etc. There is tumbling of waste so that air is provided for burning. • Treated water from the STP will be pumped to WtE site which is about 1.5-2 km distance form STP. The TW will be processed further for pre-treatment - further clarifier, multigrade filter, softener, UV and RO will be provided. Water required in plant for cooling system. About 2.4 MLD water will be taken from 155 MLD STP for cooling and related purposes. 1.5 MLD water daily is usable. The rest is water loss. As per Ministry of Power guidelines for WtE plants located within 50 km radius of STP, water used is free of cost. • Good quality of treated water is the main issue. Pretreatment is necessary before using in boiler. Blowdown loss - If TDS sf high than it needs to be cleaned and there is loss due to evaporation. Ion exchange technology is used to reduce TDS, no salt present in the water so that it can be used in boiler. • For plantation activity, good quality water can be utilized from system which is free from chemicals wherever possible. The chemical water will be used in ash quenching. • Treated water as per the norms for STP discharge is required. Currently the quality is not consistently as per the norms. If these are met then less processing for pre-treatment will be required. Surat Tertiary treatment plant is an example as the water quality is very satisfactory and can be used for industrial purposes. It is provided at a rate of Rs. 25 to 30/KL. • Approximately 600 sq.mtrs of land required for pre-treatment of the STP treated water. • Three common aspects for any industry requiring treated wastewater for their operations is 1. Treat as per discharge norms 2. Tertiary treatment is required before use of treated water 3. Revenue generation for good quality of water for Municipal authorities.

Group	Key points raised
	• At present, the cost for pre-treatment of treated sewage supplied from the STP is Rs. 25 to 35/KL for RO and Rs. 60-65/KL for boiler quality..
AMC Officials including Additional CE for DP and STP	• Some for the areas where downstream villages are located will be included in the sewerage network shortly. It is under planning for implementation. • As part of the ESIA, suggestion and satellite map marking to be done for the private road suggested for private access to graveyard. • Map should consider ease of access, proposed rising main as mentioned in the DPR and its O& M activities during operation.

8.3 Information Disclosure

The stakeholder consultations are a continuous process carried out through the project life cycle. During preparation of the ESIA, discussions were carried out in line with the SEP and disclose the key features of the project and the proposed area and components. Based on experience with similar projects, likely impacts during the implementation stage and potential impacts were also discussed. Draft ESIA will be disclosed on the website of AMC and the World Bank before Project Appraisal. After consultations and finalisation, it will be redisclosed again in the respective websites.

Annexures

CHAPTER 9. ANNEXURE

9.1 ANNEXURE I: INITIAL ENVIRONMENTAL AND SOCIAL EXAMINATION

Subproject Details

Name of Subproject:	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR FOR NEW 424 MLD TSPS AND 424 MLD STP WITH ALLIED INFRASTRUCTURE BEHIND THE EXISITNG 180 MLD STP AT NEW PIRANA, AHMEDABAD,
Subproject Components: (mention all subproject components including Networks, Treatment Plants, Disposal Arrangements, etc.)	– New pumping station of 424 MLD capacity with allied facility – Construction of proposed 424 MLD STP at Pirana – Construction of outfall for disposal of treated effluent, One 1500 mm ø GRP Rising Main of Pirana Terminal SPS out falling into bypass channel heading to Sabarmati River. – Rising main from TSPS to STP: proposed that the flow received from two 2.4m x 2.4 m ducts shall be intercepted and diverted to common inlet chamber. Flow from common inlet chamber shall be regulated and transferred to inlet chambers of existing 182 MLD TSPS (for 155 MLD STP) and new 424 MLD TSPS (for the upcoming 424 MLD STP) using gravity pipes and channels. New 424 MLD TSPS shall pump the required flow via rising mains to new 424 MLD STP for treatment. Two M S Rising Mains (each of 2000 mm Ø) and each one connected with a 2000 mm Ø Common Header at the TSPS and terminating at the inlet chamber of STP will be provided and laid to serve the STP with raw sewage for treatment. The rising main shall be laid along the boundary of 155 MLD STP and the land belongs to AMC. The rising main alignment given in the DPR is tentative and shall be finalized by DBOT Contractor after survey and investigation. ESIA and ESMP updation will be done by DBOT Contractor based on final alignment. – Approach road till STP: Access for proposed 424 MLD TSPS is from the slip road of Narol -Vishala Highway – NH-64. Presently, two gates are there on the slip road of Narol Highway, for access to the common premises of Pirana 182 MLD Terminal SPS, Pirana; 180 MLD TSPS, Pirana; 180 MLD STP, Pirana;155 MLD STP and

	the land parcel allocated to the upcoming 424 MLD TSPS & STP. –
Associated Facilities if any (Refer ESS 1 for Associated facilities)	new TSPS with 424 MLD Capacity, New outfall facility, Approach Road, Rising Main(s) carrying the discharge of 424 MLD TSPS to new STP with all associated works such as valves, pressure transmitters, flow meters etc, Gravity pipeline(s)/channel(s) along with flow regulating mechanism to carry the flow from common inlet chamber to existing 182 MLD TSPS (serving 155 MLD STP) and new 424 MLD TSPS.
Subproject Location (City/ Town/ Village with ward numbers):	Ward No 45/46, Nabha, Ahmedabad, Gujarat,

Stage 1: Exclusion List

Check the following criteria to confirm if the sub-project is excluded from consideration:

Sl No:	***Non-permissible Activities***	***Yes/ No***	***Description***
1	Sub-projects in sites/ locations which should be excluded as per prevailing Rules/ Laws on Natural Habitats and Forests or Archeologically Protected Monuments (National, State, Local): (i) any construction in demarcated Forest areas or protected natural areas or their buffers, (ii) any subproject which would impact critical natural habitats, (iii) any subproject which shall be excluded as per AMASR Act, (iv) any subproject components or activities in the Historic Walled City of Ahmedabad – the UNESCO World Heritage Site	No	The proposed 424 STP will be developed behind thre existing 180 MLD STP, on a 25 ha land belonging to the AMC. The 424 MLD TSPS is proposed ot be constructed in the Pirana Campus 1 premises on empty land. There are 2 to 3 small structures which were part of previous STP campus which shall be dismantled. Currently it a vacant and barren land.
3	Sub-projects in sites/ locations which should be excluded as per applicable siting criteria prescribed by GPCB, Master Plan, Excluded Disaster Zones, or other applicable criteria set out by National, State, Local Body	No	The proposed land belongs to the AMC and is located within the STPs cluster and is close to the dumping ground and landfill site. The TSPS is proposed to be located in the existing Pirana Campus 1.
3	Subprojects involving (i) Activities that impact the safety of Dams/ Barrages, (ii) purchase, storage, and use of Banned Pesticides/ Insecticides/ chemicals/ Asbestos, (iii)	No	Proposed TSPS and STP and no activities involve (i), (ii) or (iii). The chemicals considered as part of this report is Chlorine, Dewatering polymer and Ferric chloride (FeCl3).

Sl No:	*Non-permissible Activities*	*Yes/ No*	*Description*
	Construction of CETPs or any facilities to manage industrial/ hazardous wastes or effluents		
4	Sub Projects displacing more than 200 tribal households or 100 Primitive Tribal households	No	There is no habitations within the current land identified for the TSPS and STP. Few cultivators from Gyaspur village cultivate on land adjoining the Sabarmati river which is under AMC. During site visit, it was observed that the lands were fallow in 2 to 3 land patches and 1 to 2 patches were partially cultivated.

(Do not proceed to Stage 2; if the subproject is Excluded as per Stage 1 Exclusion List)

Name & Designation of Designated Official in charge:

Signature:

Date:

Verified by: Environmental Specialist of PIU (mark whichever is applicable)

Excluded from the Project	**Proceed to Stage 2**

Name:

Signature:

Date:

Stage 2: Environmental Screening Checklist

Project Details		
Sl. No	***Components***	***Details***
1	Sub-project components	Proposed 424 MLD TSPS Proposed 424 MLD STP behind the existing 180 MLD STP. Common inlet chamber is proposed to receive the inflow from the two box ducts and divert it to the two TSPS as per the respective capacity of TSPS /STP. Laying of proposed new rising main from Proposed Pirana TSPS till proposed 424 MLD STP. Access road for proposed 424 MLD TSPS is from the slip road of Narol - Vishala Highway – NH-64.
2	Details of Alignment/ Components: (main components including construction activities, environmental infrastructures like STP/ ETP and pipelines, disposal of treated/ untreated effluent, sludge, and other by-products	For new 424 MLD TSPS and 424 MLD STP with allied infrastructure behind the existing 180 MLD STP at new Pirana, Ahmedabad. Common inlet chamber is proposed to receive the inflow from the two box ducts and divert it to the two TSPS as per the respective capacity of TSPS /STP. Rising main from TSPS to STP: proposed that the flow received from two 2.4m x 2.4 m ducts shall be intercepted and diverted to common inlet chamber. Flow from common inlet chamber shall be regulated and transferred to inlet chambers of existing 182 MLD TSPS (for 155 MLD STP) and new 424 MLD TSPS (for the upcoming 424 MLD STP) using gravity pipes and channels. New 424 MLD TSPS shall pump the required flow via rising mains to new 424 MLD STP for treatment. Two M S Rising Mains (each of 2000 mm Ø) and each one connected with a 2000 mm Ø Common Header at the TSPS and terminating at the inlet chamber of STP will be provided and laid to serve the STP with raw sewage for treatment. The rising main shall be laid along the boundary of 155 MLD STP and the land belongs to AMC. The rising main alignment given in the DPR is tentative and shall be finalized by DBOT Contractor after survey and investigation. ESIA and ESMP updation will be done by DBOT Contractor based on final alignment. Approach road till STP: Access for proposed 424 MLD TSPS is from the slip road of Narol -Vishala Highway – NH-64. Presently, two gates are there on the slip road of Narol Highway, for access to the common premises of Pirana 182 MLD Terminal SPS, Pirana; 180 MLD TSPS, Pirana; 180 MLD STP, Pirana;155 MLD STP and the land parcel allocated to the upcoming 424 MLD TSPS & STP. – Construction of outfall for disposal of treated effluent, One 1500 mm ø GRP Rising Main of Pirana Terminal SPS out falling into bypass channel heading to Sabarmati River.

<table>
<tr><th colspan="3">Project Details</th></tr>
<tr><th>Sl. No</th><th>Components</th><th>Details</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>3</td><td>Location of the Project Sites &Landuse (Provide information for all sites involved in the project; including for Disposal/ Discharge points, Linked activities/ associated facilities) (attach map)</td><td>
<table>
<tr><td>Purpose</td><td>Current/ Historic Landuse</td><td>Survey No:</td><td>Geo Co-ordinates</td><td>Ownership</td><td>Area (Sqm)</td></tr>
<tr><td>STP</td><td>STP/vacant</td><td>AMC</td><td>22°58'11.60"N 72°32'47.11"E</td><td>AMC</td><td>25 ha.</td></tr>
<tr><td>TSPS</td><td>Vacant</td><td>AMC</td><td>25°58'33.5"N 72°32.56.4"E</td><td>AMC</td><td></td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Quantity of Water Required for Construction and Annual Operations with Details of Source/s (Ground/ Surface)</td><td>Approximately 25KLD from existing supply at STP and AMC.

Being DBOT tender Water and power required for construction will be estimated after technology .

There would be limited water requirement during operation period for admin block and lab, which is about 0.5KL/ day, i.e., about 200Kl/ year.</td></tr>
<tr><td>5</td><td>Power Required and Source of Power</td><td>Temporary connection of 415V supply would be taken from Torrent Power during construction period. It will be upgraded to 11KV during actual operation of the plant.</td></tr>
<tr><td>6</td><td>Any Raw material, the chemical used for treatment</td><td>Considering open technology tender the expected raw material and chemicals are as below.

1. The chemical considered as part of this report is Chlorine, Dewatering polymer and Ferric chloride (FeCl3) forsewge/ sludge treatment. Since UV is proposed for disinfection, chlorine is not considered.

2. Polyelectrolyte- this will be required for conditioning of sludge.</td></tr>
<tr><td>7</td><td>Estimated quantity of wastes, sludge, effluent (treated/ untreated)</td><td>
<table>
<tr><td rowspan="2">Quantity of Wastes (Kg/ Day)</td><td rowspan="2">Quantity of Sludge expected (Kg/ Day)</td><td colspan="2">Quantity of Effluent (litres/ day</td></tr>
<tr><td>Treated</td><td>Untreated</td></tr>
<tr><td></td><td>Approx. 84.736

M.T/ day. The sludge generation may go up as the plant capacity will increase.</td><td></td><td>Average flow 424 MLD</td></tr>
</table>
</td></tr>
</table>

Baseline Environmental Conditions

I.	***Environmental Aspects***	***Yes/ No***	***Distance in meters***	***Details on its Importance***
1	Is the project site located **on** or **adjacent to** any of the following (Provide Distance to these features in meters)			
(i)	Cultural Heritage site, Protected monuments - listed by ASI/ State/ Local Body	NO	1500	Existing 180 MLD STP and 155 MLD STP is located adjacent to proposed site for 424 MLD STP There are no such structures or monuments within 500 metres. The nearest monument is the Fateh Baug Fort which is at a aerial distance of 3.4 kms from the site.
(ii)	Culturally – socially important paths, areas/ religious occupancies, burial grounds, tourist, or pilgrim congregation areas, borders, etc.	NO	-	Not applicable. The location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a aerial distance of 3.4 kms from the STP. There is a temple Somnath Mahadev temple in Gyaspur in the village at a distance of 1.26 7 km arial distance from the existing site. Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities within STP premises.

I.	***Environmental Aspects***	***Yes/ No***	***Distance in meters***	***Details on its Importance***
(iii)	Eco-sensitive Areas (ESAs) or Critically Vulnerable Coastal Areas (CVCAs)	NO	-	Not Applicable.
(iv)	Natural Forests/ Protected Areas/ Bio-Reserves Is the subproject in an eco-sensitive or adjoining an eco-sensitive area, with any schedule 1 species? If Yes, which are the area and species?	NO	-	Thol Sanctuary at a distance of around 20 km from site
(v)	Other Wetlands/ Mangrove/ Estuarine Region	Yes	-	Outflow of the project is connected to the Sabarmati River
(vi)	Natural Habitat areas, Ponds, Lakes, Rivers, Streams, Canals, roosting/ nesting areas, spawning areas, breeding areas; areas with natural features like waterfalls, sacred groves	Yes	~40m	Not applicable as there is a dumping ground adjacent to the plant at a aerial distance of 2.61 kms from the proposed project area. Outflow of the project is connected to the Sabarmati River
(vii)	Other Sensitive Environmental Components listed in ESMF	No	-	Proposed development will be carried out adjacent to the existing 180 MLD STP.
(viii)	Drinking water source (Ground, Surface), upstream and downstream uses of rivers, etc.	Yes		Water is used for irrigation, During consultations held downstream to Sabarnmati river, issue of untreated sewage and effluents being released downstream has been raised. Drinking water and for domestic use is drawn from the borewell as per onlne discussion with some of the downstream village leaders/ sarpanch/ex-sarpanch.
(ix)	Low-lying areas/ areas of Tidal Influence (provide CRZ details)	No		Not applicable. The area is around 900m from Sabarmati River and at higher elevation (approx. 44 m) than the river bank (Approx. 37 m.)
(x)	Sensitive Receptors – a) Habitations/ Households/ Hostels, other special areas, etc.	No		Located near non-residential areas. Not applicable as the site is near dumping ground and nearby existing STPs. Residential colonies have come

I.	*Environmental Aspects*	*Yes/ No*	*Distance in meters*	*Details on its Importance*
	b) School c) Religious Places d) Tourist Areas			up in the vicinity since the time. Nearest colonies include Gyaspur at less than 200 metres and Ektanagar at a distance of 1.2 kms. Other sensitive receptors located nearby include Jevovah witness graveyard. Ektanagar masjid, Somnath Mahadev Temple in Vishala Gyaspur, Baliyadev temple and Gyaspur Primary school in GyaspurThe location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 3.4 kms from the STP. Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities.
2	Is the site in Critical/ Over Exploited Ground Water Block. Provide the level of the groundwater table	Yes		Ahmedabad city falls under "over exploited region" of ground water[46]
3	Is the site vulnerable to major natural or induced hazards such as Earthquakes, Landslides, Flooding, Storm surge, Severe	Yes		Site is vulnerable due to flooding in the and Sabarmati.

[46] http://cgwb.gov.in/District_Profile/Gujarat/Ahmedabad.pdf

I.	Environmental Aspects	Yes/ No	Distance in meters	Details on its Importance
	wind damage, Fire, Explosion, Other (specify)			Ahmedabad falls under Zone III: Moderate Damage Risk Zone [47]. Previously occurred earthquakes were of <4.0-5.0 magnitude[48].
4	Describe the type of soil and vegetation on site	Yes		The STP site is dominated by *Prosopis juliflora* and native shrub *Abutilon Indicum.* . The area around the TSPS and the common inlet point primarily features trees such as Neem (*Azadirachta indica*), Pheasantwood (*Senna siamea*), the Indian Tree of Heaven (*Ailanthus excelsa*) .The site soil is predominantly alluvial.
5	Is the site present in the flood plains as recorded in the last 100 years? Provide the HFL level of the site/ region	No	900	Site is 900 metres from Sabarmati River. the ground level for the STP has been proposed at 42.30 m which is above HFL which is 42.78 m.
6	Existing pollution/ contamination or degradation on site	No		Existing STP and related activities located adjacent to the proposed site Site is also surrounded by waste management facility such as wate to energy, material recovery facility etc.
7	Any other remark on baseline condition: its suitability to proposed use?	Yes		New Proposed 424 MLD STP has been proposed and the existing 180 MLD STP will be considered for upgradation and rehabilitation after commissioning of the proposed STP.

Anticipated Environmental Impacts: Impacts on Air, Noise, Land, Geology, and Soils

I.	Impacts on Land/ Soil Environment	Yes/ No	Area (in sqm)	Details
1	Totals extend of Demolition expected on-site (footprint in sqm and volume in cubic meter)	Yes		All proposed activities will be undertaken on land behind the existing 180 MLD STP. Currently the land

[47] https://www.bmtpc.org/DataFiles/CMS/file/VAI2019/map/eqmap/EQ_GUJRAT.pdf
[48] http://www.gsdma.org/uploads/Assets/other/earthquakemanagementplanvol106072017045006928.pdf

I.	*Impacts on Land/ Soil Environment*	*Yes/ No*	*Area (in sqm)*	*Details*
				is under possession of the AMC and is devoid of structures. TSPS land contains a few small structures from earlier project which shall be dismantled.
2	Extend of Land to be remediated/ repurposed	No		All proposed activities will be within the land proposed for developing the project.
3	Extend of land expected to be under green belt	Yes		About 10% of the land would be under green belt.
4	Will the proposed project cause the following on Land/ Soil?			
(i)	Impact on Surrounding Environmental Conditions including Occupation on Low lying lands/ flood plains	Yes		The land is largely barren with some shrubs.
(ii)	Substantial removal of Topsoil (mention area in sqm)	No		Some removal of topsoil is envisaged which shall be used for plantation activities.
(iii)	Any degradation of land/ eco-systems expected due to the project?	NO		Not envisaged as proposed project is proposed on land near the existing 180 MLD STP under the area of AMC. Temporary impacts during construction period only
(iv)	Loss or impacts on Cultural/ heritage areas/ properties	NO		Construction activity within STP boundary and there are no cultural properties in premises. Construction activity within STP boundary and there are no cultural properties in premises.

I.	*Impacts on Land/ Soil Environment*	*Yes/ No*	*Area (in sqm)*	*Details*
				As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the existing STP premises or in land proposed for new STP. Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities in identified land.
(v)	Does the project activity involve cutting and filling/ blasting etc.?	NO		Not envisaged. will source materials from existing quarries
(vi)	Will the project cause physical changes in the project area (e.g., changes to the topography) due to excavation, earthwork, or any other activity?	NO		There may be some filling and excavation required for construction. There would be cut and fill activities as sand mining activities have been done in some patches in the proposed land within premises and as far as possible the natural topography shall be maintained.
(vii)	Will the project involve any quarrying/ mining etc?	NO		Not applicable. Material will be sourced from

I.	***Impacts on Land/ Soil Environment***	***Yes/ No***	***Area (in sqm)***	***Details***
				existing quarries which are licensed.
(viii)	Will the project/ any of its components contaminate or pollute the Land?	No		Sludge will be managed as per consent conditions. The proposed treatment process including Sludge Management explained in the DPR, states that the sludge from Biological unit shall be thickened and dewatered by using thickener and centrifuge. The dewatered sludge shall be transferred to AMCs sludge management facility.
(ix)	Will the project contribute to any long-term significant adverse (negative), large scale, irreversible, sensitive impact at a regional scale or area broader than the project sites; in combination with other projects proposed/ existing?	No		Proposed project will enhance the quality of water being disposed off in the river thereby will improve the quality of water in the river

I.	***Impacts on Air and Noise Environment***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
1	Will the project cause or increase air pollution due to dust and/ or vehicle emissions?	Yes	Very Minimum & Temporary impact on air quality due to construction vehicles is envisaged. Open Storage of construction material may also contribute to the dust generation.
2	Will the project cause or increase pollution due to GHG emissions?	No	The project will help in mitigating the GHGs emission by implementation of energy efficient equipment and machineries.
3	Will the project cause or increase odor nuisance? (mention type of Gases expected)	No	The plant design includes a two-stage scrubbing unit designed to treat the foul air comprising of a biological system such as bio

I.	***Impacts on Air and Noise Environment***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
			trickling filter followed by Activated Carbon Filter. The Activated Carbon Filter will act as a polishing unit only. Due to the two stage processes the odor Limits shall be almost zero at the boundary of STP. The odor Control units will be provided for the inlet works area and sludge sump area where odor emissions are produced. Green belt will also be provided to mitigate odor in surrounding.
4	Is there a potential for the release of toxic gases or accident risks (eg: potential fire outbreaks)	No	No toxic gas emission is expected from the plant.
5	Will the project generate or increase noise levels or vibration which will impact surrounding biodiversity or communities?	No	Nature of project does not involve high level of noise & vibration.

I.	***Impacts on Water Environment***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
1	Will the proposed activities at the site(s) impact water quality (surface or ground) – leachate, runoff, waste deposition, erosion, effluent disposal?	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river
2	Will the activities proposed at the site(s) impact water resource availability and use – effluent disposal, leachate, runoff, wastes deposition, erosion?	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river
3	Chances of Pollution of Water bodies/ groundwater wells, nearby or downstream	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river
4	Will the activities proposed at the site(s) hinder natural drainage	No	Activities proposed are AMC land adjacent to the existing 180 MLD STP which will not interfere with the natural drainage of the area.

I.	***Impacts on Water Environment***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
5	Will the activities proposed at the site(s) decrease permeability/ rainwater percolation	No	Activities proposed are in the in barren land adjacent to the existing 180 MLD STP which will not interfere with the rainwater percolation. Rainwater harvesting is also proposed within the proposed project area.
6	Will this sub-project involve creation/ use/ result in impacts on water storage structures in any way? Is this structure/ dam in concern above 15m in height?	No	Not Applicable (NA) Dam is not proposed under project
7	Will this sub-project involve the dredging of waterbodies, sea, canals, etc?	No	No dredging is envisaged in this project
8	Will the project affect the River flow pattern, stream pattern, or any other irrigation canal?	No	Activities proposed are in the proposed land adjacent to the existing 180 MLD STP which will not interfere with the river flow pattern
9	Will the project result in Stagnation of water flow or pondage or weed growth	No	Design aspects of the project will ensure that no water logging is occurred in the plant area due to the operations.

I.	***Impacts on Biodiversity and Host Communities***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
1	Will the project necessitates cutting of Trees/ Loss of Vegetation	No	The land area contains some vegetation. Detailed survey will be carried out by contractor to assess tree cutting required for the site and extent of impact. Tree cuttings may be required which will be estimated after DPR finalization and contractor on boarding. Some shrubs may require cutting/ clearing, however, same would be replaced after construction of STP. Existing trees will be retained as far as possible, if not affected by design.
2	Will the project necessitate substantial removal of Topsoil (mention area in sqm)	No	Some amount of soil from proposed lands will need to be removed. Same shall be used in the garden area of the premises and for filling activities Topsoil will be stored for use in plantation activities.

I.	***Impacts on Biodiversity and Host Communities***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
3	Any degradation of land/ eco-systems expected due to the project?	No	Not applicable
4	Will the project result in Health & Safety Risks in the neighborhood (upstream, downstream, nearby) including heightened traffic, the release of toxic gases, untreated sewage/ drainage, accident risks	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river. HSE risk identified during the ESIA preparation and mitigated. The ESMP will be updated after design finalization. There may be possibilities of OHS issues during construction operation. Access to proposed STP site will be constructed to ensure that access to residential areas will not be interrupted. Part of the road is kaccha and difficult to traverse in the rainy season as it is used by the industries processing solid waste. Access to Gyaspur is also from another road which will not be interrupted. Better roads under project will be of benefits to residential area inhabitants.
5	Potential Noise, Light Pollution/ movements causing disturbance to nearby habitats/ communities mainly during night hours	No	Activities proposed are in the land adjacent to the exiting 180 MLD STP premises hence additional disturbance to the habitat or community is not envisaged. Other industries are located in the vicinity.
6	Potential disruption to common property, accessibility, traffic disruptions, conflicts, or disruption to the local community within the subproject area?	No	Very minimal disturbance will be resulted during the construction phase as most of the activities will be undertaken within the boundary of the identified land.
7	The potential risk of habitat fragmentation due to the clearing activities? (eg. Hindrance to the local biodiversity like disturbing the migratory path of animals/ birds etc.)	No	Activities proposed are in the proposed land for the STP hence no disturbance to the habitat is envisaged

I.	***Impacts due to Storage and Wastes, Pollution and Hazards***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
1	Will the project use or store dangerous substances (e.g., large quantities of hazardous chemicals used for treatment/	Yes	The proposed project may require storage of Chlorine, Dewatering polymer and Ferric chloride (FeCl3).

I.	***Impacts due to Storage and Wastes, Pollution and Hazards***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
	other uses; materials like Chlorine, Diesel, Petroleum products; any other?		
2	Will the project produce solid or liquid wastes; including construction/ demolition wastes (including dredging, de-weeding wastes, muck/ silt, dust); polluted liquids?	Yes	Sludge will be generated during operation of the project. Treated water will be as per the NGT norms with TSS<10 mg/l and will be disposed in the river.
3	Will the project cause or increase air pollution or odor nuisance?	No	Odorous air will be generated from the wastewater, bio solids and sludge management. The plant design includes a two-stage scrubbing unit designed to treat the foul air comprising of a biological system such as bio trickling filter followed by Activated Carbon Filter. The Activated Carbon Filter will act as a polishing unit only. Due to the two stage processes the odour limits are almost zero at the boundary of STP. The odour Control units will be provided for the inlet works area and sludge sump area where odour emissions are produced. Green belt will also be provided to mitigate odour in surrounding.
4	Will the project generate or increase noise levels that will impact surrounding biodiversity or communities?	No	Nature of project does not involve high level of noise & vibration.
5	Will the project generate or increase visual blight or light pollution?	No	Light pollution is not envisaged.
6	Will the project generate water pollution (waterbodies/ groundwater)?	No	Proposed project of upgradation will have a better treatment facility and will enhance the quality of water being disposed in the river thereby will improve the quality of water in the river. Treated water will be as per the NGT norms, with TSS<10 mg/l and will be disposed in the river.
7	Will the project involve dangerous construction activities which may be a safety concern to workers/ host communities	Yes	Construction activities may involve movement of heavy parts and working in enclosed areas. Safety of workers will be prioritised. HSE components will be assessed and appropriate mitigations will be

I.	***Impacts due to Storage and Wastes, Pollution and Hazards***	***Yes/ No***	***Details*** *(including any Quantity Estimation)*
			implemented during construction phase of the project.
8	Describe any other features of the project that could influence the ambient environment	No	The proposed project will not affect the ambient environment.
9	Were the probable environmental impacts discussed with stakeholders?	Yes	Continuous stakeholder consultations are being carried out and further stakeholder meetings are being conducted.

Suggested Environmental Enhancement Measures

	Enhancement Measures	Yes/ No	Details
1	Has the subproject considered energy conservation measures/ energy recovery options incorporated in subproject design	Yes	Proposed project will include Energy efficient blowers and Energy efficient Desludging System, diffusers, SCADA, Solar panels and other energy saving measures such as LED lighting, VFD, etc.
2	Has the subproject considered energy efficiency options or use of alternate energy	Yes	Solar power is proposed for the project for meeting the partial requirement of common lighting.
3	Has the subproject considered reducing climate impacts of GHG, other releases	Yes	The project has significant potential for reducing GHGs in terms of energy efficient machineries, equipment, lighting, solar panels and SCADA etc. Also, with the reduced contaminants to the river ecosystem, there would be indirect benefit to the environment.
4	Has the subproject considered no disturbance to natural flora including trees	Yes	There is no major disturbance to the existing flora from the project. Green belt is planned to enhance the flora and fauna in the project boundary.
5	Has the subproject considered water reuse/ recycle options	Yes	Treated water will be discharged in the Sabarmati River .
6	Rainwater harvesting, water recycling, and other water resource enhancement measures	Yes	Rainwater Harvesting (RWH) is planned in the project (Roof top RWH)

7	Has the subproject considered waste minimization or waste reuse/ recycle options	Yes	Tertiary Treatment Plant (TTP) is planned for re-use and recycle treated sewage in horticulture. C&D waste will be reused for backfilling.
8	Considerations for extreme events, drought, flood, other natural disasters	Yes	The project design would take consideration of floods, HFL, Natural Disaster and extreme events.

Land Use, Resettlement, and/ or Land Acquisition				
Sl.no	Components	Yes	No	Details
1	Does the project involve the acquisition of private land?		√	The project is proposed on land belong and in the possession of AMC and located behind the existing 180 MLD STP.
2	Alienation of any type of Government land including that owned by Urban Local Body?		√	The land belongs to AMC and it is in their possession.
3	Clearance of encroachment from Government/ Local body Land?		√	Not applicable. There are no encroachments in the existing STP.
4	Clearance of squatters/ hawkers from Government/ Local Body Land?		√	Not applicable. There are no squatters or hawkers in proposed land .
5	Number of structures, both authorized and/ or unauthorized to be acquired/ cleared		√	Not applicable
6	Number of households to be displaced?		√	Not applicable. There no houses or residential structures in STP/TSPS land or on rising main route
7	Common properties to be alienated/ Pastureland (acres) Acquisition/ burial ground and others specify?		√	Not applicable. The location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 3.4 kms from the STP.

Land Use, Resettlement, and/ or Land Acquisition				
Sl.no	Components	Yes	No	Details
				Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities within STP premises.
8	Existing land uses on and around the project area (e.g., community facilities, agriculture, tourism, private property) will be affected?		√	No impact on any such structures. There are mainly industries around the land. Gyaspur settlement is located nearby and has another access route. Road construction (kaccha to pucca) and upgradation is being undertaken under sub project 424 MLD STP .
9	Will the project result in construction workers or other people moving into or having access to the area (for a long-time period and in large numbers compared to permanent residents)?		√	For construction activities, labour/workers will be working within the project boundary. DBOT contractor shall finalize the manpower requirement for the construction activity. In urban setting the numbers estimated at present upto 200 to 300 at maximum are not large enough to make an impact within the area. All work will be done within the STP premises so disturbance due to workers/labour presence is not envisaged. O&M staff requirements is estimated to be 79 .
10	Are financial compensation measures expected to be needed?		√	There are no impacted property, structures, CPR, cultural property or livelihood impacts and therefore compensation measures are not needed. Defunct structure located within STP premises in proposed land for TSPS will be dismantled. Structures are within AMC land.
Loss of Crops, Fruit Trees, Household Infrastructure, and livelihood				
11	Will the project result in the permanent or temporary loss of the following?			
11.1	Crops?		√	Proposed sub project is within STP premises with no cultivation. Some amount of land under outfall channel is under cultivation. The construction activities will be scheduled post harvest to prevent loss to the cultivator. AMC will also notify the cultivator.

Land Use, Resettlement, and/ or Land Acquisition				
Sl.no	Components	Yes	No	Details
11.2	Fruit trees? Specify with numbers		√	There are no fruit trees. Other Trees and shrubs have been planted in the proposed land for TSPS, mainly Neem, Kashid, etc which may required cutting. For STP land contractor will do the tree survey post finalization of design and pre construction works. Shrubs may be required to be cut during upgradation.
11.3	Petty Shops		√	There are no petty shops in STP premises
11.4	Vegetable/Fish/Meat vending		√	There is no vending within plant premises
11.5	Cycle repair shop		√	There are no such shops with plant premises
11.6	Garage		√	There are no such shops with plant premises
11.7	Tea stalls		√	There are no such shops with plant premises
11.8	Grazing		√	
11.9	Loss of access to forest produce		√	
11.10	Any others - specify		√	
Welfare, Employment, and Gender				
12	Is the project likely to provide local employment opportunities, including employment opportunities for women?	√		During construction period employment opportunities will be created for women and men. Some skilled employment will also be created. There will be petty business opportunities due to the presence of labour
13	Is the project being planned with sufficient attention to local poverty alleviation objectives?	√		Treated sewage will enhance the water quality of river and overall ecosystem which may have positive impacts to the downstream users. Some treated sewage would also be given for Industrial uses which will have positive impact in terms of better employment to the locals. Industries dependence on ground water will also be reduced with availability of treated water for industrial use. Treated water will be released into the Sabarmati river thereby improving the quality of water from existing levels. Sludge from the plant is being used as manure
14	Is the project being designed with sufficient local participation (including the participation of women) in the planning, design, and implementation process?	√		Extensive consultations were conducted during preparation of ESIA for 180 MLD STP to assess the prevalent issues related to sewage and wastewater and issues and concerns with respect to the STP functioning and release of treated water in the river. Additional

Land Use, Resettlement, and/ or Land Acquisition				
Sl.no	Components	Yes	No	Details
Historical, Archaeological, or Cultural Heritage Sites				
15	Historical heritage site(s) require excavation near the same?		√	There are no such historical heritage sites identified as such, Chance find procedures will be planned and implemented for the site as Ahmedabad has been declared as Heritage city
16	Archaeological heritage site(s) require excavation near the same?		√	There are no such Archaeological heritage sites identified as such, Chance find procedures will be planned and implemented for the site
17	Cultural heritage site(s) require excavation near the same?		√	There are no such Cultural heritage sites identified as such, Chance find procedures will
18	Graves or sacred locations require excavations near the same?		√	Not applicable as the burial grounds/cemeteries of the Jevovahs witness community is located near existing 155 MLD STP premises and access to the burial site is
Tribal Population/ Indigenous People				
19	Does this project involve acquisition of any land belonging to Tribal people?		√	No land acquisition is envisaged under the project. All land proposed to be utilized under various components is with AMC and in its
Beneficiaries				
20	Population proposed to be benefitted by the proposed project	Approx. no.:		The 424 MLD STP comes under Eastern Zone 1. covering approximately 75 sq km area of AMC. This zone receives wastewater from South zone, central zone and North zone of AMC. The estimated contributing population for this zone for 2021 is about 24.89 lakh and estimated
21	No. of Females proposed to be benefitted by the proposed project	Approx. no.:		Overall city population will be benefited.
22	Vulnerable households/ population to be benefitted	Approx. no.:		Overall city population will be benefited.
23	No. of Families to be benefitted	Approx.		

Clearances and Permits Required

II.	**Type**	**Yes/ No**	**Details**
i)	Environmental Clearance (mention State/ Centre)	No	The project doesn't require Environmental Clearance (EC) as per EIA Notification 2006. However, it will require Consent to Establish (CTE) and Operate (CTO) from Pollution Control Board (PCB) under Air and Water Act.

II.	Type	Yes/ No	Details
ii)	Consent from SPCB for establishment and operation of STP/ WTP	Yes	For proposed project consent to establish , will be sought.
iii)	NOC Forest Department for either the conversion of forest land or for tree-cutting	No	Activities proposed are proposed land adjacent to existing 180 MLD STP . Land is under AMC. Forest Clearance is not required.
iv)	Permission from AMC for Tree cutting	Yes	May be required after design finalization by DBOT contractor for TSPS and STP land and for part of the area identified for outfall channel.
v)	NOC for the establishment of water supply intake	No	NA
vi)	NOC for water withdrawal from the surface water source	No	No surface water withdrawal is proposed
vii)	Mining Permit (for dredging)	No	Not applicable
viii)	Labor License and related	Yes	It shall be included in the scope of contractor
ix)	Permit for Batching Plant	No	Not envisaged
x)	NOC for transportation and storage of diesel, oil, and lubricants, etc.	Yes	It shall be included in the scope of contractor
xi)	Others (Mention)	No	

This Screening sheet must be completed for each of the proposed sites by the respective Designated Nodal Officer on Environment and Social in the concerned department (Sewage/ Wastewater, Drainage) and forwarded to the E&S Specialist in the PIU along with the following enclosures. In the case of TA, appropriate parts of this shall be filled for areas of concern. Provide available information at the start of the subprojects to initiate assessment and update the same as required.

Enclosures: Provide maps with the geographical location of the project; and an appropriately-scaled map clearly showing the project area and project sites with land use, existing buildings, infrastructure, vegetation, adjacent land use, utility lines, access roads, and any planned construction, and any other information to describe the project, locations and possible impact as required.

Project Categorisation and Need for Instruments, Oversight

Project Category	□Low (L1) □ Moderate (M1) ☒**Substantial (S1)** □High (H1)
Key Reasons	

Instruments Required	a) S1: Project-specific ESIA (impact assessment considering the project details & location) by Independent Consultant (with signed/ sealed Screening Form, Consultations, ESMP, Budget, Responsibilities); and/ or Environmental and Social Audit; RAP including LRP b) M1: Project-specific ESIA by DPR Consultant (with signed/ sealed Screening Form, Consultations, ESMP, Budget, Responsibilities); and/ or Environmental and Social Audit; RAP including LRP **c)** L1:signed/ sealed Screening Form, Consultations, ESMP, Budget, Responsibilities; and/ or Environmental and Social Audit
Additional Responsibilities Expected	Mention: i) Specialists to be hired for Physical/ Cultural resources, Natural Habitats/ others, GHG estimation, etc for ESIA preparation, and/ or supervision), ii) Consultations, iii) any other aspect

Status	***Agency/ Official***	***Name, Signature with Date, and Seal***
Prepared by	ULB Department (project in-charge)	
	Environmental Engineer/ Social Specialist	
Checked, categorised as ____ (S1, M1, L1) & ToR issued by:	PIU Environmental Specialist/ Social Specialist	
	Approved by PIU Project Director	

9.2 ANNEXURE II: APPLICABLE REGULATIONS

1. Environmental Regulations at National Level:

i. National Environment Policy, 2006

The National Environment Policy by the MoEFCC aims at mainstreaming environmental concerns into all developmental activities. It emphasizes the conservation of resources and points out that the best way to aid conservation is to ensure that people dependent on resources obtain better livelihoods from conservation than from degradation of the resources. It argues that environmental degradation often leads to poverty and poor health outcomes among populations. The objectives of the National Environmental Policy are-

- Conservation of Critical Environmental Resources
- Intra-generational Equity: Livelihood Security for the Poor
- Inter-generational Equity: ensure judicious use of environmental resources Integration of Environmental Concerns in Economic and Social Development
- Efficiency in Environmental Resource Use
- Environmental Governance
- Enhancement of Resources for Environmental Conservation

ii. The Environment Protection (Act) 1986 and The Environmental Protection Rules

The Environment (Protection) Act was enacted in 1986 to provide for the protection and improvement of the environment. It empowers the Central Government to establish authorities [under section 3(3)] charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country. The Act was last amended in 1991. This act was passed as an overall comprehensive act "for protection and improvement of environment". Under this act, rules have been specified for the discharge/emission of effluents and different standards for environmental quality. These include Ambient Noise Standard, Emission from Motor Vehicles, Mass Emission Standard for Petrol Driven Vehicles, General Effluent Standards, etc. in the exercise of the powers conferred under the Act, the following rules are devised

- The Water (Prevention and Control of Pollution) Act, 1974 and Water Cess Act, 1977
- The Air (Prevention and Control of Pollution) Act, 1981
- The Noise Pollution (Regulation and Control) Rules, 2000
- Environment Protection (EP) Act, 1986
- National Green Tribunal Act, 2010
- Waste Management Rules under EP Act including
  - Solid Waste Management Rules, 2016
  - Construction and Demolition Waste Management Rules, 2016.
  - Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016, amended 2019

- E-Waste (Management) Rules, 2016, amended 2018
- Bio-medical Waste Management Rules, 2016, amended 2019
- Plastic Waste Management (Amendment) Rules, 2018
- Batteries (Management and Handling) Amendment Rules, 2010

iii. Environmental Impact Assessment Notification, 2006

EIA notification 2006 and its subsequent amendments list out the type of project that requires Environmental Impact Assessment and Environmental Clearance from MoEFCC or State Environment Impact Assessment Authority before the commencement of any developmental work or project expansion. The notification gives stage-wise guidance for the processing of Environmental Clearance. The objective of the notification is to formulate a transparent, decentralized, and efficient regulatory mechanism to:

- Incorporate necessary environmental considerations at the planning stage
- Involve stakeholders through the public hearing process
- Identify developmental projects based on impact potential
- Securing provision for mitigation efforts

iv. The Water (Prevention and Control of Pollution) Act, 1974 and The Water Cess Act 1977

The Act is enacted to prevent pollution of water sources through industrial or any other construction activity and for maintaining or restoring of wholesomeness of water. The Act prohibits the discharge of pollutants into water bodies beyond a given standard and lays down penalties for non-compliance with its provisions.

The act resulted in the establishment of the Central and State Level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders, and issuing licenses for construction and operation of any facility. This will include the generation of liquid effluent during construction /civil engineering activities or from domestic activities in workers' colonies. Water (Prevention and Control of Pollution) Cess Act was enacted in 1977, to provide for the levy and collection of a cess on water consumed by persons operating and carrying on certain types of industrial activities. This cess is collected to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974. The Act was last amended in 2003.

v. The Air (Prevention and Control of Pollution) Act. 1981

The purpose of this act is to prevent, and control air pollution and preserve air quality. This act empowers Central and State Pollution Control Boards for managing air quality and emission standards, as well as monitoring air quality, prosecuting offenders, and issuing licenses for construction and operation of any facility. Air quality includes noise levels also. This act has notified the National Ambient Air Quality Standard for different land uses.

vi. The Noise Pollution (Regulation and Control) Rule,2000

The Noise Pollution (Regulation and Control) rules are promulgated under the Environmental (protection) Act, 1986. The noise pollution rules lay down terms and conditions as are necessary to reduce noise pollution, including during night hours. The rule provides ambient noise level standards for various types of land uses. PCB can take action if the sound level exceeds the standards by 10 dBA. Noise standard for different zones.

- Industrial zone- 75 & 70 dBA Leq during daytime and night-time respectively
- Commercial zone- 65 & 55 dBA Leq during daytime & night-time respectively
- Residential zone- 55 & 45 dBA Leq during daytime and night-time respectively
- Silence zone 50 & 40 dBA Leq during daytime and night-time respectively

vii. The Wildlife Protection Act, 1972

The Wildlife Protection Act, 1972 has allowed the government to establish several Protected Areas like National Parks and Sanctuaries over the past 37 years, to protect and conserve the flora and fauna and their habitat.

Prior recommendation of the National Board for Wildlife (NBWL) will be required

- in case any subproject activity is proposed within the boundaries of a Protected area
- in case any project requiring Environmental Clearance (under the purview of EIA Notification 2006 and its subsequent amendments) is located within the eco-sensitive zone around a Wildlife Sanctuary or National Park or in absence of delineation of such a zone, within a distance of 10 km from its boundaries

viii. The Wetlands (Conservation and Management) Rules, 2017

Wetlands (Conservation and Management) Rules, 2017 are promulgated under the Environmental (protection) Act, 1986 for prohibiting reclamation and degradation through drainage and landfill, pollution (discharge of domestic and industrial effluents, disposal of solid wastes), hydrological alteration (water withdrawal and changes in inflow and outflow), over-exploitation of their natural resources resulting in loss of biodiversity and disruption in ecosystem services provided by wetlands by conservation of wetlands.

As defined in the rule, ‘wetland’ means an area of marsh, fen, peatland, or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation, and irrigation purposes. Whereas, ‘wetlands complexes’ means two or more ecologically and hydrologically contiguous wetlands and may include their connecting channels/ducts

The rules shall apply to the wetlands or wetlands complexes of the following types-

- wetlands categorized as 'wetlands of international importance under the Ramsar Convention
- wetlands as notified by the Central Government, State Government, and Union Territory Administration

Section 4 of the rule elaborates restrictions of activities in wetlands which includes handling or storage or disposal of construction and demolition waste covered under the Construction and Demolition Waste Management Rules, 2016; hazardous substances covered under the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 or the Rules for the Manufacture, Use, Import, Export, and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells, 1989 or the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008; Solid waste dumping; Discharge of untreated wastes and effluents from industries, cities, towns, villages and other human settlements; and any construction of a permanent nature.

2. Waste Management Regulations

i. Solid Waste Management Rules, 2016

The Rules shall apply to every urban local body, other areas and to every domestic, institutional, commercial, and any other non-residential solid waste generator except industrial waste, hazardous waste, hazardous chemicals, biomedical wastes, e-waste, lead-acid batteries, and radioactive waste.

The rules define the duties of solid waste generators. The rules outline the responsibilities of line ministries, ULB's and other stakeholders, the duty of the operator of the Solid Waste Processing and Treatment Facility.

ii. Construction and Demolition Waste Management Rules, 2016

Construction and demolition waste include waste comprising of building materials, debris, and rubble resulting from construction, remodelling, repair, and demolition of any civil structure.

As per rule-

1. Every waste generator shall prima-facie be responsible for the collection, segregation of concrete, soil, and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules ((Rule 4 sub-rule (1))
2. There should be no littering or deposition of construction and demolition waste to prevent obstruction to the traffic or the public or drains (Rule 4 sub-rule (4))

iii. Plastic Waste Management Rules, 2016, amended 2018

MoEFCC issued the Plastic Waste Management Rules, 2016 to give thrust on plastic waste minimization, source segregation, recycling, and disposal effectively.

These rules shall apply to every waste generator, local body, Gram Panchayat, manufacturer, Importers, and producer. Section 6 and Section 8 of the rule explain the Responsibility of the Local Body and the Responsibility of the waste generator respectively.

iv. Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016, amended 2019

The rule dictates the entity generating hazardous wastes (as defined in the rule), to take all practical steps to ensure that such wastes are properly handled without any adverse effects, which may result from such wastes. It stipulates proper collection, reception, treatment,

storage, and disposal of such wastes and provides for the process/mechanism to do so. Waste generators will need to obtain permission from the State Pollution Control Boards and other designated authorities for the storage and handling of any hazardous material.

- Schedule I of the rule lists out of processes that generate hazardous wastes.
- Schedule II of the rule provide a list of waste constituents with concentration limits

v. E-Waste Management Rule, 2016, amended in 2018

These rules shall apply to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler, and recycler involved in the manufacture, sale, transfer, purchase, collection, storage, and processing of e-waste or electrical and electronic equipment listed in Schedule I of the rule, including their components, consumables, parts, and spares which make the product operational. These rules are applicable

Two categories of electrical and electronic equipment namely (i) IT and Telecommunication Equipment and (ii.) Consumer Electricals and Electronics such as TVs, Washing Machines, Refrigerators Air Conditioners including fluorescent and other mercury-containing lamps are covered under these Rules

Section 5 of the rule defines the responsibilities of the producer of e-waste.

vi. Batteries (Management and Handling) Rules, 2001

MoEFCC under the provisions of the Environmental Protection Act, 1986 issued the Batteries (Management and Handling) Rules, 2001. The rules were enacted with the primary objective of ensuring the safe disposal of discarded lead-acid batteries. Rules mandate proper control and record-keeping on the sale or import of lead-acid batteries and recollection of the used batteries by registered recyclers to ensure environmentally sound recycling of used batteries.

vii. The Motor Vehicle Act, 1988 & Motor Vehicles Rules, 1989

The Act regulates all aspects of road transport vehicles. It provides in detail the legislative provisions regarding licensing of drivers/conductors, registration of motor vehicles, control of motor vehicles through permits, traffic regulation, insurance, liability, offenses, and penalties, etc.

3. Regulations Related to Pesticides/ Insecticides

i. Insecticide Act 1968 and Rules 1971

The Insecticides Act, 1968 and Insecticides Rules, 1971 regulate the import, registration process, manufacture, sale, transport, distribution, and use of insecticides (pesticides) to prevent risk to human beings or animals and for all connected matters, throughout India. All insecticides (pesticides) have to necessarily undergo the registration process with the Central Insecticides Board & Registration Committee (CIB & RC) before they can be made available for use or sale.

The Act also has guidelines stipulated for the protective clothing of persons handling insecticides. Disposal of used packages, surplus material, and washing of insecticides are also included in the Act.

ii. Draft Bill on Pesticide management, 2020 introduced in Rajya Sabha in March 2020

The purpose of the bill is to minimize risk to human beings, animals, living organisms other than pests and the environment, with an endeavour to promote pesticides that are biological and based on traditional knowledge. The bill on Pesticide management seeks to regulate the manufacture, import, sale, storage, distribution, use, and disposal of pesticides, to ensure the availability of safe pesticides and minimize the risk to humans, animals, and the environment. The Bill seeks to replace the Insecticides Act, 1968

4. Acts/ Rules applicable to Land Acquisition, RoW use

i. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

Aims to ensure, a humane, participative, informed, and transparent process for land acquisition with the least disturbance to the owners of the land and other affected families and provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or those that are affected by such acquisition and make adequate provisions for their rehabilitation and resettlement and for ensuring that the cumulative outcome of compulsory acquisition should be that affected persons become partners in development leading to an improvement in their post-acquisition social and economic status.

ii. The supreme court order, pertaining to removal and restriction of encroachment of religious structures on the public space

Provisions of the Order: disallow/regulate the use of RoW, public spaces for the construction of temples, mosques, shrines, the church in public land, and public spaces.

5. Other Regulations/Policies/Guidelines applicable to various construction/implementation activities

i. Central Ground Water Authority- 'Guidelines to control and regulate groundwater extraction in India' September 2020

Central Ground Water Authority (CGWA), constituted by the Government of India under Section 3 (3) of the Environment (Protection) Act (EPA) of 1986, in pursuance of the Order of the Hon'ble Supreme Court of India, has been regulating groundwater development and management in the country and has proposed the guidelines for groundwater withdrawal.

The drawing/ proposing to draw groundwater through a pump of more than 2 HP and/ or through more than one functional tube well shall be required to seek NOC for groundwater withdrawal. NOC will be granted for drinking and domestic purpose only. NOC for groundwater withdrawal will be considered only in cases where the water supply department concerned is unable to supply an adequate amount of water in the area.

Government water supply agencies are also required to seek NOC from the authorized officers for existing as well as new schemes based on groundwater sources.

NOC shall not be granted for extraction of groundwater for construction activities in the project in Critical/ Over-exploited areas.

Quantum of groundwater for purposes other than drinking/ domestic use shall not exceed 25% of total groundwater abstraction

ii. The Building & Other Construction Workers (Regulation of Employment & Conditions of Service) BOCW Act, 1996

As per the Act, the employer is required to provide safety measures at the building or construction work site along with other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation, etc. to the workers.

These are comprehensive guidelines for the Occupational Health and Safety of Laborers.

iii. Child Labour (Prohibition and Regulation) Act, 1986 and Rules, amended 2016 and Child Labour (Prohibition and Regulation) Amendment Rules, 2017

The Child Labour (Prohibition and Regulation) Act of 1986 designates a child as a person who has not completed their 14th year of age. It aims to regulate the hours and the working conditions of child workers and to prohibit child workers from being employed in hazardous industries. Children between the age of 14 and 18 are defined as "Adolescent" and the law allows adolescents to be employed except in the listed hazardous occupation and processes which include mining, inflammable substance, and explosives-related work, and any other hazardous process as per the Factories Act, 1948.

iv. Minimum Wages Act, 1948

This act sets the minimum wages that must be paid to skilled and unskilled laborers. The act is legally non-binding but statutory. Payment of wages below the minimum wage rate amounts to forced labour. Wage boards are set up to review the industry's capacity to pay and fix minimum wages such that they at least cover a family of four's requirements of calories, shelter, clothing, education, medical assistance, and entertainment.

v. The Bonded Labour System (Abolition) Act 1976

The Bonded Labour System (Abolition) Act 1976: States that all forms of bonded labour stands abolished and every bonded labour stands freed and discharged from any obligations to render any bonded labour.

vi. Workmen's Compensation Act, 1923 & Rules 1924

The Act requires if personal injury is caused to a workman by accident arising out of and during his employment, his employer should be liable to pay compensation in accordance with the provisions of this Act.

vii. Interstate Migrant Workmen Act 1979

The provisions of this Act regulate the conditions of service and protect the interests of interstate migrant workers. The project requires engaging interstate migrant workers for specialized activities The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, among others.

viii. Ancient Monuments and Archaeological Sites & Remains (Amendment and Validation) Act 2010

This Act is to ensure the preservation of ancient and historical monuments and archaeological sites and remains of national importance and for the regulation of archaeological excavations

and the protection of sculptures, carvings, and other like objects. According to this Act, areas within the radii of 100m and 200m from the "protected property" are designated as "prohibited areas" and "regulated areas" respectively. No development activity is permitted in the "prohibited areas". Development activities are not permitted in the "regulated areas" without prior permission from the Archaeological Survey of India (ASI) if the site/remains/ monuments are protected by ASI or the State Directorate of Archaeology.

ix. Indian Treasure Trove Act, 1878

Whenever any treasure (anything of any value hidden in the soil, or anything affixed thereto) exceeding in amount or value ten rupees is found, the finder shall intimate District Collector in writing as soon as practicable.

x. Right to Information Act, 2005

Provides a practical regime of right to information for citizens to secure access to information under the control of Public Authorities. The act sets out (a) obligations of public authorities with respect to the provision of information; (b) requires designating of a Public Information Officer; (c) process for any citizen to obtain information/disposal of request, etc.; and (d) provides for institutions such as Central Information Commission/State Information Commission.

xi. Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989 and further Amendments 2018.

To prevent atrocities against scheduled castes and scheduled tribes. The objectives of the Act clearly emphasized the intention of the government to deliver justice to these communities through proactive efforts to enable them to live in society with dignity and self-esteem and without fear or violence or suppression from the dominant castes. With the reported misuse of the Act, In August 2018, the parliament of India passed the Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Amendment Bill, 2018, to bypass the ruling of the Supreme Court of India laying down procedures for arrests under the Act.

xii. The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013

An act that aims at providing a sense of security at the workplace that improves women's participation in work and results in their economic empowerment. It requires an employer to set up an "Internal Complaints Committee" (ICC) and the Government to set up a 'Local Complaints Committee' (LCC) at the district level to investigate complaints regarding sexual harassment at workplace and for inquiring into the complaint in a time bound manner. The ICC need to set up by ever organization and its branches with more than 10 employees.

xiii. The Street Vendors (Protection Of Livelihood and Regulation of Street Vending) Act, 2014

The act was enacted to regulate street vendors in public areas and protect the rights of the street vendors.

xiv. The Prohibition of Employment As Manual Scavengers and Their Rehabilitation Act, 2013

An Act to provide for the prohibition of employment as manual scavengers, rehabilitation of manual scavengers and their families, and for matters connected therewith or incidental thereto.

6. Technical Guidelines on Sewerage and Drainage at National Level

i. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Manual on Sewerage and Sewage Treatment Systems – 2013

Part A of the manual is on the Engineering aspect related to the sewerage system.

The manual provides detailed guidelines for:

- Planning
- Design and construction of sewers
- Design and construction of sewage pumping stations and sewage pumping mains
- Design and construction of sewage treatment facilities
- Design and construction of sludge treatment facilities
- Recycling and reuse of sewage
- Decentralized sewerage system
- On-site sanitation
- Preparation of city sanitation plan

Part B of the manual is on Operation and Maintenance aspects related to sewerage systems and includes:

- Sewer systems
- Pumping station
- Sewage treatment facilities
- Sludge treatment facilities
- Electrical and instrumentation facilities
- Monitoring of water quality
- Environmental conservation
- Occupational health hazards and safety measures
- On-site systems

Part C of the manual is on the Management aspect related to the sewerage system:

- Legal framework and policies
- Institutional aspects and capacity building
- Financing and financial management
- Budget estimates for operation and maintenance
- Public-private partnership

- Community awareness and participation
- Asset management
- Management information system

Potential disasters in sewerage and management

ii. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Manual on Storm Water Drainage Systems, 2019

This manual has been prepared for assisting engineers, planners, designers, architects, geographers, and hydrologists working in government / private institutions, urban local bodies, industrial and business concerns, consultancy services, etc., in planning and design of urban stormwater drainage systems in the country.

The manual is contained in three distinct Parts over two volumes.

Volume 1 contains Part A: Engineering Design,

Volume 2 contains Part B: Operation, Maintenance, and Part C: Management.

iii. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Manual on Operation and Maintenance of Water Supply System - 2005

The manual aims to serve as a guide for strengthening the technical, operational, and managerial capabilities required of the concerned personnel to operate and maintain water supply services as per acceptable norms of quantity, quality, sustainability, reliability, and cost. This manual provides systematic guidelines that provide the details of the operation, functioning, maintenance, and safety considerations of all the technical aspects related to water supply O & M.

iv. Central Public Health and Environmental Engineering Organisation (CPHEEO) Ministry of Housing and Urban Affairs, Advisory on On-Site and Decentralized Composting of Municipal Organic Waste, June 2018

Methods to treat organic wastes, Reduce, Recycle, Reuse, Waste to Compost systems: Waste to Compost systems for Individual Households, Small Communities, Apartments, etc. up to 10 Household; Waste to Compost systems for Medium-Sized Communities, Apartments, RWAs – for 11 – 300 Households; medium-sized Offices, medium Hotels, Resorts, medium Schools, Canteens, Marriage Halls; Waste to Compost systems for large Communities, Apartments, RWAs, high rise buildings for 301 – 1000 Households; Large Offices, Large Hotels, Large Schools, Waste to Compost systems for Decentralized plants for more than 1000 Households operated by ULBs / Institutions / Outsourced agencies.

v. Central Pollution Control Board, Guidelines for Management of Sanitary Waste, May'18

It covers possible waste management options for such kinds of wastes. Role of various stakeholders etc.

vi. Central Pollution Control Board, Guidelines on Environmental Management of Construction & Demolition (C & D) Wastes

It discusses the Quantum & composition of C & D waste generation, Initiatives in promoting C & D waste products by GoI, C & D waste processing, Existing Guidelines on C & D waste

management, Introduction to Guidelines on Environmental Management of C& D Wastes, Guidelines on Environmental Management of C & D Wastes – NOISE management, Guidelines on Environmental Management of C & D Wastes – DUST management, Guidelines on Environmental Management of C & D Wastes – Other issues

Annexures on: Initiatives in C & D waste management in 69 cities (Literature Survey); Potential uses of C & D wastes, Global practices of the utilization of C & D wastes, Criteria for site selection of C & D waste processing facility

7. Policies and Regulations at State Level

i. The Gujarat Infrastructure Development Act, 1999

This Act provides the framework for participation by persons other than the State Government and Government agencies in the financing, construction, maintenance, and operation of infrastructure projects and for that purpose to establish a Board and to provide for the matters connected therewith.

ii. Gujarat Irrigation and Drainage Act, 2013

This Act is to provide for irrigation and drainage in the State of Gujarat. Whereas it is necessary to make provisions for the construction relating to irrigation in the State of Gujarat and for the matters connected therewith and incidental thereto.

iii. Gujarat Irrigation and Drainage Rules, 2014

It shall apply to all the works constructed and maintained relating to irrigation including drainage and water supply for drinking and industrial purpose by the State Government, State Government institutions, and Grant-in-Aid Institutions of the State and includes all services rendered thereof.

iv. The Gujarat Water Supply and Sewerage Board Act, 1978

An Act to provide for the establishment of a Water Supply and Sewerage Board for the rapid development and proper regulation of water supply and sewerage services in the State of Gujarat. It extends to the whole of the State of Gujarat excluding the areas comprised of Cities and cantonments.

v. Saurashtra Felling of Trees (Infliction of Punishment) Act, 1951

An Act to provide for heavier punishment for felling of trees and for certain other matters. Whereas it is expedient to provide for heavier punishment for the unauthorized felling of trees and certain other matters

vi. The Gujarat Highways Ac, 1955

An Act to provide for the restriction of ribbon development along highways, for the prevention and removal of encroachment thereon, for the construction maintenance and development of highways, for the levy of betterment charges, and certain other matters.

vii. The Gujarat Water and Gas Pipelines (Acquisition of Right of User in Land) Act, 2000

An Act to provide for the acquisition of the right of users in land for laying water pipelines and gas pipelines in the State of Gujarat and for the matters connected therewith.

viii. Gujarat Industrial Development Act, 1962

This act is to make special provision for securing the orderly establishment and organization of industries in industrial areas and industrial estates in the State of Gujarat and to establish commercial centres in Connection with the establishment and organization of such industries and for that purpose to establish an Industrial Development Corporation, and for purposes connected with the matters aforesaid.

ix. The Gujarat Special Economic Zone Act, 2004

An Act to provide for the operation, maintenance, management, and administration of a Special Economic Zone in the State of Gujarat and to constitute an Authority and for matters connected therewith or incidental thereto

x. The Gujarat Vacant Lands in Urban Areas (Prohibition of Alienation) Act, 1972

An Act to prohibit the alienation of certain vacant lands in urban areas in the State of Gujarat.

xi. The Gujarat Town Planning and Urban Development Act, 1976

An Act to consolidate and amend the law relating to the making and execution of development plans and town planning schemes in the State of Gujarat.

xii. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Gujarat Amendment) Act, 2016 (effective from August 2016)

A further amendment to the "Principal Act" referred to the Right to Fair Compensation, Transparency in Land Acquisition and Resettlement and Rehabilitation Act, 2013 in its application to the State of Gujarat, enacted the Gujarat Amendment Act, 2016 with simplifying the provisions, which was commenced on 15th August 2016.; Major amendments include Power of State government to exempt public interest and SIA for certain projects mentioned in the sub section of 10A., R&R Assistance - lump sum amount equal to 50% of the amount of land compensation as determined under section 27 of principal Act to the affected families, in case of a project which are linear in nature.

xiii. The Gujarat Ancient Monuments and Archaeological Sites and Remains Act, 1965

An Act to make better provision for the preservation of ancient and historical monuments and records and archaeological sites and remains (other than those declared to be of national importance) in the State of Gujarat and for matters connected with the purposes aforesaid.

xiv. Gujarat Fisheries Act, 2003

An Act to provide for the protection, conservation, and development of fisheries in inland and territorial waters of the State of Gujarat and regulation of fishing in the inland and territorial waters along the coastline of the State and matters connected therewith or incidental thereto.

xv. The Gujarat Public Premises (Eviction of Unauthorised Occupants) Act, 1972

An Act to provide for the eviction of unauthorized occupants from public premises and for certain incidental matters.

xvi. The Gujarat Slum Areas (Improvement, Clearance, and Redevelopment) Act, 1973

An Act to provide for the improvement and clearance of Slum areas in the State of Gujarat and their development; and matters connected with the purposes aforesaid.

xvii. Gujarat Special Investment Region Act, 2009

An Act to provide for the establishment, operation, regulation, and management of large size Investment Regions and Industrial Areas in the State of Gujarat; and to especially enable their development as global hubs of economic activity supported by world-class infrastructure, premium civic amenities, centres of excellence and proactive policy framework; and for setting up an organizational structure with that purpose and for matters connected therewith or incidental thereto.

xviii. Gujarat State Disaster Management Act, 2003

An Act to provide for effective management of disaster, for mitigation of the effects of disaster, for administering, facilitating, coordinating and monitoring emergency relief during and after the occurrence of disasters, and for implementing, monitoring, and coordinating measures for reconstruction and rehabilitation in the aftermath of disasters, in the State of Gujarat and for these purposes to establish the Gujarat State Disaster Management Authority and to specify other agencies and for matters connected therewith or incidental thereto.

xix. Gujarat Government-Policy for Reuse of Treated Wastewater, 2018

The concept of wastewater recycling and reuse and the need to include the same in all water supply and wastewater management programs is recognized by most of the policy frameworks and institutions in India.

Gujarat Government Policy for the use of treated wastewater is in force from May 2018 with a vision to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources and also promotes treated wastewater as an economic resource.

The Policy has the following objectives:

- To reach a minimum of 80% coverage and collection of sewage in all municipal towns
- To reach a level of 100% treatment collected sewage as per the prescribed standards
- To reuse at least 25% of total freshwater consumption from treated wastewater within the time limit set under the policy by every municipal body
- To reuse 70%of treated wastewater by 2025
- To reuse 100% of treated wastewater by 2030

The prime responsibility for the treatment of wastewater, wastewater recycling, and reuse will be with the local body. Accordingly, the creation of wastewater management and planning and implementation of wastewater reuse infrastructure will be the responsibility of the local body depending on the availability of funds. However, the state government will seek to augment these efforts.

xx. Gujarat Government-The 'Urban Sanitation and Cleanliness Policy, 2018

A comprehensive policy for solid and waste management. Under this policy, all major urban civic bodies need to ensure 100 percent waste segregation to ensure less generation of solid

waste. The policy also allows civic bodies to make their laws, regulations and draw up rules concerning penalties for violators. Under the new policy, Gujarat is looking to reduce dependency on landfills and send collected waste directly to waste treatment plants. Construction waste will be recycled and reused. The main idea is to first reduce the generation of waste by encouraging segregation in households, resident welfare associations, and bulk waste generators like malls and hospitals.

This policy makes it mandatory for all households to have their drainage systems linked directly to sewage treatment plants (STPs), to avoid the direct flow of sewage into lakes or rivers.

Table 48: Applicable Regulations

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
1.	National Environment Policy, 2006	The National Environment Policy by the MoEFCC aims at mainstreaming environmental concerns into all developmental activities. It emphasizes the conservation of resources and points out that the best way to aid conservation is to ensure that people dependent on resources obtain better livelihoods from conservation than from degradation of the resources.	Prevention of pollution and degradation of resources caused due to the existing STPs functioning.	Construction and Operation phase
2.	The Environmental (Protection) Act. 1986, and the Environmental (Protection) Rules, 1987- 2002 (various amendments)	All environmental Notifications, Rules and Schedules are issued under the EPA Act	Prevention of pollution and degradation of resources caused due to the existing STPs functioning.	Construction and Operation phase
3.	Environmental Impact Assessment Notification, 2006	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994), set out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.	None of the components of this subproject falls under the ambit of the notification. and EC is not required for STP.	Not applicable

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		Category A projects requires Environmental Clearance from the National Ministry of Environment, Forest and Climate Change (MoEFCC). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).		
4.	The Water (Prevention and Control of Pollution) Act, 1974 and The Water Cess Act 1977	Consent required for not polluting ground and surface water during construction	Shall be applicable throughout the project cycle. Consent to Establish (CTE) and Consent to Operate (CTO) is required for new STPs. In this case, amendment to existing CCA will be required.	Construction and Operation phase
5.	The Air (Prevention and Control of Pollution) Act. 1981	Consent required for establishing and operation of crushers, hot mix and batching plants etc.	Shall be applicable throughout the project cycle. Consent to Establish (CTE) and Consent to Operate (CTO) is required for new STPs. In this case, amendment to existing CCA will be required.	Construction and Operation phase
6.	The Noise Pollution (Regulation and Control) Rule, 2000	Construction machineries and vehicles to conform to the standards for construction	Shall be applicable throughout the project cycle.	Construction and Operation phase
7.	The Wildlife Protection Act, 1972	An Act to provide for the comprehensive protection of wild animals, birds and plants. This would cover matters concerning appointment of forest authorities, hunting of	Not applicable as subprojects components are not located in designated protected area.	Not applicable

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		wild animals, protection of specified plants, conservation of national parks and sanctuaries, trade commerce in relation to plants and animals and prevention of any offences.		
8.	Saurashtra Felling of Trees (Infliction of Punishment) Act, 1951 Amended by Sau. 28 of 1952. Amended by Sau. 27 of 1954. Amended by Sau. 21 of 1955 Adapted and modified by the Bombay (Saurashtra Area) Adaptation of Laws (State and Concurrent Subjects) Order, 1956. Amended by Guj. 9 of 1960.	The rule indicates restriction on felling the trees without due permission[49].	Applicable as the project will require felling of trees.	Applicable
9.	The Wetlands (Conservation and Management) Rules, 2017	Conservation of wetlands for their ecosystem	Not applicable as the subproject is not near any wetland	Not applicable
10.	Solid Waste Management Rules, 2016	Disposal of Municipal Solid Waste as per rules	Applicable, construction workers camp and the waste generated from employees during operation will generate municipal solid waste which needs to be handled as per SWM rules.	Construction and Operation phase

[49] *https://ifp.gujarat.gov.in/DIGIGOV/StaticAttachment?AttachmentFileName=/pdf/approvals/pre_establishment_approvals/10_Tree_Cutting_Permission.pdf*

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
11.	Construction and Demolition (C&D) Waste Management Rules, 2016	Safe disposal for C&D Waste	Applicable, construction waste shall be generated due to demolition of existing structures & construction activities.	Construction phase
12.	Plastic Waste Management Rules, 2016, amended 2018	Safe disposal of plastic/ packaging material waste	Applicable, plastic and packaging waste will be generated in vast quantities during the implementation/ construction stage. In operation phase screening/ floating waste of plastic will be generated. .	Construction phase
13.	Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016, amended 2019	According to the Rules, hazardous wastes are wastes having constituents specified in schedule II of the rules, if their concentration is equal to or more than the limit indicated in the said schedule.	Applicable, the generated hazardous waste like waste oil. Paint, grease etc., has to be handled as per rules. Use and storage of Chlorin will attract consent from Petroleum & Explosive Safety Organization	Construction and Operation phase
14.	E-Waste Management Rule, 2016, amended 2018	The rule dictates the entity generating hazardous wastes (as defined in the rule), to take all practical steps to ensure that such wastes are properly handled without any adverse effects, which may result from such wastes. It stipulates proper collection, reception, treatment, storage, and disposal of	Applicable as e-waste will be generated during the project construction as well as during operation.	Construction and Operation phase

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		such wastes and provides for the process/ mechanism to do so.		
15.	Bio-medical Waste Management Rules, 2016, amended 2019	To improve the collection, segregation, processing, treatment, and disposal of the bio-medical wastes in environmentally sound management thereby, reducing biomedical waste generation and its impact on the environment.	The subproject does not directly deal with bio-medical wastes or its management. However, this may be Applicable as there may be household / other biomedical waste in the screenings	Construction (Rehabilitation of existing STP) and Operation Phase
16.	Batteries (Management and Handling) Rules, 2001	MoEFCC under the provisions of the Environmental Protection Act, 1986 issued the Batteries (Management and Handling) Rules, 2001. The rules were enacted with the primary objective of ensuring the safe disposal of discarded lead-acid batteries.	Applicable as the project will involve use of batteries for vehicles and plant	Construction and Operation phase
17.	The Motor Vehicle Act, 1988 & Motor Vehicles Rules, 1989	State Transport Authority to enforce standards for vehicular pollution.	All the vehicles used for construction and operation will need to comply with the provisions of this act.	Construction phase
18.	Insecticide Act 1968 and Rules 1971	The Insecticides Act, 1968 and Insecticides Rules, 1971 regulate the import, registration process, manufacture, sale, transport, distribution, and use of insecticides (pesticides) to prevent risk to human beings or animals and for all connected matters, throughout India. It	Applicable in case the subproject involves purchase or use of any insecticide or pesticides in the STP premises for landscaping purpose	Applicable

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		directs the usage of only approved pesticides / insecticides		
19.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Gujarat Amendment) Act, 2016.	Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people. Amendment of section 2 of 30 of 2013: Following proviso is inserted, provided also that the acquisition of land for the projects listed in Section 10A and the purposes specified therein shall be exempted from the provisions of the first provision. 10 A Power of the state government to exempt certain projects including projects vital to national security or defence of India, rural infrastructure including electrification, affordable housing and housing for poor,	The STP is in ownership of AMC. The proposed project doesn't involve any land acquisition or livelihood impacts as the area proposed for upgradation is within existing project premises. Workers directly or indirectly engaged with AMC/Contractors are working within the existing premises who will be absorbed during construction related activities and continue to be engaged in current tasks.	Not applicable

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		industrial corridors set up by State Government and its undertaking (up to 1 km on both side of railways or roads of such corridor), infrastructure projects including projects under PPP where ownership of land lies with state government		
20.	The Honorable Supreme Court of India order, pertaining to removal and restriction of encroachment of religious structures on the public space.	Banned fresh encroachment of roads, pavements and sideways by construction of religious structures or installation of statues of public figures. The order can empower municipal and government bodies to prevent unauthorized constructions being carried out under the garb of religious structures as often local political interests and religious sentiments render authorities helpless.	The project will be developed within the existing project boundary only which is enclosed.	Not applicable
21.	Central Ground Water Authority- 'Guidelines to control and regulate groundwater extraction in India' September 2020	All new infrastructure projects, who have submitted their applications prior to 24.09.2020 and propose to draw more than 20 KLD of ground water are required to submit proof of installation of STP or submit an affidavit as per format available on the website.	Not applicable. As no Ground water extraction is envisaged.	Not Applicable
22.	The Factories Act 1948, amended 1954, 1970, 1976 and 1987	An Act to consolidate and amend the law regulating labour in factories. WHEREAS it is	Applicable as more than 10 workers are expected to be involved in any year n the project.	Construction and operation

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		expedient to consolidate and amend the law regulating labour in factories; Health, Safety, Welfare and other provisions are mentioned specifically for compliance.		
23.	The Building & Other Construction Workers (Regulation of Employment & Conditions of Service) BOCW Act, 1996	All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government and require reporting as desired by the Registering Office in compliance to the Act - Cess should be paid at a notified rate;	• Applicable to any building or other construction work employing 10 or more workers; • Provide safety measures at the construction work and other welfare measures, such as insurance, canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc.,	Construction phase, Operations and Maintenance phases

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
24.	Child Labour (Prohibition and Regulation) Act, 1986 and Rules, amended 2016	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule. Child can help his family or family enterprise, which is other than any hazardous occupations or processes set forth in the Schedule, after his school hours or during vacations	No child labour will be appointed for any work related to this project.	Construction and Operation phase
25.	Minimum Wages Act, 1948	The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act, if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.	All construction workers should be paid not less than the prescribed minimum wage.	Construction and Operation phase
26.	The Bonded Labour System (Abolition) Act 1976	The Bonded Labour System (Abolition) Act 1976: States that all forms of bonded labour stands abolished and every bonded labour stands freed and discharged from any obligations to render any bonded labour	Applicable. Labour involved during the project will be appointed as per prevailing laws and rules.	Construction and Operation phase
27.	Workmen's Compensation Act, 1923 & Rules 1924	The Act requires if personal injury is caused to a workman by accident arising out of and during his employment, his employer should	Applicable during the construction phase.	Construction phase

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		be liable to pay compensation in accordance with the provisions of this Act.		
28.	Interstate Migrant Workmen Act 1979	The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.,	Contractor shall register with Labour Department, if Inter-state migrant workmen are engaged. Adequate and appropriate amenities and facilities to be provided to workers - housing, medical aid, traveling expenses	Construction phase
29.	Ancient Monuments and Archaeological Sites & Remains (Amendment and Validation) Act 2010	The Rules designate areas within a radius of 100 m and 200 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively. Henceforth, no permission for construction of any public projects or any other nature shall be granted in the prohibited areas of the protected monument. In respect of regulated area, the Competent Authority may grant permission for construction, reconstruction, repair and renovation based on recommendation of the National Monument Authority duly taking note	There is no protected monument in the subproject area. However, in case of chance finds, the contractors will be required to follow a protocol as defined in the Environmental and Social Management Plan (ESMP).	Construction phase, or Operations / Maintenance

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		of heritage bye-laws, which shall be prepared in respect of each protected monument and protected area		
30.	Right to Information Act, 2005	To secure access to information under the control of public authorities To promote transparency and accountability in the working of every public authority	Applicable, general public are entitled to ask information under this act related to the subproject. The project authorities shall provide necessary information.	Construction and Operation phase
31.	Gujarat (Right of Citizens to Public Services) Act, 2013	An Act to lay down an obligation upon every public authority to render public services within the prescribed time limit and provide for a grievance redressal mechanism to citizens for non-compliance and for the matters connected therewith or incidental thereto.	Applicable, general public are entitled to public services related to the subproject including access to water supply and sewerage services.	Construction and Operation phase
32.	The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act was passed in 2014	An Act to protect the rights of urban street vendors and to regulate street vending activities and for matters connected therewith or incidental thereto.	Not applicable as STP development is within the existing boundary and no street vendors are present in the plant premises or adjacent to the plant premises	Not applicable
33.	The Constitution (Seventy-Fourth Amendment) Act, 1992	An act to strengthen the Municipal Authorities.	Applicable as the subproject is being implemented by Municipal Corporation	Construction and Operation phase
34.	The Gujarat (Panchayats, Municipalities, Municipal Corporations And State) Tax On	An act to strengthen the Municipal Authorities.	Applicable as the subproject is being implemented by Municipal Corporation	Construction and Operation phase

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
	Professions, Traders, Callings And Employments Act, 1976 Amended till 2008			
35.	Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989 and further Amendments 2018.	To prevent atrocities against scheduled castes and scheduled tribes. The objectives of the Act clearly emphasized the intention of the government to deliver justice to these communities through proactive efforts to enable them to live in society with dignity and self-esteem and without fear or violence or suppression from the dominant castes.	Not applicable. specifically, to project but shall be applicable to all those working indirectly and directly on the sub-project. and in AMC.	Overall applicability to all working, directly and indirectly in sub-project, during construction and operation.
36.	The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	To provide protection against sexual harassment of women at workplace and for the prevention and redressal of complaints of sexual harassment and for matter connected therewith or incidental thereto	Applicable, to all workers, including female workers/ employees engaged in project activities to have legal protection and recourse under the act.	Construction and Operation phase
37.	The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013	An Act to provide for the prohibition of employment as manual scavengers, rehabilitation of manual scavengers and their families, and for matters connected therewith or incidental thereto.	Applicable. As G-ACRP involves sub project which includes upgradation or setting up new projects which involves sewer lines and STP. As per definition in act, it includes: - hazardous cleaning in relation to sewers and septic tanks and manual cleaning;	Construction and operation

Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
			- unsanitary latrines which requires manual removal and disposal of excreta; - local authority meaning municipal bodies/ panchayat.	

9.3 Annexure III: WORLD BANK ESSS APPLICABLE TO THE PROJECT

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
World Bank Environmental and Social Framework for Investment Project Financing	It sets out the mandatory requirements of the Bank in relation to the projects it supports through Investment Project Financing.	• The types of E&S risk and impacts that should be considered in the environmental and social assessment. • The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects where appropriate.	Applicable to this project for rehabilitation of STP and associated activities such as TSPS repairs and access road surfacing
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. To adopt a mitigation hierarchy approach to: (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.	• The types of E&S risk and impacts that should be considered in the environmental and social assessment. • The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects wherever appropriate.	Requirement under this component includes: i) Upgradation of STP, ii) Construction activities which include demolition and construction wastes from existing STP, new construction activities and iii) Appropriate technology application to handle the current/ future load with potential environmental and social risks and impacts. iv) Facilities or activities that are to be carried out, or planned to be carried out, contemporaneously with the project

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
			v) Benefits occurring from the sub-project include labor opportunities, procurement of local goods, services, equipment, and materials, the release of treated water for non-domestic purposes, improvement in quality of life for city and downstream users due to better treatment of sewage water.
ESS-2 Labor-and-Working-Conditions	• Promote safety and health at work. • Promote the fair treatment, non-discrimination, and equal opportunity of project workers. • Protect project workers, with particular emphasis on vulnerable workers. • Prevent the use of all forms of forced labor and child labor. • Support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law. • Provide project workers with accessible means to raise workplace concerns.	• Requirements of the Borrower to assess the scale, duration/timing and nature of workers to be employed, impacts/ risks associated with their engagement and how they will be addressed. • Provisions on the treatment of direct, contracted, community, and primary supply workers, and government civil servants. • Requirements on terms and conditions of work, non-discrimination and equal opportunity and workers organizations. Provisions on child labor and forced labor and prevention of SEA/SH. • Requirements on occupational health and safety, in keeping with the World Bank	Follow national, state, guidelines on OHS and WB EHGS for all works / activities Project will be hiring following types of workers: i) Direct workers will include the project managers and supervisors, who are employees of AMC, GUDM. ii) The work force deployed by the Contractors and the Project Management Consultant will be deemed to be contracted workers. The Contractor(s) might further engage multiple vendors and subcontractors;

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
		Group's Environmental, Health, and Safety Guidelines (EHSG). • Develop and implement written labor management procedures applicable to the sub-project and compliance to national requirements, laws, procedure, guidelines, standards etc.	iii) Migrant laborers may be employed by the contractor. iv) Local discomfort or potential conflicts with local people, moderate risk of Gender based Violence (GBV), social disturbance, and communicable diseases due to the low-level influx of migrant workers, including resource related conflicts. v) Labor and employment opportunities will be increased during the construction activities and local labor will be hired as far as possible.
ESS-3 Resource-Efficiency-and-Pollution-Prevention-and-Management	• Promote the sustainable use of resources, including energy, water, and raw materials. • Avoid or minimize adverse impacts on human health and the environment caused by pollution from project activities.	• Resource efficiency measures should be analyzed as part of the environmental and social assessment • When the project is a potentially significant user of water or will have potentially significant impacts on water quality, in addition to applying the resource efficiency requirements of this ESS, the Borrower will adopt measures, to the extent technically and financially feasible, that avoid or	To ensure Resource Efficiency, the project preparation and the ESIA process will identify feasible measures for efficient (a) Energy use; (b) Water management to minimize water usage during construction, and recycling of water used construction, treated water reuse, upcycling of wastes and byproducts such as gases

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	• To avoid or minimize project-related emissions of short and long-lived climate pollutants. • To avoid or minimize generation of hazardous and non-hazardous waste.	minimize water usage so that the project's water use does not have significant adverse impacts on communities, other users, and the environment. • Efficiency in use of raw materials and, thereby, efficiency in costs and labor, can be achieved by eliminating and/or minimizing the quantity used in the project, selecting the most appropriate raw materials possible, and reducing and recycling wastes. • The Borrower will avoid the release of pollutants or, when avoidance is not feasible, minimize and control the concentration and mass flow of their release using the performance levels and measures specified in national law or the EHSGs, whichever is most stringent. This applies to the release of pollutants to air, water, and land due to routine, on routine, and accidental circumstances, and with the potential for local, regional, and transboundary impacts. • ESS-3 refers to national law and Good International Industry Practice, in the first instance the World Bank Groups' EHSGs. treated sewage and sludge	(c) Raw materials use by exploring use of local materials, recycled aggregates, the project would also need to address the management of solid and liquid waste generated during the construction and operation phases. (d) Avoid the release of pollutants, avoid, minimize and control such releases and comply to regulations under nationals and local laws; and WB EHS especially in terms of discharge of treated effluents, sludge, screenings and other wastes (including C&D wastes, solid wastes, plastics, hazardous, e-wastes, biomedical wastes if any in screenings) emanating from proposed rehabilitation and operation & maintenance of STP e) minimize pollution impacts (waste and wastewater (bypass) outflow, erosion of soil, construction materials, chemicals used, siltation and other such impacts) during construction activities, maintenance, emergencies, disasters

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
			Issues related to pollution from effluents, pollutants and untreated sewage in Sabarmati River were reported during consultations and discussions. The subproject shall ensure regulatory compliance, and best standards for proposed reuse, after consultations with the stakeholders. This will reduce pollution, and resource efficiency
ESS-4 Community-Health-and-Safety	• Anticipate or avoid adverse impacts on the health and safety of project-affected communities during project life-cycle from routine and non-routine circumstances • Promote quality, safety, and climate change considerations in infrastructure design and construction, including dams • Avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials • Have in place effective measures to address emergency events	Requirements on infrastructure, considering safety and climate change, and applying the concept of universal access, where technically and financially feasible. • Requirements on traffic and road safety, including road safety assessments and monitoring • Ecosystem services: Addresses risks arising from impacts on provisioning and regulating ecosystem service • Community exposure to health issues: Measures to avoid or minimize the risk of water-related, communicable, and non-	In the project there is likely to be i) Earth excavation, use of vibratory equipment, construction debris handling and disposal etc. during construction ii) High likelihood of direct exposure to increased construction related traffic and equipment especially at road section connecting canal road to the highway. iii) There may be risks to and due to emergency release from the Vasna barrage, safety risks to project due to flooding, extreme events and mitigation and

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	• Ensure that safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities	communicable diseases on downstream communities • Requirements to assess risks associated with security personnel, and review and report unlawful and abusive acts to relevant authorities • Management and safety of hazardous materials • Emergency preparedness and response	impacts on downstream communities. Unanticipated risks to the downstream communities in case of release of untreated sewage from STPs during construction or bypass during emergencies, or Sabarmati River iv) Moderate dust levels from earthworks, moderate noise and emission level from traffic congestion and idling of vehicles, demolition of STP units during rehabilitation works v) Treated water released in the river will be improved due to the subproject and contribute in enhancing overall community health conditions. vi) There may be adverse impacts of discharge from STP on adjoining communities, especially during construction phase; vii) Women and girls in adjacent communities may face increased risk of gender based violence, sexual exploitation and abuse and sexual harassment (GBV and

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
			SEA/SH) due to larger labor presence and; other labor influx related risks
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 and assisting displaced persons in their efforts to improve, or at least restore, livelihoods and living standards to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher • Improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure • Conceive and execute resettlement activities as sustainable development programs	• Project design alternatives for avoiding and minimizing involuntary resettlement impacts • Applies to permanent or temporary physical and economic displacement resulting from different types of land acquisition and restrictions on access • Does not apply to voluntary market transactions, except where these affects third parties • Provides criteria for "voluntary" land donations, sale of community land, and parties obtaining income from illegal rentals • Prohibits forced eviction (removal against the will of affected people, without legal and other protection including all applicable procedures and principles in ESS5) • Requires that acquisition of land and assets happens only after payment of compensation and resettlement has occurred. Envisages benefits for affected persons	• Land acquisition and IR will not be required for the project as the proposed project involves upgradation of existing STP and capacity augmentation by AMC. Land use will remain the same. Land is under the Ahmedabad municipality as per land records available • Accessibility to road and river will not change and uninterrupted. There is no livelihood loss expected from the proposed upgradation and rehabilitation of the STP. • Accessibility to the river is not restricted currently or in the proposed sub-project upgradation. There are no commercial or residential or common property within the STP site.

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	• Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected	• Requires community engagement and consultation, disclosure of information and a grievance mechanism	• Kaccha access road is existing and therefore road repairs and upgradation is proposed to enhance the access in the subproject of rehabilitation of 240 MLD. • No resettlement activities are envisaged.
ESS-6 Biodiversity-Conservation	• Protect and conserve biodiversity and habitats. • Apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity. • To promote the sustainable management of living natural resources.	For the sub project, the ESIA will assess whether sub project activities will have impacts on natural habitat and biodiversity. Impacts on Sabarmati River due to discharge of treated sewage from the STP, will be assessed.	• Subproject areas are not protected areas or critical habitats. Sabarmati and Khari River and canals are all modified due to lack of water during most time of the year, and discharge of industrial effluents and poorly treated sewage, and altered water retention and flows. • Minimal impacts include site clearance activities for rehabilitation of STP or allied activities such as material storage, which may require clearing of site overgrowths. No tree at the site is proposed to be cut or disturbed. Treated water of the STP will be discharged into

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
			the Sabarmati River. After upgradation of the 126 MLD STP, discharged treated sewage will confirm to better quality which ultimately will benefit the aquatic life downstream. The biodiversity studies have indicated that the project will very negligibly affect biodiversity. • There are no critical habitats in the Sabarmati downstream as it is modified due to developments around, discharge of wastes and effluents from Ahmedabad and nearby regions and receives no natural flow during most part of the year and also suffer around 50 percent deficit rainfall. It gets water diverted from Narmada Canal since past 8 years (sourcing from Sardar Sarovar Dam around 300kms away, from which water is shared between 4 States including Gujarat) which is stored at riverfront for aesthetics and tourism as envisaged under riverfront redevelopment

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
			project; and then let out to the canal or river. Treated water from STPs of the city is the major contributor to the flow through the river most of the year, and to the Fatehwadi Canal which irrigates many hectares of land downstream.
ESS-7 Indigenous-People	• Ensure that the development process fosters full respect for affected parties' human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods. • Promote sustainable development benefits and opportunities in a manner that is accessible, culturally appropriate and inclusive. • Improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with affected parties. • Obtain the Free, Prior, and Informed Consent (FPIC) of affected parties in three circumstances.	• Applies when the Indigenous Peoples are present or have a collective attachment to the land, whether they are affected positively or negatively and regardless of economic, political or social vulnerability. • The option to use different terminologies for groups that meet the criteria set out in the Standard. • The use of national screening processes, providing these meet World Bank criteria and requirements. • Coverage of forest dwellers, hunter gatherers, and pastoralists and other nomadic groups. • Requirements for meaningful consultation tailored to affected parties and a grievance mechanism.	Not relevant to this project.

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	• Recognize, respect and preserve the culture, knowledge, and practices of Indigenous peoples, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.	• Requirements for a process of free, prior and informed consent in three circumstances.	
ESS-8 Cultural-Heritage	• Protect cultural heritage from the adverse impacts of project activities and support its preservation. • Address cultural heritage as an integral aspect of sustainable development. • Promote meaningful consultation with stakeholders regarding cultural heritage. • Promote the equitable sharing of benefits from the use of cultural heritage.	• The term 'cultural heritage' encompasses tangible and intangible heritage, which may be recognized and valued at a local, regional, national or global level, as follows: • Tangible cultural heritage, which includes movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Tangible cultural heritage may be located in urban or rural settings, and may be above or below land or under the water; • Applies to all projects that are likely to have risks or impacts on cultural heritage. This will include a project which: (a) Involves excavations, demolition, movement of earth, flooding or other changes in the physical environment;	• Not relevant for this subproject except for Chance Finds. • The location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 1.5 kms from the STP. • Masjid Mohuddin at 135 m from the boundary. Ibrahim Masjid at 188 m from the boundary.

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
		(b) Is located within a legally protected area or a legally defined buffer zone; (c) Is located in, or in the vicinity of, a recognized cultural heritage site; or (d) Is specifically designed to support the conservation, management and use of cultural heritage. • Applies to cultural heritage regardless of whether or not it has been legally protected or previously identified or disturbed.	• Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is located 1.2 km away from the STP boundary and is accessible by highway 64 and also through service road. It is located 1.6 km from the gate of the STP compound. • Marthoma Church Ahmedabad Cemetery is located 1.6 km away from boundary and from the gate it is about 1.6 kms. Therefore, impacts on the same is not anticipated due to project activities. • Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities within STP premises.
ESS-9 Financial-Intermediaries	• Sets out how Financial Intermediaries (FI) will assess and manage environmental	• Financial Intermediaries (FIs) to have an Environmental and Social Management	Not relevant as there is no financial intermediary involved.

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	and social risks and impacts associated with the subprojects it finances. • Promote good environmental and social management practices in the subprojects the FI finance. • Promote good environmental and sound human resources management within the FI.	System (ESMS) - a system for identifying, assessing, managing, and monitoring the environmental and social risks and impacts of FI subprojects on an ongoing basis. • FI to develop a categorization system for all subprojects; with special provisions for subprojects categorized as high or substantial risk. FI borrowers to conduct stakeholder engagement in a manner proportionate to the risks and impacts of the FI subprojects.	
ESS-10 Stakeholder-Engagement-and-Information-Disclosure	• Establish a systematic approach to stakeholder engagement that helps Borrowers identify stakeholders and maintain a constructive relationship with them. • Assess level of stakeholder interest and support for the project and enable stakeholders' views to be taken into account in project design. • Promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle. • Ensure that appropriate project information is disclosed to stakeholders	• Requires stakeholder engagement throughout the project life cycle, and preparation and implementation of a Stakeholder Engagement Plan (SEP). • Requires early identification of stakeholders, both project-affected parties and other interested parties, and clarification on how effective engagement takes place. • Stakeholder engagement to be conducted in a manner proportionate to the nature, scale, risks and impacts of the project, and appropriate to stakeholders' interests. • Specifies what is required for information disclosure and to achieve meaningful consultation.	• Relevant as the subproject will involve a wide variety of stakeholders during its project cycle. SEP has been prepared and it is a dynamic document for the G- ACRP project and this sub project. Consultations have been carried out for preparation of draft ESIA, ESIA, SEP and ESMF and details are included in the Chapter 8.

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	in a timely, understandable, accessible and appropriate manner.		

World Bank Group General ESHS Guidelines, April 2007, and Industry-specific Guidelines (for Water, Sanitation, and other Good International Industry Practices will be applicable for this project. The General ESHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. It has requirements for environmental and social health and safety issues during construction and operation. All applicable guidelines on COVID 19 also will be followed.

9.4 ANNEXURE IV: BIODIVERSITY ASSESSMENT: FLORA & FAUNA

Flora

Sr No:	Family	Scientific name	Author name	Common name		Origin	IUCN status
				English	Gujarati/Hindi		
Trees							
1	Annonaceae	*Annona squamosa*	L.	Custard apple	Sitaphal	E	NA
2	Annonaceae	*Polyalthia longifolia*	(Sonn.) Thwaites	Mast tree	Asopalav	E	NA
3	Apocynaceae	*Holarrhena pubescens*	Wall. Ex G.Don	Indrajao	Kadvo indrajav	N	LC
4	Apocynaceae	*Wrightia tinctoria*	R. Br.	Sweet indrajao	Mitho dudhalo	N	NA
5	Arecaceae	*Borassus flabellifer*	L.	Toddy palm	Taad	E	NA
6	Arecaceae	*Cocos nucifera*	L.	Coconut	Nariel	N	NA
7	Arecaceae	Phoenix dactylifera	L.	Date Palm		N	NA
8	Caesalpiniaceae	*Delonix regia*	(Hook.) Raf.	Flame Tree	Gulmohor	E	LC
9	Caesalpiniaceae	*Senna siamea*	L.	Pheasantwood		N	NA
10	Casuarinaceae	*Casuarina equisetifolia*	L.	Whistling Pine	Vilayti saru	N	NA
11	Combretaceae	*Anogeissus latifolia*	(Roxb. ex DC.) Wall. ex Guillem. & Perr.	Axle Wood Tree	Dhavdo	N	NA
12	Ebenaceae	*Diospyros melanoxylon*	Roxb.	Coromandel Ebony	Timru	N	NA
13	Fabaceae	*Albizia saman*	(Jacq.) Merr.	Rain Tree	Roto sarasdo	E	NA
14	Fabaceae	*Butea monosperma*	(Lam.) Taub.	Flame of the Forest	Palas, Kesudo	N	NA
15	Lamiaceae	*Gmelina arborea*	Roxb.	White Teak	Sivan	N	NA
16	Leguminosae	*Leucaena leucocephala*	(Lam.) de Wit	Wild tamarind	Su Baval	E	NA
17	Leguminosae	*Peltophorum pterocarpum*	(DC.) K.Heyne	Copperpod	Tamrafali	E	NA
18	Leguminosae	*Pithecelobium dulce*	(Roxb.) Benth.	Sweet Tamarind	Vilayti Amli	E	NA
19	Leguminosae	*Pongamia pinnata*	(L.) Pierre	Pongam Tree	Karanja	N	LC
20	Leguminosae	*Prosopis cineraria*	(L.) Druce	Indian Mesquite	Khijado	N	NA

Sr No:	Family	Scientific name	Author name	Common name		Origin	IUCN status
				English	Gujarati/Hindi		
21	Meliaceae	*Azadirachta indica*	A.Juss.	Neem	Limbdo	N	NA
22	Mimosaceae	*Acacia nilotica*	(L.) Del.	Indian gum Tree	Baval	N	LC
23	Mimosaceae	*Senegalia catechu*	L.F	Black Cutch Tree		N	NA
24	Moraceae	*Ficus benghalensis*	L.	Banyan Tree	Vad	N	NA
25	Moraceae	*Ficus hispida*	L.f.	Hairy fig	Dedh umbar	N	NA
26	Moraceae	*Ficus racemosa*	L.	Cluster fig	Umbar	N	NA
27	Moraceae	*Ficus virens*	Aiton	White Fig	Pepri	N	NA
28	Moringaceae	*Moringa oleifera*	Lam.	Drumstick	Mittho Saragvo	N	NA
29	Myrtaceae	*Syzygium cumini*	(L.) Skeels	Jamun	Jambu	N	NA
30	Rubiaceae	*Morinda citrifolia*	L.	Indian Mulberry	Aal	E	NA
31	Rutaceae	*Aegle marmelos*	(L.) Corrêa	Wood apple	Bili	N	NA
32	Sapindaceae	*Schleichera oleosa*	(Lour.) Merr.	Lac Tree	Kusum	N	NA
33	Sapotaceae	*Madhuca longifolia var. latifolia*	(Roxb.) A.Chev.	Indian Butter Tree	Mahudo	N	NA
34	Simaroubaceae	*Ailanthus excelsa*	Roxb.	Indian Tree of Heaven	Arduso	N	NA
35	Verbenaceae	*Tectona grandis*	L. f.	Teak	Sag	N	NA
Shrubs							
1	Apocynaceae	*Calotropis procera*	(Aiton) Dryand.	Rubber Bush	Akdo, Nani rui	N	NA
2	Capparaceae	*Capparis sepiaria*	L.	Wild Caper Bush	Kalo kantharo	N	NA
3	Cucurbitaceae	*Cucumis sativus*	L.	Cucumber	Keshar	N	NA
4	Euphorbiaceae	*Croton bonplandianus*	Baill.	Ban tulsi	Kala Bhangra	N	NA
5	Euphorbiaceae	*Euphorbia neriifolia*	L.	Indian Spurge Tree	Thor	N	NA
6	Euphorbiaceae	*Ricinus communis*	L.	Castor oil plant	Aerendiyo	N	NA

Sr No:	Family	Scientific name	Author name	Common name		Origin	IUCN status
				English	Gujarati/Hindi		
7	Leguminosae	*Abrus precatorius*	L.	Coral bead vine	Chanothi	N	NA
8	Leguminosae	*Prosopis juliflora*	(Sw.) DC.	Algaroba	Gandobaval	E	NA
9	Lythraceae	*Lawsonia inermis*	L.	Henna	Mendi	N	NA
10	Malvaceae	*Abutilon pannosum*	(G.Forst.) Schltdl.	Ragged mallow	Khapat	N	NA
11	Malvaceae	*Abutilon indicum*	L.	Indian mallow	Kanghi	N	NA
12	Rhamnaceae	*Ziziphus nummularia*	(Burm.f.) Wight & Arn.	Jhar Beri	Chania bor	N	NA
13	Rhamnaceae	*Ziziphus xylopyrus*	(Retz.) Willd.	Kath ber	Ghat bor	N	NA
14	Verbenaceae	*Lantana camara*	L.	Lantana	Gandhari	E	NA
Herbs							
1	Acanthaceae	*Blepharis integrifolia*	(L.f.) E.Mey. & Drège ex Schinz	Narrow-Leaf Blepharis	Rankklits	N	NA
2	Acanthaceae	*Elytraria acaulis*	(L.f.) Lindau	Asian Scalystem	Shat muli	N	NA
3	Amaranthaceae	*Alternanthera paronychioides*	A.St.-Hil.	Smooth Chaff Flower		E	NA
4	Amaranthaceae	*Amaranthus viridis*	L.	Pigweed	jungali chaulayi	N	NA
5	Amaranthaceae	*Chenopodium album*	L.	Bathua	Bathavo	N	NA
6	Apocynaceae	*Hemidesmus indicus*	(L.) R. Br. ex Schult.	Indian Sarsaparilla	Anantamul	N	NA
7	Asteraceae	*Sphaeranthus indicus*	L.	East Indian Globe Thistle	Gorakhmundi	N	LC
8	Asteraceae	*Blumea eriantha*	DC.	wool-flower blumea	Kapurio	N	NA
9	Asteraceae	*Cyanthillium cinereum*	(L.) H.Rob.	Little ironweed	Sahadevi	E	NA
10	Asteraceae	*Blumea viscosa*	(Mill.) V.M.Badillo	Sticky Blumea		N	NA
11	Asteraceae	*Echinops echinatus*	Roxb.	Gokhru	Shulio	N	NA
12	Asteraceae	*Pentanema indicum*	(L.) Ling	Sonkadi	Bichhloo	N	NA
13	Asteraceae	*Parthenium hysterophorus*	L.	Parthenium weed		E	NA
14	Asteraceae	*Tridax procumbens*	(L.) L.	Tridax daisy	Pardesi Bhangro	E	NA
15	Boraginaceae	*Coldenia procumbens*	L.	Creeping coldenia	Okhrad	N	NA

Sr No:	Family	Scientific name	Author name	Common name		Origin	IUCN status
				English	Gujarati/Hindi		
16	Convolvulaceae	*Convolvulus arvensis*	L.	Field Bindweed	Nari vel	N	NA
17	Cyperaceae	*Kyllinga bulbosa*	P.Beauv.	White Water Sedge		N	LC
18	Euphorbiaceae	*Euphorbia hirta*	L.	Asthama Weed	Bara dudhi	N	NA
19	Lamiaceae	*Ocimum basilicum*	L.	Basil	Maruo	N	NA
20	Leguminosae	*Clitoria ternatea*	L.	Butterfly Pea	Garni	N	NA
21	Leguminosae	*Indigofera linnaei*	Ali	Birdsville Indigo	Leel	N	NA
22	Leguminosae	*Rhynchosia minima*	(L.) DC.	Memnonia Snoutbean	Nahnikamalvel	N	LC
23	Leguminosae	*Senna tora*	(L.) Roxb.	Stinking Cassia	Pochandio	N	NA
24	Leguminosae	*Tephrosia purpurea*	(L.) Pers.	Common tephrosia	ghodakan	N	NA
25	Malvaceae	*Abelmoschus manihot*	(L.) Medik.	Sweet Hibiscus	Kantalo bhende	N	NA
26	Malvaceae	*Abutilon theophrasti*	Medik.	Buttonweed	Bhony kanskai	N	NA
27	Malvaceae	*Sida acuta*	L.	Morning mallow		N	NA
28	Malvaceae	*Sida cordifolia*	L.	Heart leaf sida	Kharenti	N	NA
29	Malvaceae	*Sida rhombifolia*	L.	Cuban jute	Khetraubat-atibala	N	NA
30	Marsileaceae	*Marsilea quadrifolia*	L.	Four Leaf Clover		E	LC
31	Menispermaceae	*Cissampelos pareira*	L.	Velvet Leaf	Pahadvel	E	NA
32	Molluginaceae	*Glinus lotoides*	L.	Lotus Sweetjuice	Mitho Okharad	N	NA
33	Molluginaceae	*Glinus oppositifolius*	(L.) Aug.DC.	Jima	Gholo Ohkrad	N	NA
34	Nelumbonaceae	*Nelumbo nucifera*	Gaertn.	Lotus	Motunkamal	N	NA
35	Nyctaginaceae	*Boerhavia diffusa*	L.	Punarnava	Nano vasedo	N	NA
36	Nyctaginaceae	*Bougainvillea spectabilis*	Willd.	Great Bougainvillea	Boganvel	E	NA
37	Papaveraceae	*Argemone mexicana*	L.	Satyanashi	Darudi	E	NA
38	Poaceae	*Alopecurus nepalensis*	Trin. ex Steud.	Nepal Foxtail Grass	Kang	N	NA
39	Poaceae	*Cynodon dactylon*	(L.) Pers.	Bermuda grass	Darbh	N	NA
40	Poaceae	*Desmostachya bipinnata*	(L.) Stapf	Daabh	Dabh	N	LC

Sr No:	Family	Scientific name	Author name	Common name		Origin	IUCN status
				English	Gujarati/Hindi		
41	Poaceae	*Eragrostis amabilis*	(L.) Wight & Arn.	Japanese lovegrass	Limor	N	NA
42	Polygonaceae	*Polygonum plebeium var. brevifolia*	R.Br.	Small Knotweed	Zinako Okhrad	N	NA
43	Polygonaceae	*Polygonum plebeium var. plebium*		Small Knotweed	Machechi		
44	Portulacaceae	*Portulaca oleracea*	L.	Purslane	Ghol Kotbo	N	NA
45	Solanaceae	*Datura Metel*	L.	Hindu datura		-	NA
46	Solanaceae	*Solanum virginianum*	L.	Thorny Nightshade		N	NA

Fauna

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Avifauna							
African Comb Duck	*Sarkidiornis melanotos*	(Pennant, 1769)	Anatidae	LC	IV	II	R
Ashy prinia	*Prinia socialis*	(Sykes, 1832)	Cisticolidae	LC	-	-	R
Ashy-crowned Sparrowlark	*Eremopterix griseus*	(Scopoli, 1786)	Alaudidae	LC	IV	-	R
Asian Brown Flycatcher	*Muscicapa dauurica*	(Pallas, 1811)	Muscicapidae	LC	IV	-	WV
Asian koel	*Eudynamys scolopaceus*	(Linnaeus, 1758)	Cuculidae	LC	IV	-	R
Asian Openbill	*Anastomus oscitans*	(Boddaert, 1783)	Ciconiidae	LC	-	-	R
Asian Palm Swift	*Cypsiurus balasiensis*	(Gray, 1829)	Apodidae	LC	-	-	R
Bank Myna	*Acridotheres ginginianus*	(Latham, 1790)	Sturnidae	LC	IV	-	R
Barn Swallow	*Hirundo rustica*	(Linnaeus, 1758)	Hirundinidae	LC	-	-	WV
Baya Weaver	*Ploceus philippinus*	(Linnaeus, 1766)	Ploceidae	LC	-	-	R
Black Drongo	*Dicrurus macrocercus*	(Vieillot, 1817)	Dicruridae	LC	IV	-	R

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Black-hooded Oriole	*Oriolus xanthornus*	(Linnaeus, 1758)	Oriolidae	LC	IV	-	R
Black-rumped Flameback	*Dinopium benghalense*	(Linnaeus, 1758)	Picidae	LC	IV	-	R
Blyth's reed-warbler	*Acrocephalus dumetorum*	(Blyth, 1849)	Acrocephalidae	LC	-	-	WV
Brahminy Starling	*Sturnia pagodarum*	(Gmelin, 1789)	Sturnidae	LC	IV	-	R
Cattle Egret	*Bubulcus ibis*	(Linnaeus, 1758)	Ardeidae	LC	IV	-	R
Common Babbler	*Argya caudata*	(Dumont, 1823)	Leiotrichidae	LC	IV	-	R
Common Iora	*Aegithina tiphia*	(Linnaeus, 1758)	Aegithinidae	LC	IV	-	R
Common Myna	*Acridotheres tristis*	(Linnaeus, 1766)	Sturnidae	LC	IV	-	R
Common Quail	*Coturnix coturnix*	(Linnaeus, 1758)	Phasianidae	LC	IV	-	R
Common Tailorbird	*Orthotomus sutorius*	(Pennant, 1769)	Cisticolidae	LC	-	-	R
common Woodshrike	*Tephrodornis pondicerianus*	(Gmelin, 1789)	Vangidae	LC	-	-	R
Coppersmith Barbet	*Psilopogon haemacephalus*	(Müller, 1776)	Megalaimidae	LC	IV	-	R
Eurasian collared Dove	*Streptopelia decaocto*	(Frivaldszky, 1838)	Columbidae	LC	IV	-	R
Golden-fronted leafbird	*Chloropsis aurifrons*	(Temminck, 1829)	Chloropseidae	LC	-	-	R
Green bee-eater	*Merops orientalis*	(Latham, 1802)	Meropidae	LC	-	-	R
House Crow	*Corvus splendens*	(Vieillot, 1817)	Corvidae	LC	V	-	R
House sparrow	*Passer domesticus*	(Linnaeus, 1758)	Passeridae	LC	-	-	R
Indian Golden Oriole	*Oriolus kundoo*	(Sykes, 1832)	Oriolidae	LC	IV	-	R
Indian Jungle Crow	*Corvus macrorhynchos*	(Wagler, 1827)	Corvidae	LC	-	-	R
Indian peafowl	*Pavo cristatus*	(Linnaeus, 1758)	Phasianidae	LC	I	III	R
Indian Pond Heron	*Ardeola grayii*	(Sykes, 1832)	Ardeidae	LC	IV	-	R
Indian robin	*Saxicoloides fulicatus*	(Linnaeus, 1766)	Muscicapidae	LC	-	-	R
Indian Roller	*Coracias benghalensis*	(Linnaeus, 1758)	Coraciidae	LC	IV	-	R
Indian Silverbill	*Euodice malabarica*	(Linnaeus, 1758)	Estrildidae	LC	IV	-	R
Intermediate Egret	*Ardea intermedia*	(Wagler, 1829)	Ardeidae	LC	IV	-	R
Jungle Babbler	*Turdoides striata*	(Dumont, 1823)	Leiotrichidae	LC	IV	-	R

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Large Grey Babbler	*Argya malcolmi*	(Sykes, 1832)	Leiotrichidae	LC	IV	-	R
Laughing Dove	*Streptopelia senegalensis*	(Linnaeus, 1766)	Columbidae	LC	IV	-	R
Little Cormorant	*Microcarbo niger*	(Vieillot, 1817)	Phalacrocoracidae	LC	IV	-	R
Little Egret	*Egretta garzetta*	(Linnaeus, 1766)	Ardeidae	LC	IV	-	R
Little Grebe	*Tachybaptus ruficollis*	(Pallas, 1764)	Podicipedidae	LC	IV	-	R
Oriental Honey-buzzard	*Pernis ptilorhynchus*	(Temminck, 1821)	Accipitridae	LC	-	II	R
Oriental Magpie-robin	*Copsychus saularis*	(Linnaeus, 1758)	Muscicapidae	LC	-	-	R
Oriental white-eye	*Zosterops palpebrosus*	(Temminck, 1824)	Zosteropidae	LC	-	-	R
Pied Kingfisher	*Ceryle rudis*	(Linnaeus, 1758)	Alcedinidae	LC	IV	-	R
Plain prinia	*Prinia inornata*	(Sykes, 1832)	Cisticolidae	LC	-	-	R
Plum-headed Parakeet	*Psittacula cyanocephala*	(Linnaeus, 1766)	Psittacidae	LC	IV	II	R
Purple Sunbird	*Cinnyris asiaticus*	(Latham, 1790)	Nectariniidae	LC	IV	-	R
Purple-rumped Sunbird	*Leptocoma zeylonica*	(Linnaeus, 1766)	Nectariniidae	LC	IV	-	R
Red-collared Dove	*Streptopelia tranquebarica*	(Hermann, 1804)	Columbidae	LC	IV	-	R
Red-naped Ibis	*Pseudibis papillosa*	(Temminck, 1824)	Threskiornithidae	LC	IV	-	R
Red-vented Bulbul	*Pycnonotus cafer*	(Linnaeus, 1766)	Pycnonotidae	LC	IV	-	R
Red-wattled Lapwing	*Vanellus indicus*	(Boddaert, 1783)	Charadriidae	LC	-	-	R
Rock Bush Quail	*Perdicula argoondah*	(Sykes, 1832)	Phasianidae	LC	IV	-	R
Rock Dove	*Columba livia*	(Gmelin, 1789)	Columbidae	LC	-	-	R
Rose-ringed parakeet	*Psittacula krameri*	(Scopoli, 1769)	Psittacidae	LC	IV	NC	R
Rosy Starling	*Pastor roseus*	(Linnaeus, 1758)	Sturnidae	LC	-	-	M
Rufous Treepie	*Dendrocitta vagabunda*	(Latham, 1790)	Corvidae	LC	-	-	R
Rufous-tailed Lark	*Ammomanes phoenicura*	(Franklin, 1831)	Alaudidae	LC	IV	-	R
Shikra	*Accipiter badius*	(Gmelin, 1788)	Accipitridae	LC	-	II	R
Small Minivet	*Pericrocotus cinnamomeus*	(Linnaeus, 1766)	Campephagidae	LC	IV	-	R
Southern coucal	*Centropus sinensis*	(Stephens, 1815)	Cuculidae	LC	-	-	R

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Streak-throated Swallow	*Petrochelidon fluvicola*	(Blyth, 1855)	Hirundinidae	LC	-	-	R
Thick-billed flowerpecker	*Dicaeum agile*	(Tickell, 1833)	Dicaeidae	LC	IV	-	R
Tickell's Blue flycatcher	*Cyornis tickelliae*	(Blyth, 1843)	Muscicapidae	LC	IV	-	R
Whiskered tern	*Chlidonias hybrida*	(Pallas, 1811)	Laridae	LC	-	-	WV
White-breasted Waterhen	*Amaurornis phoenicurus*	(Pennant, 1769)	Rallidae	LC	-	-	R
White-browed Bulbul	*Pycnonotus luteolus*	(Lesson, 1841)	Pycnonotidae	LC	IV	-	R
White-browed Fantail	*Rhipidura aureola*	(Lesson, 1830)	Rhipiduridae	LC	-	-	R
White-browed Wagtail	*Motacilla maderaspatensis*	(Gmelin, 1789)	Motacillidae	LC	-	-	R
White-eared Bulbul	*Pycnonotus leucotis*	(Gould, 1836)	Pycnonotidae	LC	IV	-	R
white-spotted fantail	*Rhipidura albogularis*	(Lesson, 1832)	Rhipiduridae	LC	-	-	R
White-breasted Kingfisher	*Halcyon smyrnensis*	(Linnaeus, 1758)	Alcedinidae	LC	IV	-	R
Wire-tailed Swallow	*Hirundo smithii*	(Leach, 1818)	Hirundinidae	LC	-	-	R
Yellow-eyed Babbler	*Chrysomma sinense*	(Gmelin, 1789)	Sylviidae	LC	IV	-	R
Black-headed Ibis	*Threskiornis melanocephalus*	(Latham, 1790)	Threskiornithidae	NT	IV	-	R
Black-winged Kite	*Elanus caeruleus*	(Desfontaines, 1789)	Accipitridae	LC	-	II	R
Indian Thick-knee	*Burhinus indicus*	(Salvadori, 1865)	Burhinidae	LC	IV	IV	R
Greater Flamingo	*Phoenicopterus ruber*	-	Phoenicopteridae	LC	IV	II	R
Eurasian Spoonbill	*Platalea leucorodia*	-	Threskiornithidae	LC	I	II	R
Asian Openbill Stork	*Anastomus oscitans*	-	Ciconiidae	LC	IV	II	R
Painted Stork	*Mycteria leucocephala*	-	Ciconiidae	NT	IV	II	R
		-					
Butterflies							
Blue Pansy	*Junonia orithya*	(Linnaeus, 1758)	Nymphalidae	-	-	-	
Common emigrant	*Catopsilia pomona*	(Fabricius, 1775)	Pieridae	-	-	-	
Common Grass yellow	*Eurema hecabe*	(Linnaeus, 1758)	Pieridae	-	-	-	
Common Gull	*Cepora nerissa*	(Fabricius, 1775)	Pieridae	-	-	-	

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Crimson tip	*Colotis danae*	(Fabricius, 1775)	Pieridae	-	-	-	
Dark cerulean	*Jamides bochus*	(Stoll, 1782)	Lycaenidae	-	-	-	
Gram blue	*Euchrysops cnejus*	(Fabricius, 1798)	Lycaenidae	-	II	-	
Grass Demon	*Udaspes folus*	(Cramer, 1775)	Hesperiidae	-	-	-	
Lesser Grass Blue	*Zizina otis*	(Fabricius, 1787)	Lycaenidae	-	-	-	
Lime swallowtail	*Papilio demoleus*	(Linnaeus, 1758)	Papilionidae	-	-	-	
Pioneer	*Belenois aurota*	(Fabricius, 1793)	Pieridae	-	-	-	
Plain tiger	*Danaus chrysippus*	(Linnaeus, 1758)	Nymphalidae	-	-	-	
Psyche	*Leptosia nina*	(Fabricius, 1793)	Pieridae	-	-	-	
Common Pierrot	*Castalius rosimon*	(Fabricius, 1775)	Lycaenidae	-	-	-	
Striped Pierrot	*Tarucus nara*	(Kollar, 1848)	Lycaenidae	-	-	-	
Silverline	*Spindasis vulcanus*	(Fabricius, 1775)	Lycaenidae	-	-	-	
Small Cupid	*Chilades parrhasius*	(Fabricius, 1793)	Lycaenidae	-	-	-	
Spotless Grass Yellow	*Eurema laeta*	(Boisduval, 1836)	Pieridae	-	-	-	
Striped Tiger	*Danaus genutia*	(Cramer, 1779)	Nymphalidae	-	-	-	
Tawny coster	*Acraea terpsicore*	(Linnaeus, 1758)	Nymphalidae	-	-	-	
Yellow orange tip	*Ixias pyrene*	(Linnaeus, 1764)	Pieridae	-	-	-	
Zebra Blue	*Leptotes plinius*	(Fabricius, 1793)	Lycaenidae	-	-	-	
Reptiles & Amphibians							
Common Name	*Scientific Name*	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	
Brahminy Skink	*Eutropis carinata*	(Schneider, 1801)	Scincidae	LC			
Indian Garden Lizard	*Calotes versicolor*	(Daudin, 1802)	Agamidae	-	-	-	
Indian Monitor Lizard	*Varanus bengalensis*	(Daudin, 1802)	Varanidae	LC	I	I	
Rat Snake	*Ptyas mucosa*	(Linnaeus, 1758)	Colubridae	-	II	-	

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Rock Agama	*Psammophilus blanfordanus*	(Stoliczka, 1871)	Agamidae	LC	-	-	
Common Skittering Frog	*Euphlyctis cyanophlyctis*	(Schneider, 1799)	Dicroglossidae	LC	-	-	
Indian Bullfrog	*Hoplobatrachus tigerinus*	(Daudin, 1802)	Dicroglossidae	LC	IV	II	
Common Indian Tree Frog	*Polypedates maculatus*	(Gray, 1830)	Rhacophoridae	LC	-	-	

Mammals						
Common Name	*Scientific Name*	Authority	Family	IUCN Status	WPA Schedule	CITES appendix
Five Striped Squirrel	*Funambulus pennantii*	(Wroughton, 1905)	Sciuridae	LC	IV	-
Grey Mongoose	*Herpestes edwardsii*	(E. Geoffroy Saint-Hilaire, 1818)	Herpestidae	LC	II	III
Northern Plains Langur	*Semnopithecus entellus*	(Dufresne, 1797)	Cercopithecidae	LC	II	I
Indian Hare	*Lepus nigricollis*	(F. Cuvier, 1823)	Leporidae	LC	IV	-

9.5 ANNEXURE V: PLANTATION LIST

Sl No:	Family	Scientific name	Common name	Origin*
1	Caesalpiniaceae	*Senna siamea*	Seemia	N
2	Caesalpiniaceae	*Cassia fistula*	Indian Laburnum	N
3	Combretaceae	*Terminalia catappa*	Indian Almond	N
4	Fabaceae	*Pongamia pinnata*	Indian Beech Tree	N
5	Meliaceae	*Azadirachta indica*	Neem	N
6	Mimosaceae	*Leucaena latisiliqua*	Wild tamarind	N
7	Moraceae	*Ficus religiosa*	Peepal	N
8	Moraceae	*Ficus benghalensis*	Banyan Tree	N
9	Myrtaceae	*Syzygium cumini*	Jamun	N
10	Rubiaceae	*Adina cordifolia*	Haldu	N
11	Simaroubaceae	*Ailanthus excelsa*	Indian Tree of Heaven	N

Note: *- Native

9.6 ANNEXURE VI: OHS RISKS DURING VARIOUS SUBPROJECT PHASES

OHS Risks due to Pre-construction/ Construction Activities

Inherent risk during construction like fatal accidents, fire, explosion, falling from height, occupational injuries, excavation, welding, material shifting, Loading/unloading are discussed in this report and relevant mitigation measures are also suggested.

Some of the common risks during operation phase of the project, risk of fire, explosion due to LPG (if used in labour camps, canteen / kitchen on site), traffic fatal accidents, Industrial accident due to Manmade & natural calamities.

Transportation

Transportation for sourcing construction material will be required. Trucks and other vehicular movement may lead to risk of accidents and Hazards created by Air, Dust & Noise pollution. This will not only affect workman but also residents of nearby settlements. Qualitative hazards with control measure are stated in **Table 49.**

Table 49: Construction Stage OHS Risks

Sl. No	Activity	Hazards	Likelihood/ Consequence	Control Measures
1	Raw material Stone		D	1) Work as per Safe operating Procedures 2) Use of PPE/ PPA 3) Avoid Manual operation 4) Safety supervision/ communication
	Crusher- coarse		C	
	Aggregate and fine aggregate capacity		C	
	Truck load 12MT		C	
2	Transportation	Road accidents	C	1) Follow strict Motor Vehicle Rules 2)PPE/PPA/First aid Box/ Communication 3) Proper planning for avoiding Traffic congestion 4) Authorized & Trained Driver 5) During unloading using fluorescent coloured high visibility apparel. 6) Truck/ tipper floor Checks 7) Visual and auditory contact of the road worker
	Crusher to site	Dust evolution	D	
	Tipper/Trucks	Spillage on road	D	
3	Unloading/ spreading	Fatal accident	C	1) Permanent right-of-way to provide room for materials 2) Use of PPE/ PPA/ Barricade/ Safety sign display on Road/ Caution board Display
	Levelling	Body injury	D	
4	Site Clearance/ Borrow Pits/ Quarrying using	Fatal Operators may get killed in machine roll-overs	B	1)Roll-over protective structure and a seatbelt to restrain the operator 2) Provide a supplementary steering system

Sl. No	Activity	Hazards	Likelihood/ Consequence	Control Measures
	(a)Wheeled and crawler tractors, loaders and dozers; (b) Motor graders and scrapers; (c) Self-propelled rollers and compactors			3) Valid approval for operating nuclear gauge from the appropriate authority
5	Earth work	falling or sliding material or article from any bank or side of such excavation	D	1) Provide adequate piling and bracing against such bank or side 2) Provide adequate shoring 3) Excavated material not to store at least 0.65 m from the edge of an open excavation or trench 4)Provide metal ladders, staircases or ramps
6	Movement of trucks numbers 50 – 500	Fall over Tip Head	C	1)A protective beam or timber baulk should be used. 2) Back under the control of a signalman
7	Bulldozers	1) Fatal Accident 2) Injuries 3) Dusty environment 4) High Noise hazards	C	1) Avoid side hill travel 2) Avoid obstacles such as rocks or logs 3)Avoid overhanging material to fall due to vibration/ Load 4) Do not work alone in deep water
8	Excavators	1) Fatal Accident 2) Injuries 3) Dusty environment 4) High Noise hazards	C	1) When excavating trenches, place the excavated material at least 600 mm clear of the edge[50] 2) Avoid swinging your boom downhill any further than necessary 3) Maintain Stability, Watch boom clearance when travelling, Avoid jerky swings or sudden braking
9	Backhoe loader	1) Fatal Accident 2) Injuries 3) Dusty environment	C	1) Operate the backhoe from the correct area, Never from the ground. 2) When operating on a slope, swing load uphill to dump

50 NHAI Safety Manual July 2012 Para 4.4

Sl. No	Activity	Hazards	Likelihood/ Consequence	Control Measures
		4) High Noise hazards		3) Select a level site While Parking 4) Lower bucket and backhoe to ground and block wheels 5) Engage parking brake, remove ignition key (parking)
10	Motor Grader	1) Fatal Accident 2) Toppled down 3) Physical Injury	C	1) Give the right-of-way to loaded vehicles 2) Drive at a slow speed in congested areas 3) Remove ignition key when leaving grader. 4) Ground the blade when leaving grader unattended. 5) Use coloured flags at each end of mouldboard when blading. 6) Shift blade to centre and lock it when parking.
11	Smooth wheeled tandem roller	1) Fatal Accident 2) Injuries 3) Dusty environment 4) High Noise hazards	C	1) Examine edges for soft Spots before starting work. 2) Avoid gear changes on steep sections 3) Park on the flat
12	Vibratory Roller	1) Fatal Accident 2) Injuries 3) Dusty environment 4) High Noise hazards	C	1)Use Rollover Protection safety when the machine is operated over unsafe ground 2) Use a three-point approach when entering or exiting the roller.
13	Surface courses	1) Accident. 2)Fire, severe burns, Eye Injury, 2)Inhalation of Toxic gases	C	1)Use proper safety equipment 2) Avoid wear rings, wristwatches, jewellery, loose or hanging apparel 3) Keep away from the machine's articulation area when the engine is running.

Note: A-Remote, B- Unlikely, C- Likely, D- Highly likely, E-Near certainty

Site excavation work

Major work during initial project phases is to level project area & provide Pipeline for water supply, Natural Drainage system, sewer lines, AWC, cables and main trunk road development. Thus, major excavation work will be required to be undertaken, as per Concept Plan.

Site excavation Risk:

- A person falling into an excavation

- A person being trapped by the collapse of an excavation
- A person working in an excavation being struck by a falling thing
- A person working in an excavation being exposed to an airborne contaminant.

To manage the risks, all relevant matters must be considered including: i) The nature of the excavation ii) The method of the excavation work, including the range of possible methods of carrying out the work

The means of entry into and exit from the excavation to be restricted/ regulated, hard barricading, cordoning etc,

Identifying the Excavation Hazards

The first step in the risk management process is to identify the hazards associated with excavation work. Examples of excavation specific hazards include:

Underground essential services including gas, water, sewerage, telecommunications

- Electricity lines - Underground services network not found as being placed on ground.
- Any storage tanks, in and adjacent to the workplace, must be established before
- Directing or allowing excavation work, Controlled by site engineer through Site supervisor
- The fall or dislodgement of earth or rock
- Falls from one level to another
- Falling objects
- Inappropriate placement of excavated materials, plant or other loads
- The instability of any adjoining structure caused by the excavation
- Any previous disturbance of the ground including previous excavation
- The instability of the excavation due to persons or plant working adjacent to the excavation
- Hazardous atmosphere in an excavation – To be checked before work vibration and hazardous noise from Excavators & Overhead essential services (power lines) and ground mounted essential services – During visit, HT/LT overhead lines noticed in proposed plot area.

Factors for suitable control measures

Excavating plan - when quantities are large, it may be effective to use for the various materials to be excavated.

Stockpiling arrangements – Proper site may need to be found for temporary stockpiling of materials. Materials should not dissolve and drained during Monsoon leading to water pollution

Material placement - The methods and plant used for excavating, transporting and compacting the material should be evaluated.

Dewatering equipment, if required, and the system to be used, transport of the excavated material - the type of plant used, length of haul, the nature of the haul route, and the conditions of tipping and/or spreading.

For Excavation planning to minimize functional Risk to workers and society following steps are required:

- Study nature and/or condition of the ground and/or working environment
- Predict weather conditions
- Consider nature of the work and other activities that may affect health and safety
- Calculate static and dynamic loads near the excavation
- Storm Water Management System
- Vibration
- Select proper type of equipment used for excavation work
- Plan for public safety
- Go through existing services and their location
- The length of time the excavation is to remain open
- Provision of adequate facilities
- Procedures to deal with emergencies

Table 50: Common hazards associated with excavation work and examples of control measures

Potential hazards	***Examples of control measures***
Ground collapse	The use of benching or the installation of ground support (e.g., shoring)
Water inrush	Pumps or other dewatering systems to remove water and prevent build-up
Hazardous manual task	Ramps, steps or other appropriate access into the excavation
Airborne contaminants	Rotating tasks between workers
Working underground or in closed structures	Appropriate ventilation arrangements shall be provided
Underground services	Obtain information from the relevant authorities on the location of underground services.

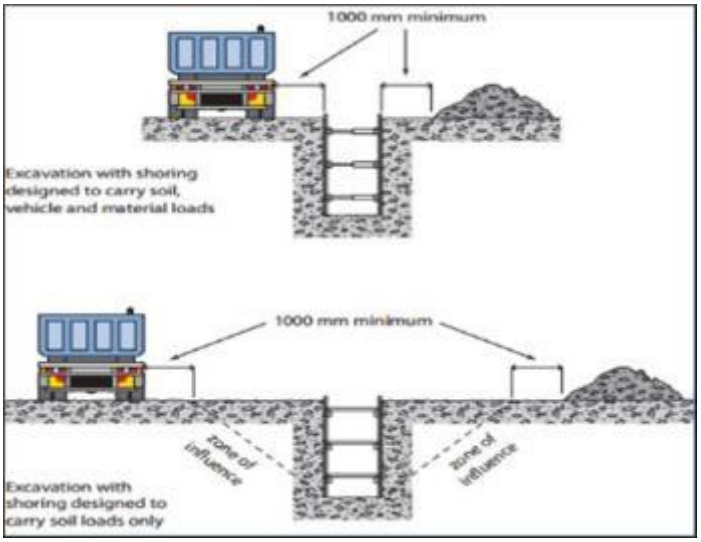


Figure 13: Safety Precautions in Excavations

Figure 13 shows an excavation with shoring that has been designed to carry vehicle and material loads. This may be required where there is limited space around the excavation for vehicle movement and /or material storage. An excavation with shoring that has been designed only to carry the load of the excavated faces and the related zone of influence.

Any material will add a load to the area where it is placed. It is important that materials are not placed or stacked near the edge of any excavation as this would put persons working in the excavation at risk. For example, the placement of material near the edge of an excavation may cause a collapse of the side of the excavation.

To reduce the risk of ground collapse, excavated or loose material should be stored away from the excavation. Excavated material should be placed outside the zone of influence. Alternatively, a ground support system should be designed and installed to carry the additional loads, including any ground water pressures, saturated soil conditions and saturated materials.

Mobile plant operator blind spots

Powered mobile plant operating near ground personnel or other powered mobile plant should be equipped with warning devices (e.g. reversing alarm and a revolving light).

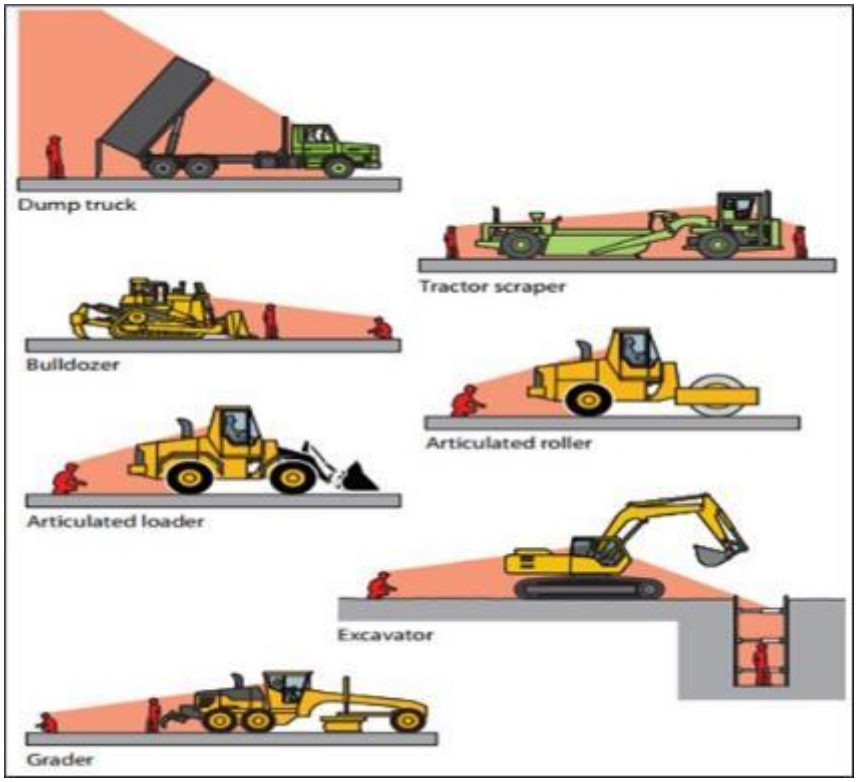


Figure 14: Mobile Plant Operator Blind Spots

An effective system of communication based on two-way acknowledgement between mobile plant operators and ground workers should be established before work commences. Relevant workers should also be trained in the procedures involved prior to the work commencing. The system should stop ground workers from approaching mobile plant until the operator has agreed to their request to approach. Similarly, the system should stop operators from moving plant closer than a set distance from ground workers until the operator has been advised by ground workers that they are aware of the proposed movement.

Mobile plant operators and ground workers should be made familiar with the blind spots of particular items of plant being used. Induction training programs should emphasis the dangers of workers working near mobile plant, and adequate supervision should be provided.

Mobile plant operators and ground workers should be provided with and required to wear high-visibility clothing**. Table 51** presents the OSH due to various Tools and Equipment

Table 51: OHS Risks due to various Tools and Equipment

Sl. No	Operations	Risk/ Impact
1	Tower Crane	Injury, Fatal accident. Contact with High Voltage Live wires
2	Batching Plant	Accident
3	Construction/material Hoists	Personal injury Accidents

Sl. No	Operations	Risk/ Impact
5	Portable electrical equipment pre-& post construction	Burn/fatal
6	Pressure vessels	Pressure air-Rupture
7	Hazardous substances paint/ thinner, waxes Plastics sheets	Fire, explosion, toxic release, Unhygienic dust.
8	Scaffolding	Fall from Height Fatal accident
9	Ladders	Accident, Injury, Fall, Slip
10	Lifts	Accidental, Injury even fatal
11	Hoists	Accidental Injury
12	Material handling cranes	Accidental Injury even fatal
13	Rigging during erection work of STP	Accidental Injury
14	Using tools/equipment with moving part(s)	Nipping Injury to hand Electrical Shocks, Leg Injury
15	Using tools/ equipment that vibrate Electrical wiring Asbestos removal Welding	Vibration hazard Electrical shocks Asbestosis Eye, Body Burns, Toxic gases inhalation
16	Working around electrical installations/ working near traffic/ working at a height (>3m)/ Working in isolation. Working in a confined space/ demolition work	Electrical shocks, Injury Fatal accident hazard of toxic gases inhalation
17	Work environment Noise Dust/ fumes/ vapours/gases Extreme temperatures Slippery surfaces/ trip hazards Poor ventilation/ air quality A poorly designed work area for the project/ task	Accidental Injury, Occupational Hazards, Rashes Burn Skin deceases

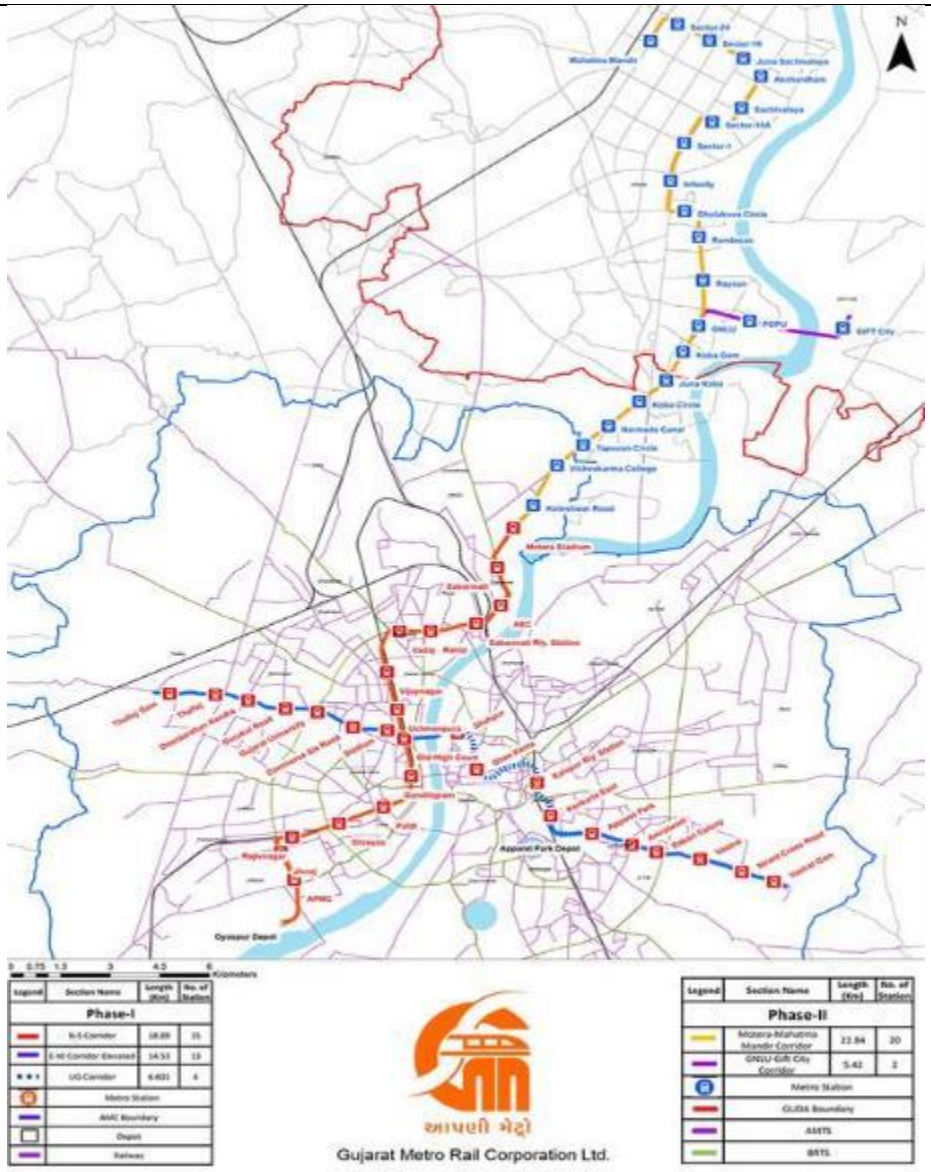
9.7 ANNEXURE VII: DISCUSSION ON MAJOR PROPOSED/ ONGOING PROJECTS IN AHMEDABAD

Sr. No.	*Project*	*Ahmedabad Metro Phase 1 and Phase 2*
1	***Proponent***	Gujarat Metro Rail Corporation Ltd (GMRC); SPV of Government of Gujarat and Government of India; earlier known as Metro-Link Express for Gandhinagar And Ahmedabad (Mega) Company Ltd.
2	***EIA/ Risk Assessment***	Yes, by RITES
3	***Details***	Phase 1:

Date of Opening Phase 1	06/03/2019
Current Operational Length	6.10 Km
Current Ridership	820 Passenger/day for FY 2019-20
No. of Train	1(One)
Frequency	50 minutes
Lines operated	1 (One)
No. of Station in operation	4
Important Destinations covered by metro	Ahmedabad famous Cotton Mills near ARPK station, Ahmedabad Railway station (4.4 Km) and residential societies of Vastral Gam

The total length of the Ahmedabad Metro Rail Project Phase-I is about 40.03 km out of which approximately 6.5 KM is underground, and the rest is elevated section. The project will connect 4 corners of the Ahmedabad city with 2 corridors and 32 stations.

Sr. No.	*Project*	*Ahmedabad Metro Phase 1 and Phase 2*
		The length of the East-West Corridor is about 21.16 km with 17 stations in the route. This corridor will connect Vastral Gaam to Thaltej Gaam and will be passing through Nirant Cross Road, Vastral, Rabari Colony, Amraiwadi, Apparel Park, Kankaria East, Kalupur Railway Station, Ghee Kanta, Shahpur, Old High Court, Stadium, Commerce Six Road, Gujarat University, Gurukul Road, Doordarshan Kendra, Thaltej stations. In the East-West corridor, approximately 6.5 km is the underground section with 4 underground stations and the rest is the elevated section with 13 elevated stations. Old High Court station will be an interchange station for both the corridors. Phase 2: Phase-2 of Ahmedabad Metro Rail Project comprises construction of 28.25 km long fully elevated corridor in 2 parts. The first part is Line-2 from Motera Stadium to Mahatma Mandir of length 22.83 km with 20 stations while the second part is Line-3 from GNLU to GIFT City of length 5.41 km with two stations. Phase-2 received approval from Union Government in February 2019 with an estimated cost of INR 5384.17 Crores with civil construction activities started from February this year. This is expected to be complete by 2023 December.
4	***Map***	Phase 1 & 2

Sr. No.	Project	Ahmedabad Metro Phase 1 and Phase 2
		
5	***Important points for G-ACRP Subproject ESIA***	– The influence zone of 11 meter has been created as per GMRC policy. No construction shall be permitted within 5 meters from the edge of metro corridor/ station structure for the safety reasons as per GMRC NOC policy. Applicable for subprojects (STP new constructions) at Vasna – Alignment of trunk sewers along metro line to consider impacts; especially work scheduling, Occupational and Community Health and Safety, cumulative air pollution impacts – Check corridor from Koteswar to Airport; and consider impacts of Metro corridor passing near proposed Koteswar STP. Vibration, pollution. – New Metro bridge upstream o proposed Barrage for water supply to city

Sl NO	*Project*	*Smart City Project, Ahmedabad*
1	***Proponent***	Government of India and Ahmedabad Municipal Corporation
2	***EIA/ Risk Assessment***	No
3	***Details***	Car parking, IT for parking, health; street lighting LED, OFC, Water supply, Anganwadi, Water & Drainage network in Ranip, Kali, STP with power plant – 100 mld; micro-tunnelling: Vadaj to Paldi, Juna Vadaj Slum Rehabilitation, Waste to Energy, BRT automated swing gates, Water SCADA, Cybersecurity, NMT, Veg supply E-Rick, GRM chatbots
4	***Map***	 
5	***Important points for G-ACRP Subproject ESIA***	– Check at subproject ESIA if any associated facility, in drainage or sewerage micro tunneling, or STP development contemporaneous to G-ACRP.

Sr NO	*Project*	*Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat*
1	***Proponent***	Ahmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)
2	***EIA/ Risk Assessment***	Yes (except for newly proposed Barrage), by Kadam Enviro Group of Companies
3	***Details***	Extending existing riverfront (11 kms) to further 5 kms towards Gandhinagar, along both edges of the river Sabarmati for Rs 850 Crores (113 million USD). The newly upgraded area will have recreational facilities and pathways as in the case of existing riverfront development from Vasna Barrage to Hansol. During first phase of Riverfront development SRFDCL was provided with a seed capital of Rs. 9 crore and entrusted with the responsibility of developing the riverfront on a Build, Maintain, Operate and

		Transfer (BMOT) basis. The SPV model was used to avoid the delays associated with municipal decision-making. Riverbed land, which was originally held by the Government of Gujarat, was transferred to the AMC. AMC has, in turn, granted development rights to SRFDCL for this reclaimed riverbed land. Activities under Phase 2 include : 1. Construction of green embankment on both banks of the river. 2. Reclamation of approximately 108 Ha of land 3. Annual retention of water in the river 4. Development of public gardens, amenities and facilities 5. Development of wide public promenades along the entire length of river 6. Development of street network along the river for North-South connectivity 7. Development of Urban infrastructure along both the banks 8. Self-Financed mechanism for the development of the entire project
4	***Map***	
5	***Important points for G-ACRP Subproject ESIA***	– Though the location of proposed barrage (upstream of Vasna Barrage within city limits) is indicated in approved EIA, no impacts or risks identified or assessed for proposed Barrage – Disposal of treated effluent from proposed subprojects upstream of proposed barrage, or into riverfront may have health impacts considering the dead storage – New metro bridge upstream of Barrage – Safety: Vasna Barrage, Flooding

Sr. NO	***Project***	***Waste to Energy Plant at Gyaspur, near Pirana***
1	***Proponent***	Ahmedabad Municipal Corporation
2	***EIA/ Risk Assessment***	No
3	***Details***	Waste to Energy plant at Piplaj near Pirana, will get operational by Dec 2021. Abelleon Clean Energy is implementing this 14 MW plant on DBOT for 30 years, for a cost of 240 crore (including 8-10% for O&M annually), spread over 13 acres. Power generated from the plant will be fed into the national power grid. It will convert 1,000 metric tonnes of mixed waste into energy daily.

4	***Map***	
5	***Important points for G-ACRP Subproject ESIA***	– Pirana and Vasna areas are complexes for waste management including solid wastes and sewage. This entire area needs need comprehensive and integrated environmental management and flood /resilience approaches, considering location near Sabarmati and Earthquake Zone III. AMC has mechanisms to manage solid and mixed wastes which might also be generated during construction and operations of the subprojects

Sr. No.	***Project***	***Biomining of Pirana Dumpsite***
1	***Proponent***	AMC
2	***EIA/ Risk Assessment***	No
3	***Details***	Started in 2019. AMC reclaimed around 24% of the Pirana dump yard land (19 acres of the total 80 acres) by freeing it from garbage through biomining. Around 33 lakh metric tonnes of garbage have been processed and expects to remove the dump in next three years. At present, 39 trommel machine are processing about 15,000 MT of garbage daily. Construction debris and large stones, which form about 30% of the garbage, is sent to AMC C&D plant at Piplaj, Pirana for construction of paver blocks, 50% of the garbage is mud and another 20% is plastic or small clothes with plastic being almost 15%.

4	***Map***	
5	***Important points for G-ACRP Subproject ESIA***	– C&D waste from biomining is sent to C&D processing facility. AMC has made a policy to buy 25 % of Paver blocks and 50% of Manhole covers Final product of the C & D Waste processing agency in the development of different civil & infrastructures projects of AMC by the approval of competent authority. Recently, competent authority of AMC has also approved a policy of procuring Precast / Prestress wall from the agency to build compound wall for AMC's various properties. This source shall be considered in project estimates.

9.8 ANNEXURE VIII: MAPS AND LAND RECORDS OF STP

Revenue Records for Existing Pirana STP

Ahmedabad Municipal Corporation
Estate Central Office
Sewage Farm

B- Block, 3rd Floor, Sradar Patel Bhavan, Danapith,Ahmedabad-380001.Email: estateofficeramc@ahmedabadcity.gov.in

Date :30/11/2022

POSSESSION RECEIPT

With reference to the Approval Given by Municipal Commissioner, Ahmedabad on Date:15/11/2022 for Allotment of the land Admeasuring 2.50.66.00sq.mts. bearing sur.no. 417/Part of Village Shahvadi, Ahmedabad to Engineering- Drainage Project Department for construction of new S.T.P plant, The clear, vacant and peaceful possession of the land (which is shown in accompanied sketch) is taken over by Aditional city engineer of Drainage project department (AMC).

The plot is demarcated on site and admeasured. The demarcation of this plot is carried out in accordance with the request made by Engineering Drainage project department which is shown by "A-B-C-D–E-F-G-H-A " with red colour border in the sketch-plan attached here with.

Date of the Transfer of the Possession 30/11/2022

Possession Handed over by :

30/11/2022

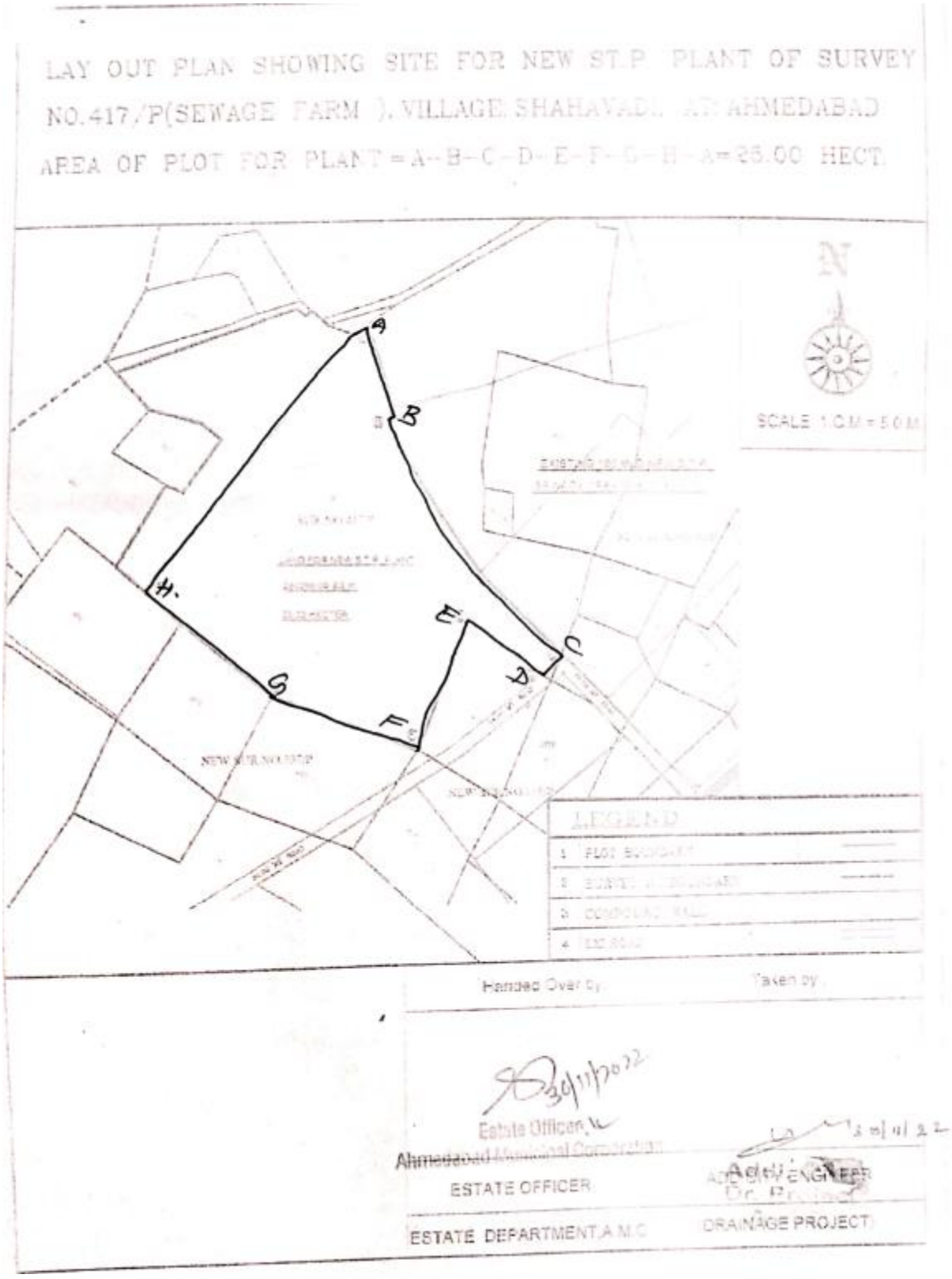
Estate Officer
(Ahmedabad Municipal Corporation)

Possession Taken over by .

30/11/22

Additional City Engineer
(Engineering- Drainage Project Department, AMC)

Enclosed:-The above referred Sketch


LAY OUT PLAN SHOWING SITE FOR NEW ST.P. PLANT OF SURVEY
NO.417/P(SEWAGE FARM), VILLAGE SHAHAVADI, AT: AHMEDABAD
AREA OF PLOT FOR PLANT = A--B--C--D--E--F--G--H--A=26.00 HECT.
N
SCALE 1 CM = 50 M
A
B
C
D
E
F
G
H
LEGEND
Handed Over by
Taken by
30/11/2022
Estate Officer
Ahmedabad Municipal Corporation
ESTATE OFFICER
ESTATE DEPARTMENT,A.M.C.
ADDL. CITY ENGINEER
DRAINAGE PROJECT

HOME RURAL LAND RECORD (../LandRecordRural.aspx) VF-7

ગામ નમૂના નંબર - ૭ ની વિગતો

* અહીં દર્શાવેલ જમીનની વિગતો ફક્ત આપની જાણ માટે જ છે જેને સત્તાવાર નકલ તરીકે ગણવામાં આવશે નહી. આ વિગતો અંગે કોઇ પણ વધારાની માહિતી મેળવવી હોય તો જે તે મામલતદાર કચેરી અથવા કલેક્ટર કચેરીનો સંપર્ક કરવો.

** The information provided online is updated, and no physical visit is required for this information. For additional information you may visit respective office.

* તા.19/05/2012 06:50:37 ની સ્થિતિએ

District (જીલ્લો)

અમદાવાદ

Taluka (તાલુકો)

વટવા

Village (ગામ)

શાહવાડી

Survey/ Block Number (સરવે/ બ્લોક નંબર)

૪૧૭

UPIN (Unique Property Identification Number)

10716008004170000

Land Details (જમીનની વિગતો)

Total Area (H.Are.SqMt.) (કુલ ક્ષેત્રફળ હે.આરે.ચોમી.) :

૫૦-૪૧-૩૬

Total Assessment Rs. (કુલ આકાર રૂ.) :

૩૯૨.૮૭

Tenure (સત્તાપ્રકાર) :

જુની શરત (જુ.શ)

Land Use (જમીનનો ઉપયોગ) :

ખેતીલાયક ઉપયોગ

Name of farm (ખેતરનું નામ) :

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Other Details (રીમાર્ક્સ) :

Ownership Details (ખાતેદારની વિગતો)

ખાતા નંબર | ક્ષેત્રફળ | આકાર |	નોંધ નંબરો તથા ખાતેદાર
૧ | ૫૦-૨૯-૨૫ | ૩૯૨.૮૭	૮૭૭,૧૦૨૫,૧૬૫૫,૨૮૧૯,૨૯૦૭,૨૯૦૮,૨૯૩૫,૨૯૫૯, ૨૯૮૭,૩૦૬૯,૩૨૩૬, અમદાવાદ મ્યુન્સીપાલીટી(૨૮૦૨)

Boja and Other Rights Details (બોજા અને બીજા હક્ક ની વિગતો)

બોજા અને બીજા હક્ક ની વિગતો
૧૧૪૬,૨૯૦૭,૨૯૦૮,૩૦૬૯,૩૨૩૬,
સ.ને ૧૯૪૬-૪૭ ના બધા ગણોતીયા સંરક્ષણ<૧૧૪૬>
ગણોતીયા છે.<૧૧૪૬>
વિઘા-૨ અને ૧/૨ ગુંઠા લીઝ ભાડાપટે<૨૯૦૭>
કાયમી ભાડા પટેરાખનાર મફતલાલ નરોતમદાસ પ્લોટ-૨૧ ની<૨૯૦૮>
૨-વિઘા અને ૦-ગુઠા લીઝ ભાડા પટે<૨૯૦૮>
હિરાબેન મફતલાલ નરોતમદાસની વિધવા<૩૦૬૯>
વીણાબેન એમ.પટેલ<૩૦૬૯>
રાજેન્દ્ર એમ.પટેલ<૩૦૬૯>
સરિતા એમ.પટેલ<૩૦૬૯>
જીગ્નાશા એમ.પટેલ<૩૦૬૯>

Top

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NEW PIRANA SEWAGE
TREATMENT PLANT
AMC LAND
EXTENSION OF
GYASPUR VILLAGE

9.9 ANNEXURE IX: PHOTOGRAPHS OF CONSULTATION AND BIODIVERSITY

	
Consultation with School at Gyaspur Village	Consultation with Ex Sarpanch of Gyaspur Village
	
Consultation with Ex Sarpanch of Kamod Village	Consultation with people of Kamod Village
	
Consultation with Ex Sarpanch of Juna vanazar Village	Consultation with Pujari of Somnath Mahadev Temple, Gyaspur Village

	
Consultation with Father Hamilton Roy of Jehovah's Witnesses	Consultation with Ahmedabad municipal corporation (AMC)
	
Proposed 424 MLD site	Proposed TSPS site
	
Algaroba *(Prosopis juliflora)*	Indian abutilon (*Abutilon indicum*)

	
Indian peafowl (*Pavo cristatus*)	Northern Plains Langur (*Semnopithecus entellus*)
	
Green bee-eater (*Merops orientalis*)	Cattle Egret (*Bubulcus ibis*)
	
Laughing Dove (*Streptopelia senegalensis*)	Black Kite (*Milvus migrans*)