FINAL REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR NATURAL GAS PIPELINE PROJECT FOR AMRAVATI GA, DISTRICT- AMRAVATI, MAHARASHTRA

SUBMITTED TO

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-that the information supplied to us for the purpose of preparing this report was (when supplied) and continues to be true, accurate and not misleading in any respect.

-that there are no other materials or other facts of which we have not been informed in relation to such matters.

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ABBREVIATIONS

ATGL	*Adani Total Gas Limited*
AoI	*Area of Influence*
ASME	*American Society of Mechanical Engineers*
BCM	*Billion Cubic Meters*
BDPO	*Block Development and Panchayat Office*
CBM	*Coal Bed Methane*
CGD	*City Gas Distribution*
CGS	*City Gate Station*
CGWA	*Central Ground Water Authority*
CNG	*Compressed Natural Gas*
COP-26	*26th UN Climate Change Conference of the Parties*
CPCB	*Central Pollution Control Board*
DRS	*District Regulatory Station*
EHS	*Environment, Health, and Safety*
EIA	*Environmental Impact Assessment*
ESIA	*Environmental and Social Impact Assessment*
ESIA	*Environmental and Social Impact Assessment*
G.S.R	*Gazette of India, Statutory Rules and Orders*
GA	*Geographical Area*
GA	*Geographical Area*
GI	*Galvanized Iron*
GIGL	*GSPL India Gasnet Limited*
GIS	*Geographic Information System*
H.T. Line	*High Tension Line*
HDD	*Horizontal Directional Drilling*
IFC	*International Finance Corporation*
ISO	*International Organization for Standardization*
JV	*Joint Venture*
MoEF&CC	*Ministry of Environment, Forests and Climate Change*
MMSCMD	*Million Metric Standard Cubic Meter per Day*
MSS	*Manufacturers Standardization Society*
MUT	*Mechanized Ultrasonic Testing*
NG	*Natural Gas*
NH	*National Highway*
NOCs	*National Oil Companies*
OISD	*Oil Industry Safety Directorate*
PCV	*Pressure Control Valve*
PESO	*Petroleum & Explosive Safety Organization*

PNGRB	*Petroleum & Natural Gas Regulatory Board*
RoU	*Right of Use*
RoW	*Right of Way*
ROW	*Right of Way*
SCADA	*Supervisory Control and Data Acquisition*
SOP	*Standard operating Procedure*
SDG	*Sustainable Development Goal*
SH	*State Highway*
UN	*United Nations*

EXECUTIVE SUMMARY

INTRODUCTION

Adani Total Gas Limited (hereinafter referred as **ATGL**) is in the process of developing City Gas Distribution (CGD) networks to deliver Piped Natural Gas (PNG) to industrial, commercial, and residential sectors, as well as Compressed Natural Gas (CNG) to the transportation sector. Natural gas is a reliable, convenient, and environmentally friendly fuel that provides consumers with enhanced safety, convenience, and economic efficiency.

The company has already set up city gas distribution networks in various locations in India. To cater industrial, commercial and transportation demand of natural gas **ATGL** has planned to develop "***total of 68.2 km Natural Gas Pipeline Infrastructure***" in Amravati District of Maharashtra, India.

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA STUDY) & SCREENING

TÜV SÜD South Asia Private Limited (hereinafter referred as **"TÜV SÜD")** has been entrusted by **ATGL** for providing consultancy services of Environmental and Social Impact Assessment Study (ESIA) for City Gas Distribution of Natural Gas Project at Amravati and nearby villages in Amravati District, Maharashtra, India. The objective of the study is to assess potential Social and Ecological, Environmental Impacts from the project on the environment and social setting and address mitigation measures for the identified impacts. Environmental and Social management Plan (ESMP) has been designed in line with the impact identified and mitigation measures suggested in this report. In accordance with the screening criteria of IFC, and in accordance the observations of site reconnaissance survey, **TÜV SÜD** ESIA team has categorized Project as **Category B+**, since the proposed line route passes through three river crossings, national highway, state highway and several other roads, forest patches that requires forest clearance.

AREA OF INFLUENCE (AOI) FOR ESIA STUDY

ESIA study to evaluate environment and social risks and impacts associated with the Project.

The overall area covered by the assessment includes the following constituent areas:

- The footprint of the project, hereafter referred to as the 'Project Site for environment and ecology.
- The area extending 500 m (either side) outward from the project site boundary (estimated to contain the potential receptors of any project related environment, social and ecological impacts), hereafter referred to as the 'Area of Influence' or 'AOI'; and the buffer zone is 5 km for environment and ecology and 20 to 50 m on both sides of the pipeline, for social.

LEGAL FRAMEWORK

The Environmental and Social Impact Assessment study report has been prepared in accordance with major international and national regulatory frameworks. The major guidelines considered for the project are the *IFC's EHS Guidelines dated 30th April 2007.* The *IFC performance standard, 2012 and Equators principle "EP4" guideline* has also been considered during the study.

PROJECT DESCRIPTION

ATGL is responsible for laying, building, operating or expanding the CGD of natural gas pipeline network of 68.2 km that is proposed via Five stretches. Stretch-1 extends from Bori Village to Nandgaon Khandeshwar, covering 15 km with a pipeline diameter of 12 inches. Stretch-2 runs from Khandeshwar Shiva Temple to Shiv Shakti Gaushevashram over 15 km, also with a 12-inch diameter. Stretch-3 covers a 10 km alignment from DODO Sambhu Raje to Gajanan Maharaj Temple, maintaining the same 12-inch specification. Stretch-4 comprises a total length of 17 km, including a 15 km segment with a 12-inch diameter and an additional 2 km extension with a 4-inch diameter up to the endpoint near Amravati Bus Depot. Lastly, Stretch-5 begins near the Surat-Kolkata Highway crossing (between KM 41 and 42 markers) and extends to BPCL RP Bhagwat Petroleum at Bopnemtabad, spanning 11.2 km with a 6-inch diameter pipeline. This pipeline network is designed to support the reliable supply and distribution of natural gas across key residential, commercial, and industrial areas within the project region.

BASELINE ENVIRONMENTAL AND SOCIAL CONDITION

The baseline environmental, ecological, conditions of the project area have been assessed within 05 km radius of study area and social conditions have been assessed for 20 to 50 m. Assessment of physical environmental and ecological parameters are conducted during the site visit on **11th and 12th July 2025**, and the secondary baseline environmental survey was conducted from **11th** to **17th July 2025**.

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

As per the impact assessment study conducted for natural gas pipeline project, environmental and social parameters can be mitigated with prescribed measures. Route has been strategically selected to minimize environmental and social impacts by avoiding sensitive areas and aligning with existing infrastructure. The stretches are spread across urban, peri-urban, and rural landscapes, intersecting roads, railways, canals, drains, and forested areas.

Permission is required for River & Drain crossings, Railway crossings and Roads such as for NH from the NHAI, for PWD Roads, and for Amravati Municipal Corporation spread across the city. The Road, Railway crossing permissions, Rivers & Drain crossing permissions are partially secured. While clearance for protected forest is pending, permissions have been applied. Sensitive receptors such as schools, hospitals, and markets lie along the route, requiring careful construction planning.

Construction impacts—such as dust, noise, and emissions—will be temporary and mitigated through best practices. No groundwater will be used, and 40% of the pipeline will be laid using HDD to avoid disturbing water bodies. The pipeline will be buried, minimizing land use impacts, and surplus soil will be reused.

During operation, environmental impacts are negligible. Safety will be ensured through SCADA systems and regular monitoring. A robust Environmental Management Plan and post-monitoring program will guide mitigation.

During the construction Phase, various factors such as topography, drainage, water resources, ambient air and noise quality have moderate impacts, which can be reduced to minor with appropriate mitigation

measures and efficient management. Socio-economic impacts are initially low but can become moderately beneficial because of community engagement and local employment. Occupational health and safety risks, which are moderate at first, are minimized to minor with proper safety measures. In the Operational Phase, the water environment and health & safety impacts are low, and with effective measures, they reduce to insignificant. A summary of impacts has been provided in the table below.

Table: Summary of Impacts

Category	Impact Significance (withoutmitigation measures)	Impact Significance (post-mitigation)
Construction Phase		
Topography and Drainage	Moderate	Minor
Water resources and availability	Moderate	Minor
Ambient air and noise quality	Moderate	Insignificant
Land and Soil Environment	Moderate	Minor
Ecology and Biodiversity	Moderate	Minor
Socio-economic Impacts	Low	Moderate-beneficial
Occupational Health and Safety (OHS)	Moderate	Minor
Operational Phase		
Water Environment	Minor	Minor
Environmental Health & Safety	Moderate	Minor

**Source: Analysis by TÜV SÜD Team*

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Environmental and Social Management Plan for the project has been designed in accordance with the impact identified during the project lifecycle (Construction and Operation phase). Adequate mitigation measures have been suggested against each identified impact during each of the above-mentioned phases.

Based on the ESIA Study conducted, it may be concluded that the project is eco-friendly and environmentally sustainable in the long run. The project will not only help in reducing the CO_2 emission responsible for global warming but also other gases and particulate emissions, which otherwise would be generated using conventional fossil fuel-based transportation vehicles and to cater energy demand for residential and commercial use. This Baseline ESIA study together with mitigation measures and follow up of recommendations on management actions will help **ATGL** in complying with the environmental & social standards/safeguard policy of MFIs & National regulations as well.

A separate budgetary provision has been made for implementation of Environmental Monitoring Plan in construction phase. The environmental monitoring cost is estimated based upon the environmental monitoring program, a provision of INR 3.25 Lakhs has been kept for Construction Phase Environmental Management Plan (EMP) for its implementation

1 INTRODUCTION

1.1 BACKGROUND

Energy has been essential to human advancement since the "Industrial Revolution," and it will continue to be a key component of India's economic growth. India is home to about 18% of the world's population. Only about 6% of the world's basic energy resources are currently consumed by it. India uses around a third of the world's average amount of energy per person. However, as the nation continues to grow and prosper, so too will its energy needs in the years to come. The government's first objective is to guarantee that people have access to clean and sustainable energy sources. The Indian government is making strategic efforts to achieve Sustainable Development Goal (SDG) 7, which is to ***"Ensure access to affordable, reliable, sustainable, and modern energy for all."*** The government has taken various steps to achieve the five nectar elements (Panchamrit) of India's climate action as outlined during COP-26 by achieving the target of net-zero emissions by 2070 and reduction of the carbon intensity of the economy by 45 percent by 2030.

In India's energy portfolio, the Oil and gas sector holds a significant share of around one-third and is posed to continue serving as a critical enabler of India's rapidly growing economy. Energy is the mainstay of socio-economic growth and development for a nation like India which is currently the third largest primary energy consumer while its per-capita energy consumption is only a third of the global average. As per various projections, India's Energy Demand is expected to grow at 2.7% till 2050 as compared to World's 0.6%. India constitutes ~6% of the global primary energy demand wherein it constitutes 9.4% of the global oil demand and 2.2% of the global gas demand.

The demand for energy is met mostly by fossil fuels as fossil fuels make up 88% of India's primary energy requirement. Coal accounts for 55% of the energy mix, oil, and gas account for 28% and 6%, respectively. During the financial year 2022-23, 67% of natural gas production was by National Oil Companies from nomination regime, 33% of natural gas production was by Private/JV companies/ NOCs from Contract regimes (inclusive of ~2% was from Coal Bed Methane). The import dependency on crude oil and natural gas based on consumption of petroleum products in 2022-23 was about 87.4 % and 43.9 %, respectively. This provides a scope and opportunity for increasing energy consumption by India in near future and it being the central driving force in the global energy narrative. The Oil & Gas sector holds a prominent position as one of India's eight core industries, exerting significant influence on decision-making across various sectors of the economy. [1]

ATGL is in the process of developing City Gas Distribution (CGD) networks to deliver Piped Natural Gas (PNG) to industrial, commercial, and residential sectors, as well as Compressed Natural Gas (CNG) to the transportation sector. Natural gas is a reliable, convenient, and environmentally friendly fuel that provides consumers with enhanced safety, convenience, and economic efficiency.

[1] Indian Petroleum and Natural Gas Statistics (2022-23), Ministry of Petroleum & Natural Gas, GOI

The company has already set up city gas distribution networks in multiple Geographical Areas (GA)in India. Among these, **ATGL** received authorization for the laying of CGD Natural Gas pipeline for the Amravati GA. To cater industrial, commercial and transportation demand of natural gas it has planned to develop a total of "***68.2 km Natural Gas Pipeline Infrastructure***" in Amravati District via five (5) stretches.

1.2 PROJECT BRIEF

With intent of catering demand of natural gas of several industrial and commercial service sectors in, Adani Total Gas Limited (ATGL) has proposed the **laying of a 68.2 km Natural Gas Pipeline Infrastructure**. The pipeline will be laid across five distinct stretches within Amravati District, Maharashtra, as follows:

Stretch-1 (15 Km): From Bori Village to Nandgaon Khandeshwar.

Stretch-2 (15 Km): From Shree Khandeshwar Shiva Temple to Shiv Shakti Gaushevashram.

Stretch-3 (10 Km): From DODO Sambhu Raje to Gajanan Maharaj Temple.

Stretch-4 (15 Km): Extending up to the end point - Amravati Bus Depot.

Stretch-5 (11.2 Km- Additional Stretch): Beginning near the Surat-Kolkata Highway crossing (between 41 and 42 km markers) and extending to BPCL RP Bhagwat Petroleum at Bopnemtabad.

ATGL is responsible for designing and installation of optimal size of the infrastructure in terms of pipeline of various types including steel belting of the authorized area, allied equipment and facilities in the NG pipeline network depending upon the potential demand for natural gas. The infrastructure in the network will be adequate to maintain uninterrupted flow of natural gas in the pipelines.

The service for Environment and Social Impact Assessment (hereinafter referred as "ESIA") has been aligned in accordance with the **International Finance Corporation (IFC's)** *Performance Standards (PS) on Environmental & Social Sustainability (2012)*. The pipeline being included within the regulatory framework of host country, attracts MoEF&CC's EIA Notification 2006 & its subsequent amendments. The proposed natural gas pipeline has been categorised under "***Item 6(a)*** *i.e., Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks /sanctuaries/coral reefs /ecologically sensitive areas including LNG Terminal*" of Schedule of EIA Notification,2006 & its subsequent amendments[2].

1.3 OBJECTIVES OF ESIA

- Develop project baseline to understand and access the ground condition of the project study area for understanding and assessing impacts from the project.
- Assess the environmental, social, and ecological impacts from the project.
- Identify and characterize cumulative impacts that could result from the proposed project in relation to other existing & ongoing projects or reasonably foreseeable proposed activities within the surrounding area of the project site.

[22] standardtorreference.pdf

- Prepare mitigation measures and environmental and social management plan (ESMP) for the proposed NG pipeline project.

1.4 PROJECT DEVELOPER

ATGL specializes in the development of city gas distribution (CGD) networks for the continuous supply of piped natural gas (PNG) and compressed natural gas (CNG). These networks provide natural gas as a convenient, economical, dependable, and environmentally friendly fuel option, offering consumers safety and convenience. ATGL has ventured into e-mobility and biomass business through two wholly owned subsidiaries – Adani Total Energies E-mobility Limited (ATEL) and Adani Total Energies Biomass Limited (ATBL) respectively.

The company is expanding its operations to include the production and distribution of clean energy derived from biomass, as well as the establishment of electric vehicle charging infrastructure. ATGL is adopting a comprehensive approach by providing a unified wallet offering that encompasses basket of services. Additionally, **ATGL** has entered the gas meter manufacturing sector (mechanical and smart meters), through its JV, SMTPL.

1.5 SCREENING OF THE PROJECT & RATIONAL

The purpose of this assignment is to evaluate the environmental and social impacts of the proposed project in line with the **International Finance Corporation (IFC's)** Performance Standards (PS) on Environmental & Social Sustainability (2012) and other national and international statutory regulations applicable to the project.

This project has been screened considering guidelines provided in **IFC's** Interpretation Note (IN) on Environmental and Social Categorization, 2012. Categories underlined in **IFC** Project screening methodology are as follows:

- **Category A:** Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- **Category B:** Business activities with potential limited adverse environmental or social risks and/or impacts that are few, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- **Category B+:** The categorization of projects under B+ generally covers small to medium-scale projects which have localized impacts and can be managed through the implementation of specific mitigation measures. These projects might involve changes to land use, small-scale infrastructure development, or activities that don't significantly affect sensitive areas like forests, wetlands, or biodiversity hotspots.
- **Category C**: Business activities with minimal or no adverse environmental or social risks and/or impacts.
- **Category FI:** Business activities involving investments in financial institutions (FIs) or through delivery mechanisms involving financial intermediation.

In accordance with the screening criteria of IFC, and in accordance the observations of site reconnaissance survey, **TÜV SÜD** ESIA team has categorized Project as **Category B+**, which specifies that the project can have potential limited adverse social or environmental impacts since the proposed pipeline routes passes through three river crossings, national highway, state highway and several other roads, forest patches that requires forest clearance and other sensitivities.

1.6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) CONSULTANT

TÜV SÜD South Asia Private Limited (hereinafter referred as **"TÜV SÜD"**) has been entrusted by **ATGL** for providing consultancy services of Environmental and Social Impact Assessment Study (ESIA) for Gas Pipeline project in Amravati GA at Amravati District, Maharashtra, India.

TÜV SÜD is one of the leading testing, certification, and technical advisory firm. TÜV SÜD was established in 1995 in India & is a 100% owned subsidiary of **TÜV SÜD AG, Germany**. It is the trusted advisor to some of the world's leading businesses and institutions. The organization provides products, services, and insights to private, public, and independent sector organizations throughout the capital value chain, drawn from nearly two decades of front-line experience.

Working for many years with evaluation and assessment of sustainability, environment, safety, and social management, supply chain management and performance of companies all over the world and working with Bi-lateral and Multilateral Financial Institutions (MFIs), **TÜV SÜD** has developed an eclectic understanding in Environment, Social, Safety management system and presenting our studies in a balanced and trustworthy manner. Assessment of projects impact on environmental and social aspects and reporting by **TÜV SÜD** will therefore add trust and confidence to the report and your communication with stakeholders.

1.7 LIMITATIONS OF THE STUDY

The ESIA Report has been prepared based on professional judgement to ascertain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the facts available within the limits of the scope of work, information provided by the client or its representatives, prevailing secondary data, budget, and schedule.

The walk-through survey along with a brief discussion with project stakeholders was undertaken during the site visit based on the present understanding of the project. This assessment may change in case of a change in the project location. The documents like SOPs, policy and procedures for EHS&S management were limited for review at the time of pre-project desktop review process. The team did not conduct a traffic survey on-site, but the generalized traffic management plan has been prepared as part of the ESMP providing guidelines to prepare the site specific TMP.

1.8 CONTENTS OF EIA REPORT

The report has been divided into the following chapters.

Table 1-1: Contents of EIA Report

Chapter	Title	Description and Details

Chapter 1	Introduction	This chapter provides background information of the existing pipeline, brief description and objectives of the project, scope of the study.
Chapter 2	Project Description	This chapter presents the details of the proposed project with description of the resources required and emissions, waste and wastewater anticipated to be generated.
Chapter 3	Legal, Policy and Administrative Framework	Assessment of applicable laws & legislations, and institutional framework for its implementation.
Chapter 4	Description of Environment	This chapter describes the existing baseline status of environment components collected in a pre-defined study area based on primary and secondary data collection.
Chapter 5	Anticipated environment impacts and mitigation measures	This chapter describes the potential impacts of the proposed project and evaluates their significance based on parameters such as Intensity, Spatial extension, Temporal duration, and Environmental Vulnerability. Impact avoidance and mitigation measures are delineated.
Chapter 6	Analysis of Alternatives	The chapter to identify the most sustainable option with the least environmental and social impacts.
Chapter 7	Additional Studies	This chapter assesses the potential risks involved in the construction and operation of proposed facilities and presents a Disaster Management Plan (DMP).
Chapter 8	Project Benefits	This chapter presents the details of direct and indirect benefits due to proposed project.
Chapter 9	Environment Monitoring & Management Plan	This chapter describes the details of the monitoring schedule to be implemented for checking the effectiveness of mitigation measures. It covers the parameters, frequency, and location of monitoring. If existing monitoring schedule is sufficient to cover the proposed development, the same has been clearly mentioned. The chapter also describes the organizational structure and resources planned for implementing the mitigation measures and monitoring schedule.
Chapter 10	Summary & Conclusions	This chapter summarizes the potential positive and negative environmental impacts of the project.

1.9 NEED AND SCOPE OF ESIA

The purpose of this ESIA is to assess the potential environmental and social impacts associated with the proposed project within a delineated Area of Influence, comprising a core zone of 50 meters on either side of the proposed pipeline alignment to capture direct impacts, and a broader study area extending up to a 5-kilometre radius to assess indirect and cumulative impacts in accordance with applicable **Category B+**. The assessment covers both construction and operation phases of the project. The ESIA forecasts changes (positive and negative) that may occur because of key project activities to the baseline environmental conditions in the study area. Early identification of impacts and their mitigation reduces the risk of long-term adverse environmental effects.

The broad scope of work will be undertaken by the consultant for ESIA study includes the following aspects of proposed project but not limited to the following:

- Literature survey, data collection, examination of available environmental, social reports/data, understanding the proposed project through project report and discussions etc.

Baseline environmental studies shall be carried out as below, but not limited to:

- **Physical environment**
  - Temperature, Wind speed, Wind direction, Wind rose patterns, relative humidity, Rainfall, Visibility, Cloud cover, Solar Radiation.
  - Ambient air quality (PM10, PM2.5, SO2, NOx, CO) to be monitored as per be monitored as per CPCB guidelines.
  - Noise levels of the study area shall be monitored and measured as per CPCB guidelines and IFC PS requirements.
  - Ground water quality (drinking purpose) shall be monitored against IS specifications.
  - Surface water quality shall be monitored and measured as per CPCB norms.
  - Soil quality of study area will be monitored and analyzed for parameters as per ICAR specification/guidelines.
  - Geological & hydro geological data/information will be compiled from secondary sources or as per study requirement.
  - Land use information/status will be based on the district census handbooks as well as with the help of satellite imagery.
- **Ecological environment**
  - This shall include assessments/information of terrestrial and aquatic communities (as applicable), presence of rare, threatened & endangered species etc. if any.
  - The survey also includes identification & presence of national parks, sanctuaries, Biodiversity Park, endangered/threatened/ rare species & assessment of the species diversity, density, abundance etc. and formulation of ecological indexes.
- **Socioeconomic environment**
  - Demographical information/status will be based on census documents and other state level / district level databases.
  - Socio-economic information and profile outlining data from census and socio- economic surveys, with information on livelihood profile, infrastructure, vulnerability, gender, indigenous peoples (ethnic minorities, scheduled tribes), and labour.
  - Identification of historical/ archaeological sites/ monuments in the study area (if any) based on Archaeological Survey of India (ASI)/revenue records.
  - Identification of common property resources within project site and mitigation measures, if any.
  - Traffic survey for the present daily traffic, peak hour traffic and traffic composition & any change in traffic composition and volumes due to project development.
- **Assessment of E&S Impacts**
  - The potential E&S impacts will be assessed based on baseline data generated from studies. It

should be analyzed and compared with applicable standards for each environmental attribute. The short-term and long-term impacts particularly on sensitive targets such as endangered species, plants and historically important monuments should also be identified.

- A qualitative and quantitative assessment of sources of pollution from proposed project (dust, wastewater, noise pollution, solid waste, etc.) should be done to identify the adequacy of the proposed control measures as well as the likely impact on existing critical areas.
- Discuss the land procurement / acquisition process, considering Indian laws, rules and regulations. Rates of compensation paid in accordance with market rates, consultation before land procurement shall be reflected with relevant evidence in the Study.
- Discuss impacts on indigenous peoples or scheduled tribes.
- Impacts will be assessed for both Construction & Operation phases.

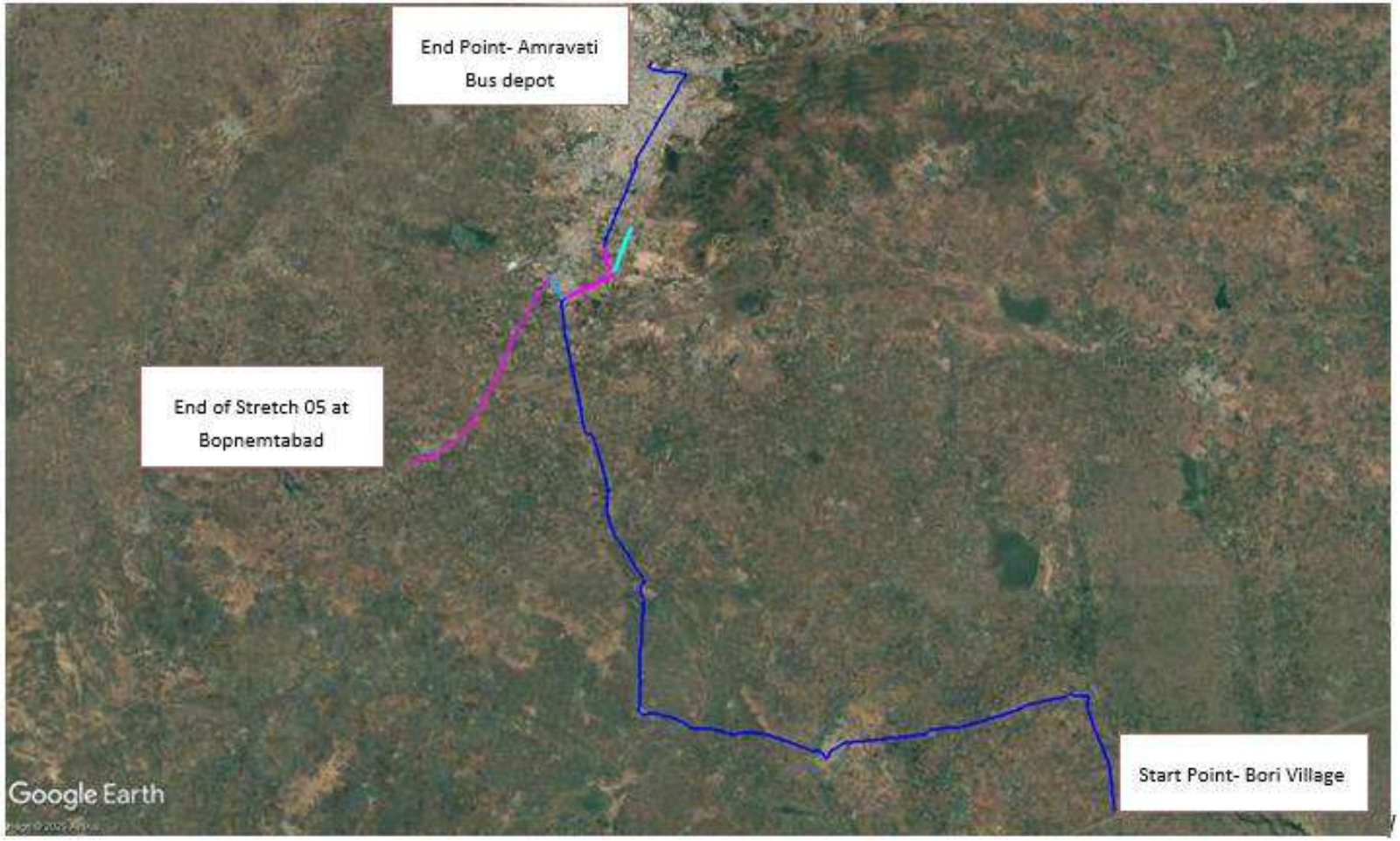
- **Environmental, Social & Biodiversity management & monitoring plan**
  - Identify and summarize all anticipated significant adverse E&S impacts along with mitigation measures.
  - Define a set of policies and objectives for environmental performance and continual enhancement of performance.
  - Monitoring programme for the proposed project (for construction & operation phase) will be worked out covering all E&S attributes as per the best practices in the World Bank/IFC General and sector specific EHS.
  - For each potential negative impact identified, recommendations will be presented for avoidance, minimization or mitigation of impacts along with costs associated with potential mitigation. The ESMP will address the following:
    i. Recommend monitoring and reporting procedures including the parameters to monitored, methods to be used, sampling locations, frequency of measurements, detection limits and definition of thresholds that will signal the need for corrective actions.
    ii. Develop management plan for addressing specific issues such as waste management, disasters, emergencies, external grievances, construction safety, labour management, stakeholder engagement, indigenous peoples etc.

2 PROJECT DESCRIPTION

2.1 DESCRIPTION OF NATURAL GAS PIPELINE NETWORK

Adani Total Gas Limited (ATGL) has been granted authorization for laying, building, operating, and expanding the City Gas Distribution (CGD) network in Amravati GA, catering to Domestic, Commercial, and Industrial sectors. ATGL has planned to lay a natural gas pipeline network of approximately 68.2 km, with pipeline diameters ranging from 4 inches to 6 inches to 12 inches, depending on demand and location-specific requirements. The pipeline route is divided into five stretches (Stretch-1 to Stretch-5) across Amravati city and its adjoining areas. The detail of the stretch is mentioned in **Table 2-1**.

ATGL is responsible for laying, building, operating or expanding the (CGD) network of optimal size of the infrastructure in terms of pipeline of various types including steel belting of the authorized area, allied equipment and facilities in the NG pipeline network depending upon the potential demand for natural gas. The infrastructure in the NG pipeline network will be adequate to maintain uninterrupted flow of natural gas in the Amravati city and its nearby villages**. Figure 2-1** provides the details of the layout of the pipeline gas network.



Source: Identified by TÜV SÜD Team

Figure 2-1: Route Map of Proposed Natural Gas Pipeline Network of Amravati

2.2 PIPELINE ROUTE & ACCESSIBILITY

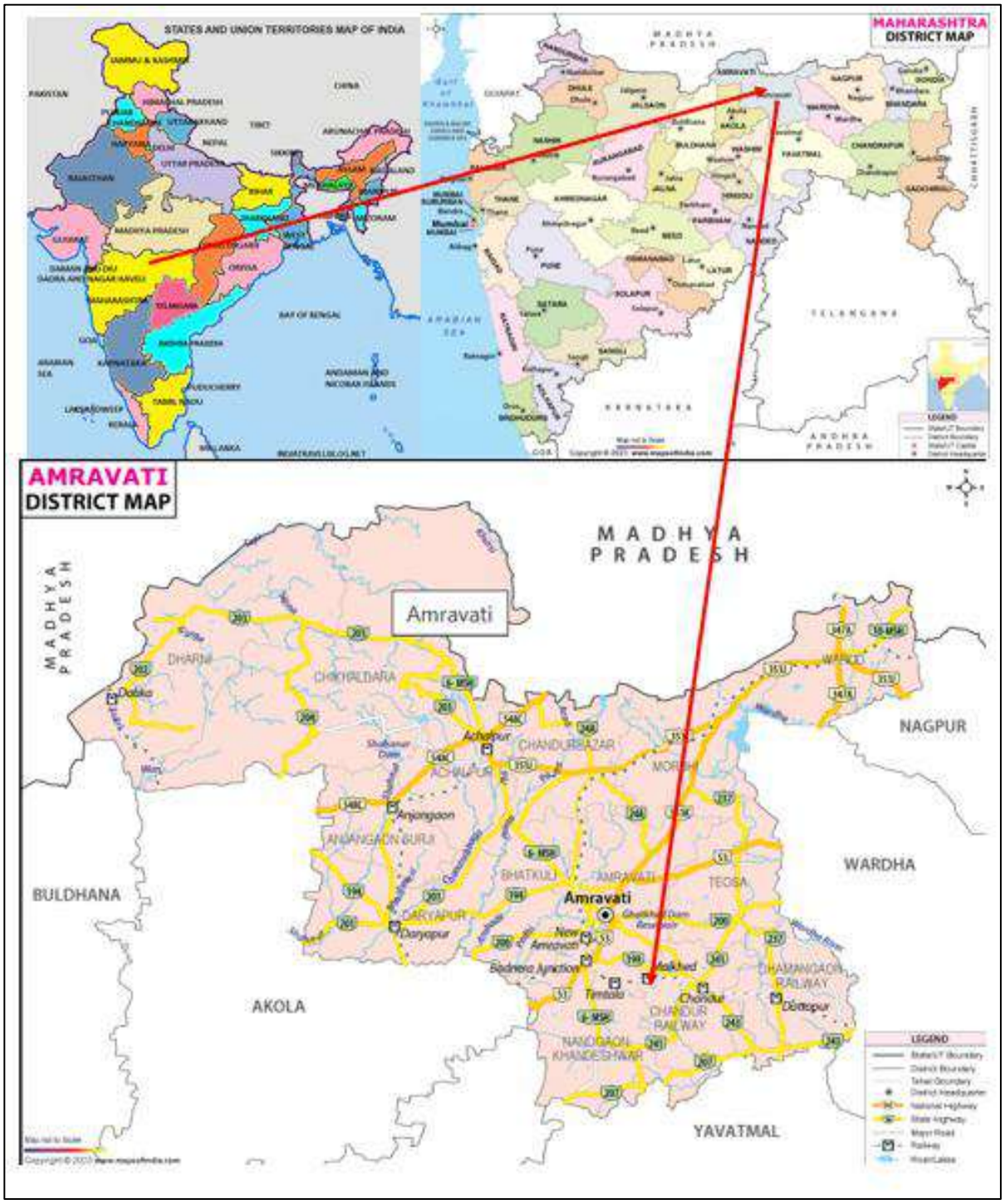
The pipeline for the CGD that run along ROW of the Amravati GA is sub divided in the Five (5) pipeline stretches the details of each stretch is given below in **Table 2-1**.

Table 2-1: Basic Details of the Pipeline

Sr. No.	Chainage	Total Length	Pipeline internal Diameter
1	Stretch-1 Bori Village to Nandgaon Khandeshwar	15 Km	12 inches
2	Stretch-2 Khandeshwar Shiva Temple to Shiv Shakti Gaushevashram	15 Km	12 inches
3	Stretch-3 DODO Sambhu Raje to Gajanan Maharaj Temple	10 Km	12 inches
4	Stretch-4 Extending up to the end point of Amravati Bus Depot with an additional stretch of 2 Km	17 Km	12 inches for 15 Km stretch and 4 inches for 2 km stretch
5	Stretch-5 Additional Stretch that begins near Surat-Kolkata Highway crossing (between 41 and 42 Km markers) and extending to BPCL RP Bhagwat Petroleum at Bopnemtabad	11.2 Km	6 inches
Total		**68.2 km**	

**Source: ATGL*

The **Figure 2-2**, depicts the location map of the project site and **Photo Plate 2-1** provides the photographs of the site as per the primary survey conducted in Amravati GA by the TUV-SUD team.



**Source: Maps of India*

Figure 2-2: Location Map of Project Site

Photo Plate 2-1 Photographs of Site

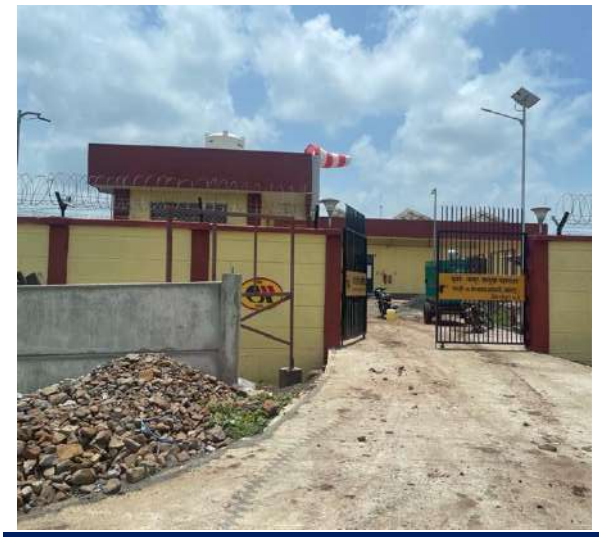


Photo 2.1- GAIL (India) Limited - Natural Gas Pipeline Block Station

Photo 2.2- ATGL City Gate Station

Photo 2.3- Habitation in Stretch 01

Photo 2.4- Agricultural Field in Stretch 01

Photo 2.5- Seasonal Drain with adjacent green cover

Photo 2.6- Gram Panchayat Office at Rajura

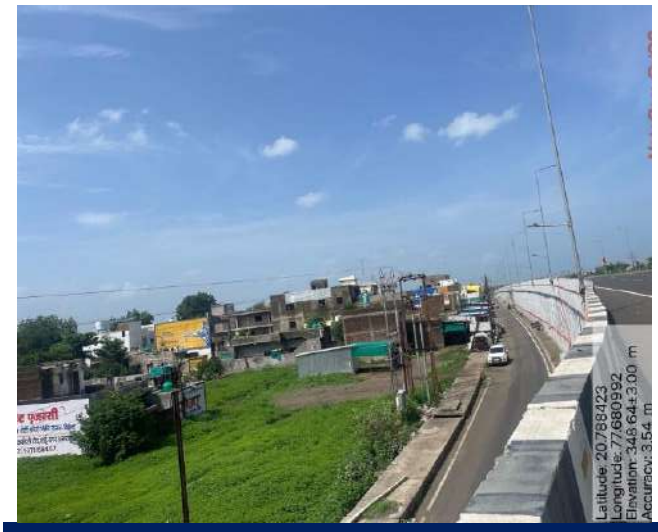


Photo 2.7- NH 53

Photo 2.8- Village street in Stretch 02

Photo 2.9- Nal River at Stretch 04

Photo 2.10- Hindu Temple at Stretch 04

Photo 2.11- Patch of Forest

Photo 2.12- Khandrav Deshmukh Madhyamik Vidyalaya Rajura

Photo 2.13- Nayara Petrol Pump

Photo 2.14-Hindustan Petrol Pump

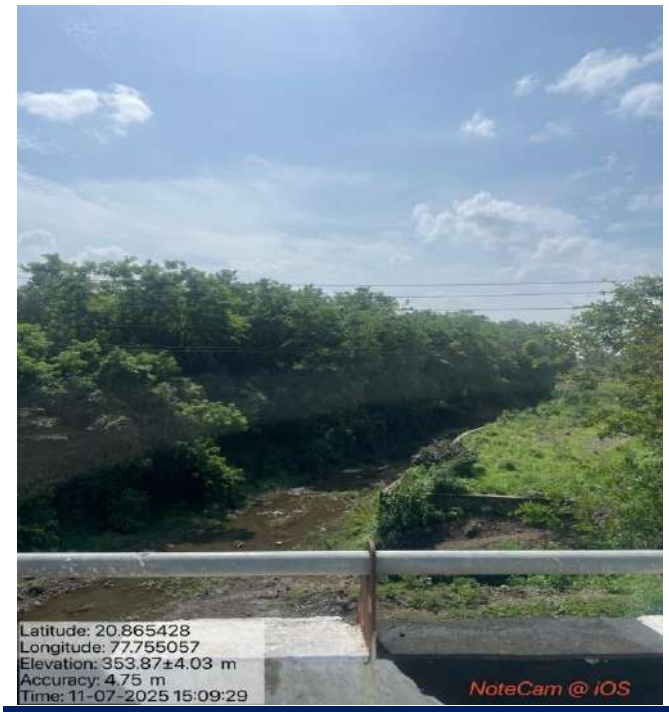


Photo 2.15- Jallu River at Stretch 02

Photo 2.16- Stretch 04 Passing through the Railway Crossing

Photo 2.17- Primary School

Photo 2.18- Labour Quarter

Photo 2.19- Laying of Pipeline across a Green cover

Photo 2.20- Proposed Stretch Passing through Forest

Photo 2.21- Transition from Stretch 04 to Stretch 05

Photo 2.22- Urban Area of Amravati along Stretch 04

Photo 2.23- Private School- Titans, at Stretch 04

Photo 2.24- SGM High School and Junior College at Stretch 04

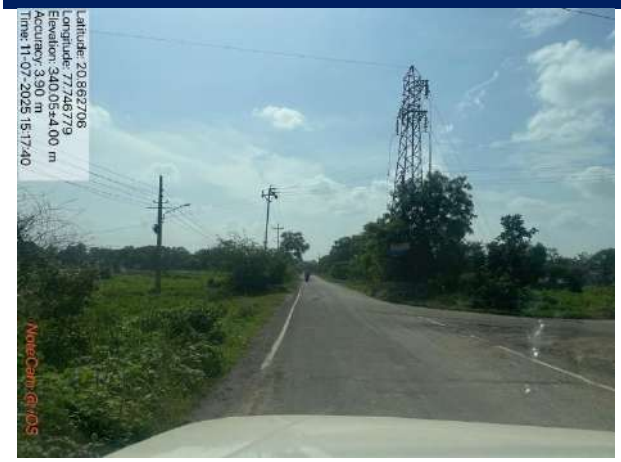


Photo 2.25- Powerlines across the Route

Photo 2.26- Over-flowing Nala

Details of all the major crossing, status of its availability along with its permission status for all the Five pipeline routes is given in **Table 2-2** to depict the technical specification of the pipe.

Table 2-2: Details of Crossing for all 5 stretches

Sl. No.	Detail of Crossing	Stretch-01 to 05 (68.2 Km)		
		Availability Status	Description	Permission Status
1	Landscape Type	Approximately 10 kilometers of the proposed pipeline alignment passes through areas characterized by high human population density, including urban and peri-urban settlements. The remaining route traverse predominantly agricultural land.		
3	Protected Forest	Yes	761 m of Forest	Applied
4	NH	Yes	NH-53	Attached in **Annexure no. 05 & 06**
5	PWD Road	—	—	Attached in **Annexure no. 02**
6	Corporation Road	Yes	—	Permission for the same is enclosed in the **Annexure 4**
7	Other District Road (ODR)	Yes	135	NA
8	Railway	Yes	2 Railway lines falling enroute- Central Railway Main Line (Chandur-Murtizapur) (Takli RS to Badnera RS) and Central Railway Line Badnera Amravati Branch (Amravati RS to Badnera RS)	Permission letter from the Central Railways is attached in **Annexure no. 01**
9	River	Yes	2 Rivers fall enroute- Jallu Nadi falling enroute the pipeline route twice and Nal Nadi once at TP 601 & 602	WRD's Permission attached in **Annexure no. 03**
10	Canal	NA	NA	NA
11	Nala/ Drain	Yes	39	WRD's Permission attached in **Annexure no. 03**
13	Presence of Heavy Traffic Area	Yes	1. Kaloti Nagar to Amravati Bus stand 2. Nandgaon Khandeshwar	Attached in **Annexure no. 05**
14	Sensitive Receptors	Yes	Most Rural Landscape of the pipeline route has agricultural lands and some prominent patches of settlements like at Nandgaon Village. Whereas the urban part is continuous from Yashoda Nagar to Amravati Bus	

Sl. No.	Detail of Crossing	Stretch-01 to 05 (68.2 Km)		
		Availability Status	Description	Permission Status
			Depot. The stretches contains schools, Colleges, Banks, Several Petrol Pumps, Industrial Area etc. along with busy market area with the heavy traffic movement in Amravati Municipal Corporation Area.	

**Source: Observations of TÜV SÜD Team During Site Visit & DFR, Adani Total Gas Limited*

2.3 ASSOCIATED TECHNICAL FACILITIES

2.3.1 CGD Network

A typical CGD network shall comprise of one or more or all the following:

- City Gate Station (CGS)
- Pipeline Network-Steel pipeline, Polyethylene pipeline etc.
- Regulating stations- District Regulating Stations (DRS), Service Regulators, Domestic / Commercial / Industrial Regulators.
- Metering Stations / Metering & Regulating Stations (MRS)
- CNG Stations

Project Company will take tap-off from nearest natural gas transmission pipeline of Gas Suppliers and further lay steel pipeline network, build City Gate Stations (CGS), Compressed Natural Gas (CNG) stations & District Regulating Stations (DRS), lay MDPE pipeline network etc in the various GAs for supplying piped natural gas to Domestic Households, Commercial & Industrial consumers and CNG to Automotive sector. The steel pipeline route will be mainly along the National or State highways from CGS and will further spread inside city boundaries.

The Gas Distribution network will be designed and engineered primarily in accordance with the provisions of the PNGRB Regulations GSR 612(E), Aug' 2008 (T4S) and ASME Standards for Gas Transmissions and Piping Systems (ASME B31.8).

2.3.2 City Gate Station (CGS)

The gas from pipeline owner shall be available at a maximum pressure level of 49 Bar(g) at the upstream of CGS. Pressure reduction skid is assumed to be installed by pipeline owner or CGD entity within its premise as per their normal business practice. Un-odorized gas is assumed to be made available from the downstream flange at the outlet of pressure reduction skid after metering at a maximum pressure of 45 Bar(g).

2.3.2.1 Steel Network

Steel pipeline sizes are generally restricted to 16" NB, 12" NB, 8" NB, 6" NB & 4" NB whereas, spur lines shall be of 4" NB. Steel pipeline is proposed to be installed at a minimum depth of 1.2 meters of soil cover, and in accordance with international standards for pipeline laying.

2.3.2.2 District Regulating Station (DRS)

DRS are provided at various demand centers based on the requirement. DRS are located either in customers' premises or at a safe location on the roadside. DRS capacity may be 5000 SCMH, 2500 SCMH, 1500 SCMH and 1000 SCMH or below is based on its availability and requirement in a particular area.

2.3.2.3 CNG Stations (MOTHER /ONLINE/DAUGHTER/ DAUGHTER BOOSTER Stations)

CNG Station

CNG station is a site consisting of interconnected equipment, which is designed to compress natural gas to a high pressure, store and dispose it directly to a natural gas vehicle. CNG stations are located at various locations in the city based on the demand and availability of land. CNG station can be either – On-line station (including mother stations) or daughter booster station.

Mother / Online Station

These are equipped with a compressor, which compresses low-pressure pipeline gas to the pressure of 255 bar for dispensing CNG to the vehicle cylinder at a pressure of 200 bar (g). Some of these stations also provide Cascade filling facility at 255 bars (g), used to fill gas in small cascades and transmitted to daughter booster stations. These kinds of stations are referred to as "Mother Stations". Online stations are the same as mother stations except that they do not have the cascade filling facility. The main components of an online CNG station are Compressors along with auxiliaries, Stationary cascades, Dispensers for cars and three-wheelers (autos), Dispenser for buses, Loading Facility for Mobile Cascades, Stainless steel tube connecting compressor, dispenser & cascades laid in U/G trenches, DG Set, UPS & Battery Bank, AVR, Electrical Control Panel, Instrument Air and Water Facilities and firefighting equipment.

Daughter Booster Station: Daughter station provided with the compressor (Known as booster) to compress the gas we are getting from the mother station are known as as daughter booster station.

Daughter station: Daughter stations are established in those areas where laying a pipeline is not possible. In that case gas is delivered from mother station to daughter station, via mobile cascade van. The gas from mother station is filled in mobile cascade by LCV filling point.

2.3.3 Design Basis/Philosophy Considered for CGD Network Simulation

The details of the four segments in which natural gas use/ application is primarily segmented are as follows:

- **Domestic segment (cooking/residential use**) – This segment includes Households and their usage for cooking and other house utilities such as geyser etc within the geographical area

- **Commercial segment**– This segment includes usage of gas in hotels, hospitals, bakeries, shops, hostels, food plazas, restaurants, sweet shops, malls and other commercial establishments for cooking/ heating purpose within the GA
- **Industrial segment (heating/ power generation use) –** This segment includes small/ medium scale industries (customers having requirement of natural gas up to 50,000 SCMD shall be supplied through the CGD network) located within GA for power generation, heating and other industrial applications.
- **CNG Segment (NGV applications)** – This segment primarily caters to the transportation fuel demand of the various vehicles and potentially inter-city floating vehicles.

2.3.4 SCADA, Telecommunication and Leak Detection System

SCADA system shall be devised to monitor and operate the NG pipeline network. The Master Control Station shall be equipped with Supervisory Control and Data Acquisition (SCADA) software running under multi-programming, multitasking real time operating system environment. The SCADA software shall incorporate control & monitoring of all locations including Block valves. Leak Detection system shall be provided, and the Leak Detection Software shall run in a separate machine at Master Control Station. Regular check and control will be conducted to assure the safe continuity of the gas supply to consumers. For the network, patrolling will be conducted by the owner operators. This operation shall include but not limited to the activities like, checking of local device such as levels of liquid, filter DP in filtration skid, regulator/ monitor/ SSV reliability etc. The gas quantity consumed by each end user will be totalized once a year. This package will enable the operator to take optimal control actions and thus ensure the safety and security of the pipeline network.

2.3.5 Filtration Skid

Cartridge type filters will be installed to remove entrained particles (filtration efficiency 99%) made up of Borosilicate fibre glass cartridge type. Equipment like regulators and metering are quite sensitive to dirt. Metering requires no particles above 5 microns.

2.3.6 Pressure Reduction Skid

The pressure reduction system shall consist of the following:

- Slam-shut valve actuated to close in case of downstream pressure increase above safe level; it needs local manual reset.
- *Monitor*: A Pressure Control Valve (PCV) which takes over control in case the Active PCV fails to maintain downstream pressure below required maximum pressure; Fail-safe is to open.
- *Active Pressure Control Valve (PCV)* that regulates the downstream pressure as required.
- Such concept is called “Non-Venting Pressure Safety” and allows avoiding the "Safety Relief Valves" more common in industrial plants. Indeed, large relieves as may be needed by the “Venting Pressure Safety” is then avoided and relevant hazards suppressed.

2.3.7 Metering Skid

Custody transfer metering will be provided before the gas is transferred to the end users. The custody transfer metering system will be Ultra Sonic Meter. The flow meters are connected to a flow computer which calculates the mass flow and corrects for temperature and pressure. Gas quality and gas compressibility data will be provided to the flow computer by a gas chromatograph located at a place before comingling of the gas from various sources.

2.3.8 Odorizer

Natural gas is, by nature, odourless what makes detection of leaks impossible without special gas detection tools. End-users connected to a Natural Gas Distribution System being not supposed to have adequate skill for gas handling, it is mandatory to add an odorant to the gas before it enters the CGD System. Odorization shall be based on the injection of suitable sulphur compound in adequate proportion (in function of actual flow) on the primary network system. The Odorization unit will consist of a Stainless-Steel storage vessel with reserve vessel internal piping & accessories, suitable cabinet & skid. This unit should be designed to provide the desired odour intensity for the entire gas stream.

A salient feature of odorization skid at CGRS is mentioned in table below:

Table 2-3: Salient Feature of Odorization

Sl. No.	Particulars	Specifications
1.	Operating Pressure	26 Bar (max.)
2.	Operating temperature	5-55 Degree C
3.	Design pressure	49 Bar
4.	Design temperature (min/max)	0/+65 Degree C
5.	Odorization agent	Tetra-Hydro-Thiophene (THT), Ethyl Mercaptan, Tetra-Butyl Mercaptan (TBM)
6.	Dosing rate	Enough for identifying leakage at far-off place

Source -Standard industry Norms

2.3.9 Fire Alarm and Fire Fighting System

As per the Petroleum and natural gas regulatory board notification 2008, Schedule 1 D, after construction activities relevant warning signs shall be displayed in the area. A proper Emergency Response Plan shall be in place and emergency contact numbers of relevant agencies should be visible. Firefighting equipment's should be available during commissioning.

As per the PNGRB notification, 2008, ATGL shall provide an Emergency Control Room, staffed round the clock, and equipped with effective communication system and emergency vehicles fitted with communication facilities, first aid equipment, fire extinguishers, gas detectors, repair kits and tools, maps, plans, material safety data sheets etc. at its disposal. The entity shall put in place an Emergency Response Plan, a Disaster Management Plan, and a Pandemic Plan. While preparing these plans the entity shall take into confidence the various local authorities (i.e., Fire authorities, Police authorities, Health authorities, local administration, Disaster Management authorities, Mutual aid, Factory inspectorate etc) and clearly elaborate on their role in case of an incident.

2.3.10 Corrosion Protection

Underground carbon steel section beyond transition fitting is below ground, it shall be protected against corrosion by minimum 400 micron thick 2 pack high build epoxy coating. Above ground service piping shall be Galvanized Iron or copper, or carbon steel protected by anti-corrosive coating.

2.4 LAYING OF PIPELINE

The pipeline construction is proposed to be conducted through deployment of 4 to 5 spreads. The sequence and methodology of construction of new pipeline is given below:

- **Clearing and grading**: A 30 m wide Right of Use (RoU) area will be cleared off for vegetation and other obstacles such as boulders. Tree felling will not take place.
- **Stringing**: Pipes are transported to the site on trucks will be offloaded using side booms. Pipes are then strung adjacent to the trench. Trailers and cranes will be used for manoeuvring of pipes. This activity may be done before or after trenching.
- **Trenching**: Trenchers and backhoe type excavators will be used to dig the trench for laying the pipeline. The topsoil in agricultural areas will be removed and stockpiled for restoration. The excavated sub-soil will be stockpiled separately for backfill.
- **Bending**: Pipes will be bent using a bending machine to the appropriate angle to match the vertical and horizontal alignment of the trench.
- **Welding:** Welding will be done using conventional manual/ semi-automatic welding involving a crew of welders and fitters. Once the pipe is strung a line-up crew will position the pipe using side booms in preparation for welding. Pipe strings to be welded will be effectively earthed. During welding, at least one end of the pipe string will be closed to prevent a forced draught effect.
- **Non-Destructive Inspection**: Mechanized Ultrasonic Testing (MUT) is the specified method to be applied for the execution of NDT. Each field weld will be 100% radiographed to evaluate for soundness of the weld in compliance with specifications. NDT and its evaluation shall be performed in accordance with API Standard 1104.
- **Coating**: After welding at each weld joint, coating of field joints of bare pipes and the repair of coating shall be done by.
- **Burial**: General burial depth of the pipeline along the route will be with a minimum 1.0 m cover. Burial cover will be compacted to avoid future erosion by all weathers.
- **Backfilling**: The excavated sub-soil will be returned to the trench. The topsoil, which has been preserved on the side of the ROU, will be spread over the filled-up trench. A crown of soil will be kept on top of the trenched portion to allow for future settlement. Backfilling will be managed so that damage from sizable rocks is not used or any other materials that may damage the pipeline.
- **Crossings**: The method used for the crossing of waterways and other infrastructure facilities will vary from place to place depending on the environmental setting and the geo-technical features of the area. The detail method of various types of crossings is specified below.

Table 2-4: Type of Crossings

Sl. No.	Type of Crossing	Method of Crossing
1	National Highway	Conventional Trenching/ Horizontal Directional Drilling (HDD)
2	State Highway	Conventional Trenching/ HDD
3	Other Roads	Conventional Trenching/ HDD
4	Railway Crossing	HDD
5	Major Lined Canal	HDD
6	Unlined Canal	HDD

(Source: PNRGB Notification, 2008)

- **Restoration** - Restoration of the ROU will be conducted progressively following the completion of construction work. This will involve removal of foreign materials such as construction debris and wastes. The ROU will be returned to its original condition by spreading the topsoil over the areas from where it was stripped, so that green belt activities will be restored along roadside of the SEZ area. Special focus will be given to restoration of side slopes and beds of natural water body crossings.
- **Pipeline warning markers**–In the final stages of construction, warning marker posts will be erected indicating the location of the pipeline and the crossing of other pipelines, cables, and features. A marker tape will be placed in the trench 500 mm above the pipeline to indicate to future excavators that a pipeline is below and that they are nearing.

The major construction activity involved during laying of pipeline are as follows:

- Transport of pipes from the place of availability to stock/lining yard.
- Transporting of pipes from the stock / lining yard to suitable places along the route of the pipeline.
- Application of lining and coating.
- Fabrication of fittings and special lining and coating of the same.
- Excavation and preparation of trenches for the pipes. Topsoil to be kept separately.
- Lowering the pipes into the trench.
- Jointing of pipes inside the trench.
- Welding of pipes.
- Rectification of defects and re-testing
- Finishing the coating and lining at weld joints.
- Back-filling of the trench with topsoil layer.
- Construction of valve chambers and erection of valve.
- Construction of necessary pipe supports anchor blocks.
- Providing line markers

2.4.1 Site Preparation and Laying Methodology

The project is for laying of natural gas pipeline with open trenching. However, for the Portion passing through, train tracks, Canals, Horizontal Directional Drilling Method (HDD) will do ponds bridges to reduce the environmental impacts to minimum.

The usual approach to pipeline installation is to dig an open trench, place the pipeline and then bury it. Proposed pipeline is passing through commercial, industrial residential, agricultural areas, water bodies, public spaces etc. shall be laid by:

1. Horizontal Directional Drilling (HDD) method for pipeline.
2. Open cut method for remaining portion of pipeline.

2.4.1.1 Horizontal Directional Drilling (HDD)

It is a Trench-less methodology that provides an installation alternative that can offer several benefits over traditional open-cut method.

- In a sensitive wetland environment such as a river/creek crossing, wildlife habitats would be destroyed, and extensive mitigation efforts would be required while pipe laying by open cut method. As a result, trenchless or "no-dig" technology has been used extensively worldwide.
- HDD can be implemented with little disruption to surface activities, requires less working space, and may be performed more quickly than open-cut methods.
- 8" Nominal bore & 4" Nominal bore pipelines Steel Pipelines laid together by HDD methodology and remaining length of CRZ portion by Open Cut Method.

2.4.1.2 Open Cut Method

Open Cut Method is a usual approach to pipeline installation is to dig an open trench, place the pipeline and then bury it.

- Pressure shall be between 16-40 Bar, 3 layers of PE coated steel pipes for the transportation of gas to its delivery centres.

2.4.1.3 Laying Methodology to be Adopted by ATGL:

During the site visit the TUV-SUD team observed that since most of the stretches are passing through the heavy traffic areas where prominent settlements, market area and other sensitive receptors are observed hence ATGL Amravati team has assured that they will use the HDD method for laying of the 40% pipes. Whereas open Cut Method will be adopted for the 60% area where sensitivities are less.

2.4.2 Pipeline Burial

As per the Petroleum and natural gas regulatory board notification 2008, all types of pipes (plastic and steel) and fittings shall be laid underground and shall not be exposed. The buried service lines are provided with a minimum cover of 1.0- 1.5 m. Where it is impractical to provide 1.0 m cover due to physical constraints, additional protective measures such as concrete slabs or high impact resistance plastic sheets shall be installed at least 300 mm above the service line. In no case the depth of cover shall be less than 600mm. For transition from plastic pipe to GI pipe, transition fittings shall be used. Plastic part of transition fitting protruding above ground shall be protected by encasing it with concrete guard.

In case carbon steel section beyond transition fitting is below ground, it shall be protected against corrosion by minimum 400 micron thick 2 packs high build epoxy coating. Above ground service piping shall be Galvanized Iron or copper, or carbon steel protected by anti-corrosive coating.

In cases where HDD is used for pipeline burial, plastic or carbon steel, adequate depth of 2-2.5m shall be maintained under if the pipeline is going below from any of the listed features, i.e., River/ canal beds, highways, roads, houses, and industries.

Table 2-5: Minimum Depth of Cover for Buried

Sl. No.	Location	Minimum Cover (m)
1	Normal/ Rocky Terrain	1.0
2	Minor River/ unlined canal/ nala crossing/ tidal areas/ other water courses	1.5
3	Major River Crossings	2.5
4	Rivers with rocky bed	1.5
5	Lined canals/ drains/nalas	1.5
6	Drainage ditches at roadways and railways	1.0
7	Rocky Areas	1.0
8	Cased/ uncased road crossing	1.2
9	Cased railroad crossing	1.7

(Source: PNGRB Notification,2008)

2.4.3 Testing, Cleaning and Drying

2.4.3.1 Filling of Nitrogen for Gas-in

The nitrogen shall be injected in the pipeline before filling the pipeline with gas (gas-in) to prevent direct mixing of gas with air. Nitrogen needed for Energization of the pipeline shall be provided by the contractor. The maximum allowable Oxygen content inside the pipeline shall be less than 1% by volume. The pipeline will be evaluated, cleaned, and dried, section after section.

2.4.3.2 Cleaning of Pipeline

Before starting the pigging activity, initial weight of the pig shall be measured at the Launching Station and after receiving the pig at the Receiving Station, the final weight of the pig shall also be measured. The difference between the initial and final weights of the Pig shall not exceed more than 20% of the initial weight of the pig. Air cleaning must be done by oil free compressors only.

2.4.3.3 Testing

Pre-Hydrostatic test Pressure and Final Hydrostatic Test Pressure shall be done at 1.4 times of design pressure. It should be confirmed that the hoop stress should not increase by 95% of SMYS.

2.4.3.4 Thermal Stabilization

If the difference of minimum and maximum atmospheric temperature should cause thermal instability on the pipe section directly exposed to atmospheric condition, the temporary scraper traps and above ground pipeline shall be properly protected. The test medium shall be evaluated to confirm soft non-aggressive water. The water to be used shall be filtered, shall not be contaminated, and free from sand or silt. Before filling operation, air driven pigs will clean the pipeline to remove all mill scale rust/sand from the internal of pipe sections. The final change shall be executed with pigs provided with air jet holes or nozzles to keep the internal dust in turbulence ahead of the pigs. Thermal stabilization shall be considered to have been achieved when a difference not higher than 1°C is attained between the average values of the last two readings.

2.4.3.5 Swabbing and Drying

Poly pigs followed by high and medium density foam pigs shall be propelled with compressed / Dry air for removal of residual water for swabbing operation. Drying shall be conducted round the clock, once started after the swabbing operation. If possible, the swabbing shall be preferably conducted using drying air to reduce the drying time. Mainline valves shall be kept fully open during operation and by passes shall be used only to check drying stage in between length and drying of valves.

After completion of swabbing and tie-in of valves, tap off etc. in each Hydrotest section, following operations shall be conducted for the drying. A sequence of three nos. of foam pigs, High, Medium & Low density (7 to 10-kg ranges) shall be launched with the super dry air at the interval of 30 minutes each. The discharge of drying unit shall be measured at every 06 hours using digital dew point meter and – 45°C at the outlet of dryer shall be maintained. The foam pigs when received at other end shall be removed and vents shall be kept open on receiving end to ensure min. backpressure. The dry air shall be allowed to flow continuously till – 8 to 10°C is achieved at the receiving end.

2.5 PROJECT REQUIREMENT

2.5.1 Manpower Resources

During the construction phase, local skilled and unskilled labour will get temporary employment based on required skill sets. However, as the development will be phase wise, the total number of locals employed at any one time may not be more than 100. **ATGL** has contracted out the construction works and management of labour to contractors, local skilled and unskilled workers and service providers are preferred to boost local employment generation. For operational phase is considered, guards will be employed to patrol the pipeline areas, which will be around 10-15 people for this stretch. Skilled workers will be employed for the operation and maintenance. All these will also be contracted out to the subcontractors.

2.5.2 Power Requirement

The power requirement as indicated by the Amravati GA team is around 550 to 650 units per day and it will be met from DG sets during construction phase of the project. ATGL will pay for electricity based on actual consumption, as measured by the energy meter. Bills will be raised by the concerned authority.

During operational phase, power will be only required for SCADA & associated facilities. The same shall be supplied via state grid.

2.5.3 Water Requirement

Water requirement as indicated by the Amaravati GA team will be around 4,500 to 5,500 litres per day for the project associated only with domestic use by the workers during construction and office staff will require during constructions and operations period at the distribution centres. The water requirement for construction phase will be contracted out to private tankers. There will be no water requirement during operation phase expect for domestic usage of staff and workers.

2.5.4 Emission and Discharges

Fugitive dust shall be the main air pollutant, from the small diesel engines used for the construction works & movement of vehicles for which dust suppression system will be used as relevant points. No effluent will be generated during operation of the proposed project.

3 LEGAL, POLICY AND REGULATORY FRAMEWORK

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. There is a need to integrate the environmental consequences of development activities and for planning suitable measures to ensure sustainable development of the region. The environmental and social considerations in any developmental process have become necessary for achieving sustainable development. To achieve such goals, the basic principles to be adopted are:

- To enhance the quality of environment in and around the project area by adopting proper measures for conservation of natural resources.
- Prevention of adverse environmental and social impact to maximum possible extent; and
- To mitigate the possible adverse environmental and socio-economic impact on the project-affected areas.

This section highlights the environmental and social regulations applicable to proposed City Gas Pipeline distribution network project. The section broadly focuses institutional framework, applicable environment, health and safety and social legislative, World Bank's guidelines and IFC's Performance Standards requirements relevant to the proposed project.

3.1 ENFORCEMENT AGENCIES

All the permissions and the approvals must be taken from concerned ministries, line departments and the local civic bodies for any upcoming project in India. The environmentaland social governance approach in the country consists of:

1. Regulatory and implementing entities.
2. Legal framework includes policies, acts, and laws; and
3. Permitting system.

With the aim to create a National Gas Grid (One Nation, One Gas Grid) and increase the availability of natural gas across the country, Petroleum and Natural Gas Regulatory Board (PNGRB) under Ministry of Petroleum and Natural Gas has authorized to lay Natural Gas Pipeline network across the country and the environmental aspects are governed by Ministry of Environment, Forests and Climate Change (MoEF&CC), Central Pollution Control Board (CPCB). The social governance aspects at the micro level are addressed by institutions like panchayats and municipal bodies.

A brief description of the relevant enforcement agencies with respect to the institutional framework is described in the following sub-sections:

3.1.1 Ministry of Environment, Forests and Climate Change (MoEF&CC)

The Ministry of Environment, Forests and Climate Change (MoEF&CC) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and

overseeing the implementation of India's environmental and forestry policies and programs. The primary concerns of the ministry are implementation of policies and programs related to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests, and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programs, the ministry is guided by the principle of sustainable development and enhancement of human well-being. The specific functions of MoEF&CC are as follows:

1. Environmental policy planning.
2. Effective implementation of legislation.
3. Monitoring and control of pollution.
4. Environmental Clearances for industrial and development projects covered under EIA notification.
5. Promotion of environmental education, training, and awareness; and
6. Forest conservation, development, and wildlife protection.

3.1.2 Central Pollution Control Board (CPCB)

The Central Pollution Control Board (CPCB) was established in September 1974, for the purpose of implementing provisions of the Water (Prevention and Control of Pollution) Act, 1974. The executive responsibilities for the industrial pollution prevention and control are primarily executed by the CPCB at the Central level, which is a statutory body, attached tothe MoEF&CC. CPCB works towards control of water, air and noise pollution, land degradationand hazardous substances and waste management. The specific functions of CPCB are as follows:

1. Prevent pollution of streams and wells.
2. Advise the Central Government on matters concerning prevention, control and abatement of water and air pollution.
3. Co-ordinate the activities of SPCB's and provide them with technical and research assistance.
4. Establish and keep quality standards under review for surface and groundwater and for air quality.
5. Planning and execution of national programmes for the prevention, control, and abatement of pollution through the Water and Air Acts; and
6. The CPCB is responsible for the overall implementation and monitoring of air and water pollution control under the Water Act, 1974, and the Air Act, 1981.

3.1.3 Maharashtra Pollution Control Board (MPCB)

Maharashtra Pollution Control Board (MPPCB) was established on 7th September,1970 under the provisions of Maharashtra Prevention of Water Pollution Act, 1969. The Water (P&CP) Act, 1974, that is a central legislation, was adopted in Maharashtra on 01/06/1981 and accordingly Maharashtra Pollution Board was formed under the provisions of section 4 of Water (P& CP) Act, 1974. The Air

(P&CP) Act 1981 was adopted in the Maharashtra in1983 and initially, some areas were declared as Air Pollution Control Area on 02/05/1983. The entire state of Maharashtra has been declared as an Air Pollution Control Area since 06/11/1996. The Board is also functioning as the State Board under section 5 of the Air (P&CP) Act, 1981.

To have uniform laws, all over the country for broad environmental issues endangering the health & safety of our people as well as of our flora and fauna and to check environmental degradation, the Parliament of India has enacted the following laws:

- The Water (Prevention & Control of Pollution) Act, 1974 as amended to date
- The Water Cess Act, 1977
- The Air (Prevention & Control of Pollution) Act, 1981 as amended to date
- Some of the provisions under the Environmental (Protection) Act, 1986 and the rules framed under this like:
  - Biomedical Waste (M&H) Rules, 2016,
  - Hazardous Waste (M&H) Rules, 2016,
  - Municipal Solid Waste Rules, 2016 etc.

  The aforesaid laws have been adopted by the Govt. of Maharashtra to control environmental pollution in the State. The Govt. of India, Ministry of Environment & Forests, has also framed the following rules for the management of Hazardous Waste, Bio Medical Waste, Municipal Solid Waste, Recycled Plastic, Used Batteries, Control of Noise Pollution and Protection of Ozone Layer under the provisions of the Environment (Protection) Act, 1986.
- The Hazardous Waste (Management & Handling) Rules, 1989 as amended to date
- The Manufacture, Use, Import, Export and Storage of Hazardous Micro Organisms Genetically Engineered Organisms or Cells Rules, 1989
- The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 as amended to date
- The Public Liability Insurance Act, 1991
- The Bio-Medical Waste (Management & Handling) Rules, 1998
- The Recycled Plastics Manufacture, Sale & Usage Rules, 1998 as amended to date
- The Municipal Solid Waste (Management & Handling) Rules, 2000
- The Noise Pollution (Regulation & Control) Rules, 2000
- The Ozone Depleting Substances (Regulation) Rules, 2000
- The Batteries (Management & Handling) Rules, 2001
- E-waste (Management) Rules, 2016

The Maharashtra Pollution Control Board has been entrusted with the task of implementation of environmental laws in the State of Maharashtra.

Some of the important functions of MPCB are:

- To plan a comprehensive program for the prevention, control or abatement of pollution and secure executions thereof,
- To collect and disseminate information relating to pollution and the prevention, control or abatement thereof,
- To inspect sewage or trade effluent treatment and disposal facilities, and air pollution control systems and to review plans, specifications or any other data relating to the treatment plants, disposal systems and air pollution control systems in connection with the consent granted,
- Supporting and encouraging developments in the fields of pollution control, waste recycle reuse, eco-friendly practices etc.
- To educate and guide the entrepreneurs in improving the environment by suggesting appropriate pollution control technologies and techniques
- Creation of public awareness about the clean and healthy environment and attending to the public complaints regarding pollution.

3.1.4 Petroleum and Explosives Safety Organization (PESO)

The PESO is under the Department of Industrial Policy & Promotion, Ministry of Commerce and Industry, Government of India. The Chief Controller of Explosives is responsible for dealing with the provisions of

1. The Petroleum Act 1934 and the Rules 2002.
2. The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000,2004.
3. Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendment 2000.

3.1.5 Ministry of Petroleum and Natural Gas

The MoPNG is the nodal ministry of Government of India for all matters related to petroleum and Natural Gas. The ministry formulates policies for the exploration, production, refining, distribution, and marketing of petroleum and natural gas. The ministry, through the Petroleum and Natural Gas Regulatory Board (PNGRB), authorizes entities to develop City Gas Distribution networks. These networks supply piped natural gas (PNG) to households, industries, and commercial establishments, and compressed natural gas (CNG) for vehicles. MoPNG promotes the development of infrastructure for natural gas, including pipelines and import terminals, to enhance the availability and accessibility of natural gas across the country. The ministry issues guidelines for the allocation and pricing of natural gas to ensure its efficient and equitable distribution.

3.1.6 *Central Ground Water Authority (CGWA)*

Central Ground Water Authority (CGWA) was constituted under sub-section (3) of Section 3 of the Environment (Protection) Act, 1986 for the purposes of regulation and control of ground water development and management. The authority is entrusted with the powers of:

- To resort the penal provisions contained in section 15 to 21 of the said act.
- To regulate and control, management and development of ground water in the country and to issue necessary regulatory directions for the purpose.
- Exercise of powers under section 4 of Environment (Protection) Act, 1986 for the appointment of Officers.

CGWA is regulating withdrawal of ground water by industries/ projects. CGWA has published guidelines/ criteria for evaluating proposals/ requests for ground water abstraction (with effect from 16/11/2015) and updated as on March 2023. As per the guidelines, for non-notified areas, NOC for ground water withdrawal will be considered for Industries as per the criteria given in the notification, presented **Table 3-1** below.

Table 3-1: Criteria for granting NOC to Industries/ Infrastructure/ Mining in Non-Notified Areas

Category	Requirement of NOC			
	Safe	Semi-Critical	Critical	Overexploited
Domestic use (rural & urban)/Rural drinking water supply schemes/armed forces establishment/MSME abstracting less than 10 cum/day	Not Required	Not Required	Not Required	Not Required
Residential Apartments / Group Housing Societies / Govt. Water Supply Agency	Still required as of 2020 but exempt as of March 2023 amendments.	Still required as of 2020 but exempt as of March 2023 amendments.	Still required as of 2020 but exempt as of March 2023 amendments.	Still required as of 2020 but exempt as of March 2023 amendments.
Agriculture	Not Required	Not Required	Not Required	Not Required
Industrial Use	Required	Required	Required	Prohibited except MSME excluding new packaged water industries
Mining	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)	Required (GW restoration charges to be paid)
Infrastructure Projects	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)	Prohibited for Water Parks/Theme Parks/Amusement Parks. For construction is allowed only if alternate options

Category	Requirement of NOC			
	Safe	Semi-Critical	Critical	Overexploited
				such as treated sewage water is not available within 05 km.

*Authorized water tankers will supply the water needed to clean the modules in areas where automated cleaning systems are not available. However, **ATGL** will adopt robotic cleaning technology and dry brush cleaning to conserve water.*

3.2 IFC EHS GUIDELINES

The IFC's EHS Guidelines dated 30th April 2007 shall be applicable for the project. **ATGL** should ensure using the Guidelines as guiding framework for addressing impacts on Environment, Occupational Health and Safety, Community Health and Safety during construction, operation as well as decommissioning phase of the project.

The IFC's EHS Guidelines provides industry specific management measures for addressing impacts on biodiversity, occupational health, and safety as well as community health and safety as early as possible in the project cycle, including the incorporation of EHS considerations into the site selection, to maximize the range of options available to avoid and minimize potential adverse impacts.

The EHS Guidelines for Electrical Power Transmission and Distribution dated 30th April 2007 should be followed by **ATGL** for addressing EHS issues associated with electric power transmission and distribution that occur during the construction and operation phases of the project along with recommendations for their management.

3.3 IFC PERFORMANCE STANDARDS

The Performance Standards (PS) established stipulate that the project shall meet the following throughout the life of an investment by IFC or other relevant financial institutions:

- **Performance Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts.
- **Performance Standard 2:** Labour and Working Conditions.
- **Performance Standard 3:** Resource Efficiency and Pollution Prevention.
- **Performance Standard 4:** Community Health, Safety and Security.
- **Performance Standard 5**: Land Acquisition and Involuntary Resettlement.
- **Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources
- **Performance Standard 7:** Indigenous Peoples; and
- **Performance Standard 8:** Cultural Heritage.

These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts. A brief on the requirements laid down in the performance standards is described below.

Table 3-2: Applicable performance Standards

PS No.	Performance Standards	Applicability
PS-1	Assessment and Management of Environmental and Social Risks & Impacts	• Yes ○ No
PS-2	Labour and Working Conditions	• Yes ○ No
PS-3	Resource Efficiency and Pollution Prevention	• Yes ○ No
PS-4	Community Health, Safety, and Security	• Yes ○ No
PS-5	Land Acquisition and Involuntary Resettlement	○ Yes • No
PS-6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	• Yes ○ No
PS-7	Indigenous Peoples	○ Yes • No
PS-8	Cultural Heritage	○ Yes • No

The details of applicability of IFC Performance Standards for proposed for proposed distribution of Natural Gas pipeline project are given below **Table 3-3:**

Table 3-3: Applicability of IFC Performance Standards for CGD Project

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
Assessment and Management of Environmental and Social Risks & Impacts (PS-1)	PS-1 establishes the importance of integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; the client's management of environmental and social performance throughout the life of the project.	The PS-1 is applicable to projects with environmental and/or social risks and/or impacts. The proposed project is a CGD of NGP Project and will have environmental and social impacts such as stress on existing water resources, generation of noise, air emission during construction activities and transportation, biodiversity impacts etc.	**Applicable** ***Policy and Environment and Social Assessment and Management System*** **ATGL** in coordination with other responsible government agencies and third parties as appropriate, will conduct a process of environmental and social assessment. The client will also establish an overarching policy defining the environmental & social objectives and principles that guide the project to achieve sound environmental and social performance. Further, **ATGL** needs to adhere with respect to measures suggested in ESMP of this report to manage the risks associated with its operations like stakeholder engagement, emergency response plan, contractor management plan, grievance redressal etc. and decommissioning phase of the project. ***Requirements: Identification of Risks and Impacts and Management Programs.*** **ATGL** will establish and maintain a process for identifying the environmental & social risks and impacts of the project. Management Programs will be developed depending upon nature and scale of the project. Impacts identified during construction and operation phase of the project have been detailed in **Chapter 5** of this ESIA report. **Chapter 9** defines framework for environmental and social management plan for the proposed project. ***Requirements: Organizational Capacity and competency*** **ATGL** in collaboration with appropriate & relevant third parties, will establish, maintain, and strengthen as necessary an organizational structure that defines roles, responsibilities in association with the project. Organization structure for

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			implementation of environmental and social management plan has been detailed in **Section 9.3, ESMP** of the report. It reflects the role of corporate and site level EHS team in managing EHS aspects at site and outlines a clear responsibility of the EHS team in management of EHS with respect to ESMP. Some of the specific trainings that will be carried out on routine basis are as follows: • Occupational Health & Safety • Fire Safety & Prevention • Emergency Response Preparedness • Operational Training • HR Induction Training • PPE Training • Driver Safety The above-mentioned trainings are preliminary trainings which will be undertaken at inception stage once the employee/worker joins the company and/or project. Post that, monthly refresher training can be taken especially for the workers. **ATGL** will draw project specific HSE plan and other management plans like water management, waste management, labour management, site security etc ***Requirements: Emergency Preparedness and Response*** The **ATGL** will establish emergency preparedness and response system to respond to accidental and emergency situations associated with the project in a manner appropriate to prevent and mitigate any harm to people and/or the environment. The client is required to design emergency preparedness and response plans based on the risks to community health and safety identified during the risks and impacts identification process. The level of planning and communication should be commensurate with the potential impacts.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			ATGL will establish procedures to monitor & measure effectiveness of management program, as well as compliance with any related legal and/or contractual obligations and regulatory requirements. This ESMP will have to be monitored on aregular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments. ***Requirements: Monitoring and Review*** The monitoring process will cover all stakeholders including contractors, labourers, suppliers, and local community impacted by project activities and associated facilities. Inspection and monitoring of environmental & social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring, **ATGL** will ensure that all contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits will be done by **ATGL's** trained team & external agencies/experts. The entire process of inspections & audits will be documented. The inspection and audit findings will be implemented by contractors in their respective areas. ***Requirements: Stakeholder Engagement, Disclosure of Information and Consultations*** **ATGL** should identify the range of stakeholders that may be interested in their actions and consider how external communications might facilitate a dialogue with all stakeholders. **ATGL** will develop and implement a Stakeholder Engagement Plan that is scaled to the project risks & impacts. It will be tailored to characteristics and interests of the affected communities. **ATGL** will provide affected communities with access to relevant information on:

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			(i) Purpose, nature, and scale of the project. (ii) Duration of project activities (iii) Any risks to and potential impacts on such communities and Relevant mitigation measures. (iv) Envisaged stakeholder engagement process. (v) Grievance mechanism. When affected communities are subject to identified risks and adverse impacts from a project, the client will undertake a process of consultation in a manner that provides the affected communities with opportunities to express their views on project risks, impacts and mitigation measures. It will allow the client to consider & respond to them. **Chapter 9,** of the report details the stakeholder identification and engagement related to the project. A stakeholder's engagement plan is also formulated as a part of ESIA report (enclosed in **Section 9.5)** to correct any gaps and ensure adequate stakeholder engagement going forward.
Labour and Working Conditions (PS-2)	Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of fundamental rights of workers. The objectives of PS 2 are: • To promote fair treatment, non-discrimination, and equal opportunity of workers. • To establish, maintain, and improve worker- management relationship. • To promote compliance with national employment and labour	The proposed project will involve employment of direct and contracted workers during construction and operation phase. The client will engage direct workers, workers engaged through third parties (contracted workers), as well as workers engaged by the client's primary suppliers (supply chain workers).	**Applicable** ***Requirements: Working Conditions and Management of Worker Relationship*** The **ATGL** will provide workers with documented information that is clear and understandable, regarding their rights under national labour and employment law. The proponent shall ensure measures to: • Prevent child labour, forced labour, and discrimination. • Freedom of association and collective bargaining shall be provided. • Wages, work hours and other benefits shall be as per the national labour and employment laws. **ATGL** will ensure that reasonable working conditions and terms of employment for both direct and contracted workers through

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
	laws. • To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. • To promote safe and healthy working conditions, and health of workers. • To avoid use of forced labour.		contractor agreements are provided. Contractor engaged by **ATGL** for various activities should ensure that terms of employment include wages and benefits, wage deductions, hours of work, breaks, rest days, overtime arrangements, overtime compensation, medical insurance, pension, leave for illness, vacation, maternity, and holiday are communicated to workers clearly. Migrant workers, if employed shall also be providedsame working conditions equivalent to those of non-migrant workers performing the same type of work. It will be the responsibility of all theconstruction contractors engaged by **ATGL** for the project, to provide accommodation, transportation, and basic services including water, sanitation, & medical care to workers. ***Requirements: Non-Discrimination and Equal Opportunity*** **ATGL** will not discriminate with respect to any aspects of employment relationship, such as recruitment, hiring, compensation (including wages and benefits), working conditions, terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices. **ATGL** will take appropriate measures to prevent any discriminatory treatment of migrant workers. Measures to prevent any harassment, including sexual harassment or psychological mistreatment within the workplace will also be undertaken. ***Requirements: Retrenchment*** **ATGL** should ensure that all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. **ATGL** should ensure that proper consultations are undertaken with the workers before retrenchment, if any. Selection criteria

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			for those to be laid off should be objective, fair, and transparent. The retrenchment should not be based on personal characteristics and unrelated to inherent job requirements. ***Requirements: Grievance Mechanism*** **ATGL** will provide a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns. In providing a grievance mechanism through which workers may raise workplace concerns, **ATGL** should ensure that matters are brought to management's attention and addressed expeditiously. **ATGL** needs to document all grievances and follow up on any corrective actions. ***Requirements: Protecting the Work Force*** **ATGL** will not employ children in any manner that is economically exploitative or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. **ATGL** is required to ensure that no child labour (as defined in IFC PS 2), forced labour is employed by the contractor during construction and operation phase of the project. **ATGL** should also exercise diligence regarding key contractors and subcontractors so that they do not knowingly benefit from practices that lead to bonded or indentured status of workers. ***Requirements: Occupational Health and Safety (OHS)*** **ATGL** will provide a safe and healthy work environment, considering inherent risks in its sector and specific classes of hazards in the client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. **ATGL** will extend a safe and healthy work environment to contracted workers and to any other workers who provide project-related work and services. **ATGL** should ensure that

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			training is provided to all workers on relevant aspects of OHS associated with their daily work, including emergency arrangements and OHS briefing for visitors and other third parties accessing the premises. All occupational injuries, illnesses and fatalities are to be documented and should be clearly communicated to third parties, and if possible, to workers engaged by these third parties.
Resource Efficiency and Pollution Prevention (PS-3)	Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. The objectives of PS 3 are: • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To promote more sustainable use of resources, including energy and water. • To reduce project related GHG emissions.	**ATGL** shall assess the impacts and risks associated with generation, use, storage, release, and/or disposal of pollutants during the ESIA, and implement them as per action plan. Also, pollution control measures shall be planned and implemented right from the project conception stage. Practices like minimal release of waste, handling of hazardous waste, safe disposal of waste, wastewater management etc. shall be considered prior to each phase. PS -3 is therefore applicable for the proposed project. The proposed project is a clean energy project and will not have major pollution sources associated with it. The construction works for development of project will entail generation of wastes like wastewater, waste oil and construction debris.	**Applicable** **Requirements: Resource Efficiency** **ATGL** will implement technically and financially feasible and cost-effective measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities. ***Requirements: Greenhouse Gases*** **ATGL** needs to work on the management, mitigation, and reduction of GHG emissions associated with the construction, operation, and decommissioning of the pipeline. These emissions primarily include methane (CH_4), which is a potent GHG associated with natural gas distribution, and other related carbon emissions. ***Requirements: Water Consumption*** During the construction phase, water will be primarily required for dust suppression on the site, hydrostatic testing, concrete mixing, and providing catering and sanitation for the workforce. Sustainable sourcing prevents over-extraction; proper wastewater management prevents contamination. Compliance with local regulations and monitoring are crucial for sustainable water use. Continuous adjustment is essential to meet IFC Performance Standard 3 requirements and avoid the significant adverse impacts on others.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			Requirements: Pollution Prevention **ATGL** will avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. **ATGL** should monitor emissions to ensure that requirements of PS-3 are being met. Monitoring frequency of pollutant emissions should be appropriate to the nature, scale, and variability of potential impacts. ***Requirements: Waste and Hazardous Materials Management*** **ATGL** will avoid generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, they will reduce generation of waste, recover and reuse waste in a manner that is safe for human health and the environment. **ATGL** should investigate options for waste avoidance, waste recovery and/or waste disposal during the design and operational stage of the project. MSDS for all the hazardous chemicals to be used during construction and operation phase should be readily available. Also, arrangements for storage yard and scrap yard needs to be made for storage of construction material and disposal of scrap. The arrangements need to be made for segregation of biodegradable and non-biodegradable waste and a CPCB authorized vendor is required to be hired for waste handling and management.
Community Health, Safety, and Security (PS-4)	PS 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Its main stress is to ensure that safeguarding of personnel and property is carried out in accordance with relevant human	The proposed project will involve transportation of construction material and movement of construction machinery using existing road which may pose safety risks to the affected communities.	**Applicable** ***Requirements: Community Health and Safety and Community Exposure to Disease*** Community health and safety considerations should be addressed through a process of environmental & social risks and impact identification resulting in action plan for disclosure to project affected communities. **ATGL** is required to address community

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
	rights principles and in a manner that avoids or minimizes risks to the affected communities.		health and safety associated with the construction and operation phase of the project. A transport and traffic management plan required to be implemented during different phases of the project. Since the project will be using existing roads for transportation of equipment and machinery, impacts due to transportation on the community could be mitigated through implementation of Traffic Management Plan. ***Requirements: Infrastructure and Equipment Design and Safety*** For the **ATGL** it is essential to minimize risks and protect the health and safety of both workers and the surrounding community, they should also build its internal capacity to monitor engineering design and managing the potential hazards associated with the distribution of natural gas, including leaks, explosions, fire risks, and other operational safety concerns. ***<u>During Construction Phase</u>*:** The safety-first approach in pipeline design involves integrating safety features like gas leak prevention measures, pressure relief systems, and venting systems. It also ensures easy emergency access and provides worker safety equipment to minimize risks associated with natural gas exposure. The project will pass through and will involve movement of vehicles through the NH, SH, MDR and other roads mainly for transportation of construction material. **Traffic and Road Safety:** The movement of construction vehicles and equipment may increase the risk of accidents, particularly in densely populated or high-traffic urban areas. A traffic management plan will be developed and implemented to mitigate these risks, including designated transport routes, speed restrictions, and community awareness measures. Also, the roads should be continually repaired if damaged due to project activity.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			Public Health and Nuisance Impacts: Construction activities may generate dust, noise, and vibrations, which could affect nearby residents. Mitigation measures such as dust suppression, noise barriers, and restricted working hours will be adopted to minimize these impacts. **Emergency Preparedness and Response:** The ATGL need to establish emergency response protocols in coordination with local authorities to address any incidents that may arise during construction or operation. ***During Operation Phase*:** It is necessary for ATGL to ensure the Gas Distribution Safety systems such as automated shut-off valves, pressure regulation systems, and gas detection sensors to minimize the risk of leaks, fires, and explosions. Corrosion protection, Leak Detection Systems, Emergency Shut-Off Systems and worker's safety. ***Requirements: Hazardous Materials Management and Safety*** **ATGL** will avoid or minimize potential for community exposure to hazardous materials and substances that may be released by the project. The project will not use any hazardous chemicals. Limited number of hazardous substances such as diesel in DG sets, transformer oil etc., will be required. **ATGL** will either engage a contractor for handling used oil or will ensure proper handling and storage procedures will be followed to minimize any contamination due to accidental spills of such substances. ***Requirements: Ecosystem Services*** CGD of NGP project being linear project there will be no significant change to physical environment, such as natural vegetation cover, existing topography, and hydrologic regime due to the project.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			Requirements: Emergency Preparedness and Response **ATGL** will assist and collaborate with affected communities, local government agencies, and other relevant parties to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations. **ATGL is** required to design emergency response plans based on risks to health and safety of the affected community and other stakeholders. Emergency plans should be developed in close collaboration and consultation with potentially affected communities and other stakeholders. The plans should include detailed preparation to safeguard health and safety of workers and communities during emergency. ***Requirements: Security Personnel*** When the client retains direct or contracted workers to provide security to safeguard its personnel and property, it will assess risks posed by its security arrangements to those within and outside the project site. **ATGL** will make reasonable inquiries to ensure that those providing security are not implicated in past abuses; will train them adequately in use of force (and where applicable, firearms), and appropriate conduct toward workers and affected communities.
Land Acquisition and Involuntary Resettlement (PS-5)	PS 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. The main aim is to anticipate and avoid, or where avoidance is not possible, minimize	The proposed project will be implemented entirely within the existing Right-of-Way (ROW) of operational infrastructure, including roads, canals, drains, and railway crossings. This alignment ensures that the pipeline will be constructed along land already designated for public infrastructure	***Not Applicable*** ***Requirements: verification of ROW and Land Use*** **ATGL** shall ensure that the ROW is legally clear for pipeline construction and that no new land acquisition or involuntary displacement occurs.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
	adverse social and economic impacts from land acquisition or restrictions on land use by providing compensation for loss of assets at replacement cost and ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.	use. These pre-existing ROWs are expected to have established legal agreements or easements that permit such development activities. Permissions from municipal authorities have been secured, with only the approval from the National Highways Authority currently pending. No land acquisition is required for the pipeline component of the project. The construction will occur within areas already allocated for road use, thereby avoiding any physical or economic displacement, involuntary resettlement, or loss of access to land or resources. Consequently, the project does not involve any new land purchases or changes in land use that would typically activate PS-5. PS-5 Compliance: Given that the project utilizes existing ROWs and involves no new land acquisition from community or involuntary resettlement, IFC Performance Standard 5 is not applicable. The project design ensures that there is no physical or economic displacement, and all land use remains consistent with its current designation for infrastructure development.	Monitoring for Potential Issues: Even though the PS-5 is not applicable for laying, it is prudent to monitor the social and environmental impacts during construction, particularly regarding temporary disruption or access issues that could affect communities near the pipeline route. ***Requirements: Community Engagement and Engagement with Relevant Authorities*** **ATGL** shall engage with affected communities, including host communities, through the process of stakeholder engagement. **ATGL** engaged community for disclosure of relevant information and participation of affected communities during planning & implementation stage of the project. A Stakeholder Engagement Plan was developed as a part of environment and social management plan. **ATGL** shall engage with local authorities and stakeholders to ensure that the project complies with any regulatory or land-use guidelines relevant to the ROW, as well as any applicable local laws that may govern infrastructure development within road corridors. ***Requirements: Grievance Mechanism*** **ATGL** shall establish a grievance mechanism consistent with Performance Standard 2 in the project development phase. **ATGL** shall ensure to resolve grievances at the community level. It is also to be ensured that a designated person will be trained and available to receive grievances and coordinate efforts to redress those grievances through the appropriate channels, taking into consideration of any customary and traditional methods of dispute resolution within the affected communities. Grievance Redressal Mechanism is already in place with **ATGL** and the same will be implemented at project level. ***Requirements: Economic Displacement*** Economically displaced persons who face loss of assets or loss of

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			livelihood during the development of project or access to assets shall be compensated for such loss at full replacement cost.
Biodiversity Conservation and Sustainable Management (PS-6)	PS 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. This standard is aimed to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	Ground vegetation will be cleared for development of project. The project activities are not likely to have any significant impact on the ecology.	***Applicable*** ***Requirements: Protection and Conservation of Biodiversity*** For the protection and conservation of biodiversity, the mitigation hierarchy includes biodiversity offsets, that may be considered only after appropriate avoidance, minimization, and restoration measures. Baseline studies for ecological aspects have been described in "**Chapter 4 ENVIRONMENTAL DESCRIPTION**" of the report. The study has been collected through site survey, literature review and initial desktop analysis. The extent of the literature review will depend on sensitivity of biodiversity attributes associated with project's area of influence and ecosystem services that may be impacted. There is no critical habitat with high biodiversity value, including: i. habitat of significant importance to critically endangered and/or endangered species. ii. habitat of significant importance to endemic and/or restricted-range species. iii. habitat supporting globally significant concentrations of migratory species and/or congregatory species. iv. highly threatened and/or unique ecosystems; and/or v. areas associated with key evolutionary processes in the project area of influence (AoI) and its associated facilities and in buffer zone. **ATGL** should adopt mitigation measures to achieve no net loss of biodiversity wherever feasible. Appropriate actions include: • Avoiding impacts on biodiversity through the identification and protection of set asides.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			• Restoring habitats during operations and/or after operations; and • Avoiding intentionally introduces any new alien species. **ATGL** should take all precautionary measures during laying of the pipeline to avoid any impact during project construction activities. It is advised that the pipeline should adhere to the mitigation measures given in "**Chapter 5 ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND** MITIGATION MEASURES" **of ESIA Report.** ***Requirements: Management of Ecosystem Services*** With respect to impacts on priority ecosystem services of relevance to affected communities and where the client has direct management control or significant influence over such ecosystem services, adverse impacts should be avoided. Being a cleaner source of energy, no significant degradation and loss of ecosystem services are associated with the project that can pose operational, financial, and reputational risks to project sustainability.
Indigenous Peoples (PS-7)	Performance Standard-7 recognizes that indigenous peoples, such as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to	All three blocks of the project area have notable representation of Scheduled Castes (ranging from 21% to 24%)	***Not Applicable*** Since, for the pipeline route project no land acquisition is required, hence it can be said that no land of ST population is getting affected. However, **ATGL** has policy of not buying any land from SC/ST or other vulnerable community members to the maximum extent possible.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
	participate in and benefit from development.		
Cultural Heritage (PS-8)	PS 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the convention concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage during their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. For this Performance Standard, cultural heritage refers to tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values.	No archaeological monument or place of importance is located within a 05 km radius from the project site.	***Not Applicable*** ***Requirements: Protection of Cultural Heritage in Project Design and Execution*** In addition to complying with applicable law on the protection of cultural heritage, World Cultural and including national law implementing the host country's obligations under the Convention Concerning the Protection of the Natural Heritage, the client will identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented. No clearance is required to be obtained from ASI as proposed development not identified within 200 meters of the protected site. However, project should be monitored during construction phase so that environmental pollution from the project would not impact the natural and cultural heritage sites around the project site. ***Requirements: Project's Use of Cultural Heritage*** Where a project proposes to use the cultural heritage, including knowledge, innovations, or practices of local communities for commercial purposes, the client will inform these communities of (i) their rights under national law; (ii) the scope and nature of the proposed commercial development; and (iii) the potential consequences of such development. The client will not proceed with such commercialization unless it (i) enters a process of ICP as described in Performance Standard 1 and which uses a good faith negotiation process that results in a documented outcome and (ii) provides for fair and equitable sharing of benefits from commercialization of such knowledge, innovation, or practice, consistent with their customs and traditions.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to Project(Compliance)	Actions Taken/Requirements
			The proposed project of gas pipeline, it **will not use cultural heritage** or the archaeological site for commercial purposes.

3.4 PROJECT SPECIFIC REGULATORY GUIDELINES

The Ministry of Environment, Forest, and Climate Change (MoEF&CC) has notified the Environmental Impact Assessment (EIA) Notification, 2006 under the provisions of the Environment (Protection) Act, 1986, which regulates development and their expansion/modernization of 39 sectors/activities listed in the Schedule to the EIA Notification, 2006. There are following categories of the projects in the notification namely Category 'A' and Category 'B' projects. Category 'A' projects are appraised at the level of MoEF&CC and Category 'B' projects are appraised by the respective State Environment Impact Assessment Authority (SEIAA) following the procedure prescribed under the EIA Notification, 2006.

As per project/ activity 6 (a) of Schedule of EIA Notification 2006, oil and gas transportation pipelines that pass through national parks, sanctuaries, coral reefs, or ecologically sensitive areas sites require Environmental Clearance (EC).

A recent notification by dated 7th November 2014 by MoEF&CC (Annexure-1) accorded general approval under the Forest (Conservation) Act, 1980 (FC Act) for underground laying of optical fiber cables, telephone lines, drinking water supply pipeline and CNG/ PNG pipelines along the petroleum pipelines within existing right of way not falling in National Parks and Wildlife Sanctuaries, without felling of trees, where the maximum size of the trench is not more than 2.00 meter depth and 1.00 meter width.

The present project does not fall under any notified area in the state of Maharashtra hence no clearance is required. However, the client needs to intimate the project detail to the respective State Environment Impact Assessment Authority (SEIAA) Maharashtra following the procedure prescribed under the EIA Notification, 2006.

The proposed pipeline alignment traverses' multiple categories of public infrastructure and environmentally sensitive areas, necessitating a range of statutory approvals from relevant authorities. The key clearances required for the project include:

- **Road Crossings and Alignments:**

  The pipeline route passes along National Highways, Public Works Department (PWD) roads, and Municipal roads. Accordingly, the project requires:

- Clearance from the **National Highways Authority of India (NHAI)** for sections along or crossing national highways.
- Approval from the **Maharashtra Public Works Department (PWD)** for state roads (PWD Amravati).
- NOC from Zila Parishad
- NOC From Gram panchayat
- Pradhan Mantri Gram Sadak Yojna Roads (PMGSY)
- **Railway Crossings:**

As the pipeline alignment intersects railway tracks, clearance from the **Central Railways** is mandatory for safe and compliant execution of works in railway zones.

- **Water Bodies (Drains and Canals):**

  The pipeline crosses two rivers (one river twice), several drains and irrigation canals. Therefore, prior approval from the Water Resources Department is required to ensure protection of water infrastructure and flow regimes.

- **Forest Clearances:**

  The project passes through designated **reserved forest areas**. As such:

- A **No Objection Certificate (NOC)** from the **Forest Department** is required.
- Additional clearance under the **Forest (Conservation) Act** is necessary for laying the pipeline through protected forest zones.

Given the nature of the project, including its linear infrastructure, potential environmental and community interface, and the requirement for multiple regulatory clearances, the proposed pipeline project is categorized as a "**Category B+"** project. This classification reflects the moderate to significant environmental and social considerations associated with the project, necessitating a detailed Environmental and Social Impact Assessment (ESIA) and implementation of appropriate mitigation measures.

Table 3-4: Applicability of all acts, laws & rules to Pipeline Project

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
1.	Environmental (Protection) Act & Rules, 1986	To protect and improve overall environment	All environmental notifications, rules and schedules are issued under this act	MoEF&CC GoI, Forest, Ecology & Environment Department, CPCB, & Maharashtra Pollution Control Board (CECB)	Yes
2.	The Irrigation Laws (Amendment) Act, 1964	To maintain the uninterrupted flow of natural water ways and canals	For using land under the right of way basis for laying the NG pipeline across either side of the flowing water course of all canals, branches, distributaries, major-minor channels etc.	Water Resources Department (Amravati Division)	Yes The permission letter for the river crossing and Nala crossing is enclosed in the **Annexure-3**.
3.	The Railways Act, 1989	To manage safety of railways	For using land under the right of way basis for laying the NG pipeline	Indian Railways (IR)	Yes. Permission/NOC is required from the Central Railway's Department as the NG pipeline crosses railway tracks at several locations in Amravati Permission Letter is enclosed in **Annexure-1**
4.	The Control of National Highways (Land and Traffic) Act, 2002	To manage safety National Highway, State Highway	For using land along the highway on the right of way basis for laying the NG pipeline	National Highway Authority of India (NHAI) & Road and Building Department	Yes. The permission letter is enclosed in the **Annexure-5** and **Annexure-6**
5.	Environmental Impact Assessment (EIA) Notification, 2006	To provide environmental clearance to new development activities following environmental impact assessment.	As per project/ activity 6 (a) of Schedule of EIA Notification 2006, oil and gas transportation pipelines which pass through national parks, sanctuaries, coral reefs or ecologically sensitive	MoEF&CC	No

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
			areas sites require Environmental Clearance (EC).		
6.	Forest (Conservation) Act, 1980 and amendments thereof	To check deforestation by restricting conversion of forested areas into non-forested areas.	The proposed stretches pass through the protected forest.	Forest Department Amravati (Maharashtra)	Yes. Application in order to seek the permission for protected forest is made the permission is under progress.
7.	National Forest Policy (Revised), 1988	To maintain ecological stability through preservation and restoration of biological diversity	Eco sensitive zone exists along the project corridor, from which the pipeline passes through.	Forest Department Amravati (Maharashtra)	
8.	Wildlife Protection Act, 1972 & 2022 (Amended)	To protect wildlife sanctuaries and National Parks	Not Applicable.	NBWL, SBWL & Chief Wildlife Warden, MoEF&CC	No
9.	Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof	To control water pollution by controlling emission & Water pollutants as per the prescribed standards	This act will be applicable during construction, for establishments of hot mix plant, construction camp, workers' camp, etc.	Maharashtra Pollution Control Board (MPCB)	Yes
10.	Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	To control air pollution by controlling emission and air pollutants according to prescribed standards	This act will be applicable during construction; for obtaining NOC for establishment of hot mix plant, workers' camp, stone crusher, construction camp, & other heavy machinery.	Maharashtra Pollution Control Board (MPCB)	Yes
11.	Noise Pollution (Regulation and Control) rules, 2000	Noise pollution regulation and controls	This act will be applicable as vehicular noise on project routes required to assess for future years and necessary protection measure need to be considered in design.	Maharashtra Pollution Control Board (MPCB)	Yes
12.	The Explosives Act (& Rules), 1884	An Act to regulate the manufacture, possession, use, sale, transport, import and export of Explosives	For transporting and storing diesel, bitumen etc.	Maharashtra Pollution Control Board (MPCB)	Yes
13.	Public Liability Insurance Act, 1991	Insurance for the purpose of providing immediate relief to the persons	Contractor needs to stock hazardous material like diesel, Bitumen, Emulsions	Maharashtra Pollution Control Board (MPCB)	Yes

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
		affected by accident occurring while handling any hazardous substance and for matters connected therewith or incidental thereto	etc. safely in designated locations within the construction camp		
14.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 (Amended,2023)	Storage, handling, transportation, and disposal of hazardous waste	Storage and handling of hazardous waste during construction	Maharashtra Pollution Control Board (MPCB)	Yes
15.	Solid Waste Management Rules, 2016	Management and handling of solid waste	For disposal of solid waste generated during construction	Maharashtra Pollution Control Board (MPCB)	Yes
16.	Construction and Demolition Waste Management Rules, 2016	Management of construction and demolition waste	For disposal of solid waste generated due to construction and demolition	Maharashtra Pollution Control Board (MPCB)	Yes
17.	Batteries (Management & Handling) Amendment Rules, 2023	Management and handling of used lead acid batteries	Safe disposal of used lead batteries through authorized e waste recyclers	Maharashtra Pollution Control Board (MPCB)	Yes
18.	E-Waste (Management) Amendment Rules, 2023	Effective mechanism to regulate generation, collection, storage, transport, import, export, recycling, treatment and disposal of e-wastes	Handling of e-waste	Maharashtra Pollution Control Board (MPCB)	Yes
19.	Central Motor Vehicles Act, 1988	To control vehicular air and noise pollution	This rule will be applicable to road users and construction machinery	Maharashtra Pollution Control Board (MPCB)	Yes
20.	The Petroleum Act 1934, as amended in August 1976 Petroleum Rules 1976, as amended in March 2002.	Operation, Storage and transportation of Petroleum products	The rule is applicable as the transportation and distribution of compressed natural gas will take place	Ministry of Petroleum & Natural Gas	Yes
21.	Petroleum and Natural Gas Rules, 1959, amended 2009.	As states own the blocks found within their territory and are therefore responsible for awarding the licenses for onshore blocks,	The rule is applicable as the distribution of natural gas will take place in Maharashtra	Ministry of Petroleum & Natural Gas	Yes

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
22.	The Petroleum and minerals pipeline (acquisition of right of user in land) act, 1962	Acquisition of the rights of user in land [for laying pipelines for the transport of petroleum and minerals and Provision of compensation in case of any damage, loss or injury is sustained by any person interested in the land under which the pipeline is proposed to be, or is being, or has been laid	The pipeline passes through industrial, residential and commercial areas.	Ministry of Petroleum & Natural Gas	Yes
23.	Petroleum and Natural Gas Regulatory Board Act, 2006	Regulation of refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas excluding production of crude oil and natural gas so as to protect the interests of consumers and entities engaged in specified activities	The project is proposed under this act and is bid out by PNGRB for an uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country.	PNGRB	Yes
24	NOC from Gram Panchayat	As per The Maharashtra Village Panchayats Act, 1959	Maharashtra Village Panchayats Act, 1959	Village Sarpanch	Yes The permission letter is enclosed in **Annexure-04**
25	The Maharashtra Underground Pipelines and Underground Ducts (Acquisition of Right of User in Land) Act, 2018	To provide the right for the use of the land for laying underground pipelines utilities	Governs legal access to land for underground utilities, including within RoW of State Highways and PMGSY roads.	Maharashtra Jeevan Pradhikaran	Yes
26	NOC for State Highway- PWD (Administrative Framework)	To regulate and streamline permissions for utility services within RoW of PWD-managed roads.	The pipeline crosses SH-274 and SH- 287	Maharashtra Public Works Department (PWD)	Yes Permission from PWD is enclosed in **Annexure-02**
27	PMGSY Operational Guidelines (for rural roads)	To ensure protection and maintenance of rural roads built under PMGSY.	The proposed pipeline route passes through the village road that falls under PMGSY	Maharashtra Rural Road Development Authority	Yes

Environmental issues during pipeline laying & construction stage generally involve equity, safety, and public health issues. The construction agencies require complying with laws mentioned below as well:

- **Workmen's Compensation Act 1923** (the Act provides for compensation in case of injury by accident arising out of and during employment).
- **Payment of Gratuity Act, 1972** (gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years).
- **Employees PF and Miscellaneous Provision Act 1952** (the Act provides for monthly contributions by the employer plus workers).
- **Maternity Benefit Act, 1951** (the Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.).
- **Contact Labor (Regulation and Abolition) Act, 1970** (the Act provides for certain welfare measures to be provided by the contractor to contract labour).
- **Minimum Wages Act, 1948** (the employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions).
- **Payment of Wages Act, 1936** (it lays down as to by what date the wages are to be paid, when it will' be paid and what deductions can be made from the wages of the workers).
- **Equal Remuneration Act, 1979** (the Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees).
- **Payment of Bonus Act, 1965** (the Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages).
- **Industrial Disputes Act, 1947** (the Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing the establishment).
- **Industrial Employment (Standing Orders) Act; 1946** (the Act provides for laying down rules governing the conditions of employment).
- **Trade Unions Act, 1926** (the Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities).
- **The Child Labour (Prohibition and Regulation) Amendment Act, 2016**: An Act further to amend the Child Labour (Prohibition and Regulation) Act, 1986. (The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry).
- **Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979** (the inter-state migrant workers, 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 to the establishment and back, etc.).
- **The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996** (all the establishments who carry on any building or

other construction work and employs 10 or more workers are covered under this Act; 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 Factories Act, 1948** (the Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours and rendering information-regarding accidents or dangerous occurrences to designated authorities).

3.5 PIPELINE DESIGN AND CODE

According to the PNGRB Notification 2008, the design, materials and equipment, welding, fabrication, installation, testing, operation and maintenance, and corrosion control of the CGD network shall comply with the requirements of ASME B31.8, except where such requirements are specifically cancelled, replaced, or modified by the regulations specified in this notification.

It is intended to apply these regulations to all new and such aspects of already existing networks as design, fabrication, installation, testing at the time of construction and commissioning. However, if an **ATGL** has laid, built, constructed, or expanded the CGD infrastructure based on some other standard or is not meeting the standards specified in these regulations, then it needs to carry out a detailed technical audit of its infrastructure through a Board authorized or approved third party agency by the Board. **ATGL** thereafter shall submit the recommendations made by the third party along-with its time-based mitigation plan and implementation schedule to the Board for authorization within six months from the date of notification of these regulations.

Technical standards and specifications mentioned in PNGRB notification, 2008 including safety standards (hereinafter referred to as standards) for city or local natural gas distribution networks are as specified in Schedule–I which cover material and equipment (Schedule–1A), welding (Schedule–1B), piping system components and fabrication (Schedule– 1C), design, installation and testing (Schedule–1D), operating and maintenance procedures (Schedule–1E), corrosion control (Schedule–1F) and miscellaneous (Schedule–1G).

Table 3-5: Applicable Standards and Codes

Sl. No.	Code No.	Description
1.	ASME B31.8	Gas Transmission and Distribution Piping Systems
2.	ASME B16.5	Specification for Pipe flanges and flanged fittings
3.	ASME B16.9	Specification for Factory made Wrought Steel Butt welding fittings
4.	ASME B16.11	Specification for Forged Fittings, Socket – Welding and Threaded
5.	ASME B16.34	Pressure and temperature ratings for forgings, castings, plate, bar, and tubular products
6.	API 5L	Specification for Line Pipe
7.	API 6D	Specification for Pipeline Valve
8.	API RP 1102	Steel Pipelines Crossing Railroads & Highways
9.	API 1104	Welding of Pipelines and Related Facilities
10.	API RP 2201	Procedures for Welding or Hot. Tapping on Equipment in Service

Sl. No.	Code No.	Description
11.	ASTM A106	Specification for Seamless Carbon Steel Pipe for High- Temperature Service
12.	ASTM A234	Specification for Piping Fittings of Wrought Carbon steel and alloy steel for moderate and High Temp. service
	AS/NZS 2885.5	Pipelines – Gas and liquid petroleum – Field Pressure Testing
13.	ANSI 16.20	Ring-joint Gaskets & Grooves for Steel Pipe Flanges
14.	T4S	Technical Standards and Specifications Including Safety Standards for City or Local Natural Gas Distribution Networks
15.	INFRA/IMP/CGD/1/2013	Integrity Management System for City or Local Natural Gas Distribution Network
16.	G.S.R. 478(E)	Determining capacity of Petroleum, Petroleum products and Natural Gas Pipeline
17.	Codes	Details
18.	G.S.R 720(E)	Code of Practice for Quality-of-Service City or Local Natural Gas Distribution Networks
19.	G.S.R 196(E)	Authorizing Entities to Lay, Build, Operate or Expand City or Local Natural Gas Distribution Networks
20.	OISD 141	Design and Construction Requirements for Cross- Country Hydrocarbon Pipeline
21.	DIN 30671	Thermoset Plastic Coating for Buried Steel Pipes
22.	DIN 30672	Tape and Shrinkable Materials for the Corrosion Protection of buried or Underwater Pipelines without Cathodic Protection for Use at Operating Temperatures Up to 500 ^{o}C
23.	DIN 30673	Bitumen Coatings and Linings for Steel Pipes, Fittings and Vessel
24.	DIN 30675-1	External Corrosion Protection of Buried Pipes & Range of Applications for Steel Pipes
25.	DIN 30677	Protection of Buried Valves Against Corrosion Coating (External) with Duroplastics
26.	DIN 30670	Polyethylene Coating on Steel Pipes and Fittings
27.	EN 12062	Non-Destructive Examinations of Welds-General Rules of Metallic Materials
28.	EN 10285	Steel tubes and fittings for on shore and offshore pipelines- external three-layer extruded polyethylene-based coating
29.	EN 12068	Cathodic Protection – External Organic Coatings for the Corrosion Protection of Buried or Immersed Steel Pipelines Used in Conjunction with Cathodic Protection of Steel Structures
30.	IS 8062	Code of Practice for Cathodic Protection of Steel Structures
31.	IS 12944-5	Paints and Varnishes – Corrosion Protection of Steel Structures by Protective Paint System
32.	ISO 8502-3	Preparation of Steel Substrates before Application of Paints and Related Products – Tests for the Assessment of Surface Cleanliness
33.	ISO 9305	Seamless Steel Tubes for Pressure Purpose Full Peripheral Ultrasonic Testing for the Detection of Transverse Imperfections

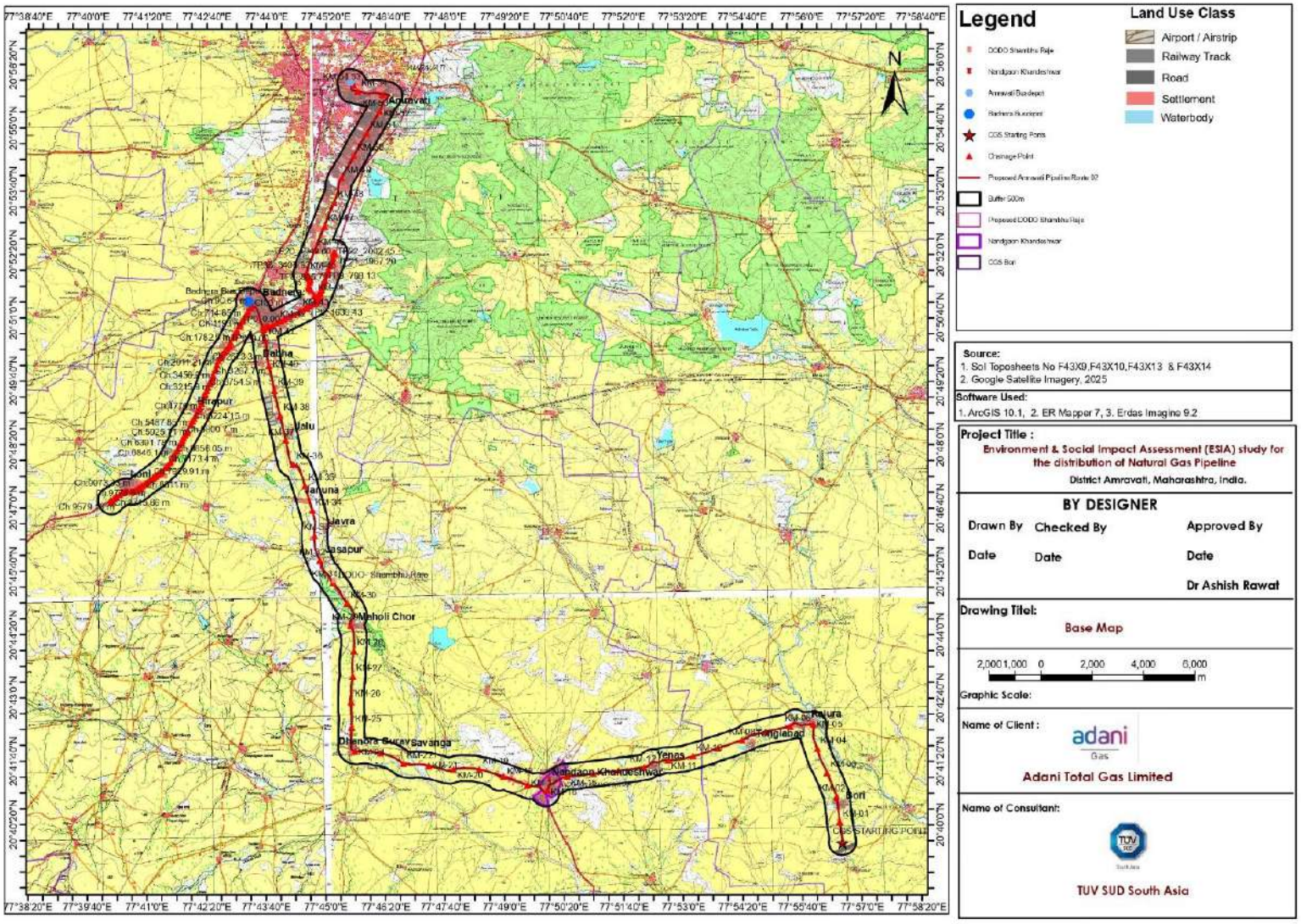
Sl. No.	Code No.	Description
34.	ISO 10124	Seamless 7 Welded (Except Submerged Arc Welded) Steel Tubes for Pressure Purposes. Ultrasonic Testing for the Detection of Laminar Imperfections
35.	ISO 12094	Welded Steel Tubes for Pressure Purpose. Ultrasonic Testing for the Detection of Laminar Imperfections in Strips / Plates used in Manufacture of Welded Tubes
36.	ISO 15741	Paints and Varnishes – Friction-Reduction coatings for the interior of on- and offshore steel pipelines for non- corrosive gases
37.	ISO 15590-1	Petroleum and natural gas industries-induction bends, fittings and flanges for pipeline transportation system- part:1 induction bends
38.	ISO 21809-3	Petroleum and Natural gas industries-external coatings for buried or submerged pipelines used in pipeline transportation system
39.	MSS-SP-44	Steel Pipeline Flanges
40.	MSS-SP-25	Standard Marking System for Valves
41.	MSS SP75	Specification for High Test, Wrought, Butt Welding Fittings
42.	G.S.R 198€	Exclusivity for City or Local Natural Gas Distribution Network
43.	OISD 105	Work Permit for Testing & Commissioning
	OISD 141	Design and construction requirements for cross-country hydrocarbon pipeline–" - latest edition.
44.	OISD 226	Natural Gas Transmission Pipeline & City gas Distribution
45.	OISD 179	Safety Requirements on Compression, Storage, Handling & Refueling of Natural Gas (CNG).
46.	PNGRB T4S	Technical Standards & Specifications including Safety Standards" for City or Local Natural Gas Distribution Network

4 ENVIRONMENTAL DESCRIPTION

Baseline data generation forms an integral part of the ESIA study and helps to evaluate the predicted impacts on the various environmental and social attributes in the study area by using scientifically developed and widely accepted environmental and social impact assessment methodologies.

4.1 STUDY AREA

The study area comprises “Project Footprint Area” (area to be physically impacted by the project activities across all phases) and “Area of Influence (up to 500 m)” and the “buffer zone” (5 km) for ecology and environment and 20 to 50 m for socio-economic studies as depicted in **Figure 4-1**. While the primary field investigations for the physical and biological and socio-economic environment have been collected from Project Footprint area and Area of influence. The Environmental baseline survey and study for the project has been carried out from **11th to 17th July July 2025**.



**Source: TUVSUD GIS Mapping*

Figure 4-1: Project Study Area superimposed on Toposheet

4.2 PROJECT FOOTPRINT AREA

The Project Footprint is the area that may reasonably be expected to be physically touched by Project activities across all phases. For the NG pipeline to be laid in five stretches:

Stretch-1 (15 Km): From Bori Village to Nandgaon Khandeshwar.

Stretch-2 (15 Km): From Shree Khandeshwar Shiva Temple to Shiv Shakti Gaushevashram.

Stretch-3 (10 Km): From DODO Sambhu Raje to Gajanan Maharaj Temple.

Stretch-4 (15 Km): Extending up to the end point - Amravati Bus Depot.

Stretch-5 (11.2 Km- Additional Stretch): Beginning near the Surat-Kolkata Highway crossing (between 41 and 42 km markers) and extending to BPCL RP Bhagwat Petroleum at Bopnemtabad.

AREA OF INFLUENCE (AOI)

Baseline monitoring for Environmental Impact Assessment study has been designed with primary data collection followed by secondary data review for establishing and interrelating the baseline condition of the project area. To collect data for baseline study, the 'Area of Influence' (AoI) has been defined as the area in which a direct or indirect impact on the physical, biological, or cultural environment might occur, and it has been considered as 500 m to the maximum buffer up to 05 km surrounding the project footprint area and for the socio-economic profile 20-50 m of study area is considered. For the detailed analysis of the current baseline of the project, the following areas of influence have been defined in **Table 4-1.**

Table 4-1: Detailed Area of Influence (AOI) considered for Different Attributes

Sl. No.	Environmental & Social issues	Area of Influence (AoI)	Justification
Physical Environment			
1.	Ambient Air Quality	Immediate vicinity of the project foot-print area	Dust Emissions, Fugitive dust etc. is typically observed within 100-200 meters from the Construction/operation areas. AoI minimum of 500 m to maximum 1.00 km has been taken to capture all sources of emissions including vehicular movement in surrounding and across access road.
2.	Noise Pollution	500 m	Primary Noise effect from a noisy source can often be detected up-to 400-500 m from any operation. However, keeping in view, an AoI of 500 m has been considered from noise pollution from all sources including vehicular movement.
3.	Surface Water	Surface Water Bodies (within 05 km of the project foot-print area)	The entire project area of influence has been considered for Surface Water Sampling. Surface water samples were collected from multiple surface water sources, which are coming within AoI (500-05 km) aerial distance from project foot-print areas.
4.	Ground Water condition	5.00 Km	Ground water quality of the project study area has been assessed in project influence area, close to the proposed construction activity sites and habitation areas.
5.	Land Environment	500 m	An area of 500 m has been considered around the project footprint area and near to habitation areas to predict the indirect effects usually occur due to accidental release of hazardous waste, vehicular/heavy machinery movement and activities at allied sites.
Biology and Environment			

Sl. No.	Environmental & Social issues	Area of Influence (AoI)	Justification
1.	Terrestrial Ecology	500 m- 05 km	Area of Influence has been considered as 500 m AOI & 05 km buffer around the project footprint area to identify the biodiversity of the area and its impacts due to the project.
Socio-economic Environment			
2.	Socio-economic conditions	20-50 m	An AoI of 20-50 m is considered for the socio-economic consultations to determine perceived impacts due to the project including employment opportunity and increased anthropogenic/vehicular activities in remote areas.

4.3 METHODLOGY FOR ENVIRONMENTAL AND SOCIAL BASELINE SURVEY

Environmental & Social study includes the study of various baseline environmental aspects covering Physical, Biological and Socio-Economic parameters. Integration of these parameters gives an overall perception of positive and negative impacts due to construction of underground NG pipelines within the port area.

Initially after primary desktop assessment of the project, detailed project reports and site details were collected from Adani Total Gas Limited. A team comprising of Social, ecological, and environmental Experts from **TÜV SÜD** visited the site on **11th to 12th July 2025** to collect the primary baseline data of drainage, land-use, topographic, ecological condition of the site and collect data on socio-economic scenario of the project study area. Baseline monitoring plan has been finalized and subsequently, in accordance with the baseline monitoring plan, secondary baseline environmental monitoring is conducted from **11th to 17th July 2025** in accordance with the Terms of Reference and Guidelines of MoEF&CC & CPCB.

Apart from the baseline environmental monitoring for Ambient Air, Noise, Soil, Water (Groundwater & Surface water) various other attributes such as aquatic and terrestrial avifaunal habitat & biodiversity, socio-economic status, geology, hydrology, and land-use pattern etc. of the study area was also studied and data has been collected from primary and authenticated secondary sources.

Table 4-2: Secondary Data Sources for Baseline Study

Data	Source
Long term Climatological Data	India Meteorological Dept. (IMD), Govt. of India and data from other Remote climate monitoring stations
Toposheets	Survey of India (SOI), Dehradun
Soil Maps	NBCC Nagpur
Satellite Data	NRSA, Google Earth, etc.
Forest Characteristics, Forest Types & Resources	Forest Survey of India (FSI)
Details of Flora, Fauna & Wildlife Habitats	From various publicly available research papers, journals, and manuscripts
Land Record and Demography Status	State Revenue Dept., District Statistical Handbook & Census of India, etc.
Drainage Pattern	Water Resource Dept., NASA SRTM data
Hydro-geology Status	District Ground Water Report, Central Ground Water Board (CGWB)
Technical Data	Details provided by **ATGL**

Prior to the site visit, the following relevant and available documents related to the underground NG pipeline project at Amravati and adjacent villages in Amravati District, Maharashtra have been collected from **ATGL**:

- Project Location Maps & KML
- Project specifications and technical details of the project – Detailed Feasibility Report

Secondary environment baseline monitoring and data collection was undertaken as per process tabulated below in **Table 4-3.**

Table 4-3: Environmental and Social Attributes studied

Sl. No.	Attributes	Parameters	Source & Frequency
1.	Ambient Air Quality	SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO	Twice a week for 1 month
2.	Ambient Noise quality	Noise level in dB(A)	Daytime and night-time sampling for single day for all locations
3.	Soil condition and its quality	Physical and chemical parameters	Composite sampling in all locations
4.	Ground water quality	Physical, chemical, biological parameters as per IS 10500:2012	Single sampling (mainly from Bore well/tube well)
5.	Surface water quality	Physical, chemical, biological parameters of different surface water stream/body within the project study area.	Single Sampling from surface water bodies.
6.	Socio-economic aspects	Socio-economic, demographic, livelihood characteristics	Secondary sources data like primary census abstracts of Census of India 2011.
7.	Hydrology & Drainage	Drainage area and pattern, nature of streams, aquifer characteristics,	Based on primary site visit and data collected from secondary sources.
8.	Ecology	Floral and faunal distribution, Terrestrial and water birds citing, identification of any migratory corridor within the project study area	From different places within study area

4.4 SECONDARY DATA COLLECTION

The environmental monitoring stations were selected for ambient Air Quality, Ambient Noise Quality, Surface Water Quality, Ground Water Quality, and Soil Quality. A NABL accredited & MoEF&CC approved laboratory is selected for conducting secondary environment baseline monitoring at project study area, under supervision of **TÜV SÜD** representative. In accordance with the Scope of Work, the baseline environmental monitoring will be carried out in the project footprint and study area during the February 2024.

4.5 PHYSICAL ENVIRONMENT

The study related to physical environment was conducted through site visits and review of the data from secondary sources such as Census of India, District Statistical Handbook, State of the Forests Report, Central Groundwater Development Board Report, District Revenue Office, and other published peer information in respect of the topographical and physiographical features, regional and the local geology of the project area, climatology, and seismicity.

Soil characteristics were established through physio-chemical tests of the soil samples revalidated though the published literature while land use and land cover; slope of the study area were established through remote sensing by using GIS tools. Prior the initiating the baseline survey, monitoring design was prepared in coordination with **TÜV SÜD** Environmental Experts and the same was fine-tuned during site survey prior to the baseline monitoring.

The components of physio-chemical environment discussed in this section include:

1. Physiography & Topography
2. Geology
3. Geomorphology and Drainage
4. Land-Use & Land Cover
5. Soil Quality
6. Seismicity & Natural Hazards
7. Climate & Meteorology
8. Ambient Air Quality
9. Ambient Noise Levels
10. Ground Water Quality
11. Surface Water Quality

4.5.1 Physiography and Topography

Amravati District is one of the eleven districts of Vidarbha region of Maharashtra State. It is situated in the northern part of the State abutting Madhya Pradesh State and lies between north latitudes 20°32' and 21°46' and east longitudes 76°27' and 78°37'. The total area of the district is 12208.77 sq. km of which only 8682.76 Sq km area is mappable and falls in Survey of India degree sheets 55 G, 55 H, 55 K and 55 L.

The district is bounded on the north by Madhya Pradesh, on the east by Nagpur and Wardha districts, and on the south and south-west by Yavatmal, Akola and Buldhana districts. Wardha River forms the eastern boundary of the district (Figure 1.1). It has a total population of 28, 87,826 of which male and female are 14,82,845 and 14,04,981 respectively as per 2011 census

The district consists of six sub-divisions which are further divided into 11 towns, 14blocks, 2002 villages and 843 Gram Panchayats. Out of these, 3 blocks are over-exploited 5 and 2 are Semi-Critical. The National Aquifer Mapping & Management Programme

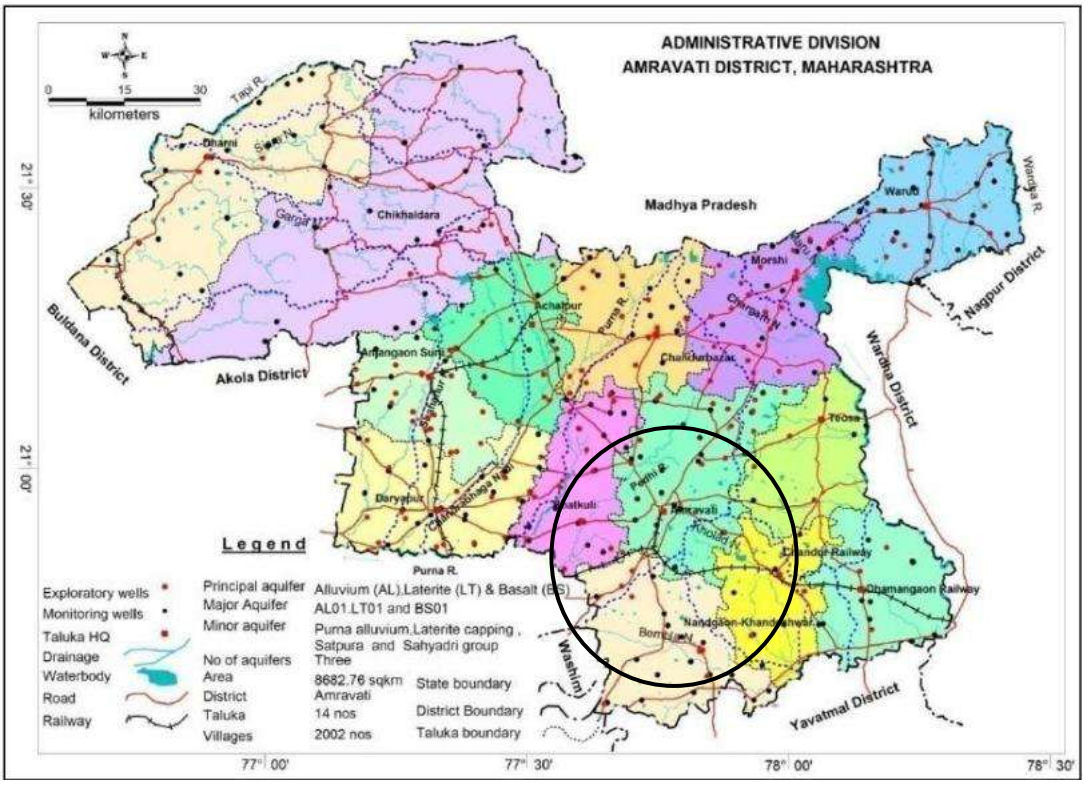
(NAQUIM) has been taken up in 8 blocks in two phases of XII five Year Plan

I. Warud & Morshi Blocks (1554 Sq Km) in AAP 2012-13.

II. Amravati, Bhatkuli, Daryapur, Anjangaon Surji, Achalpur & Chandur Bazar

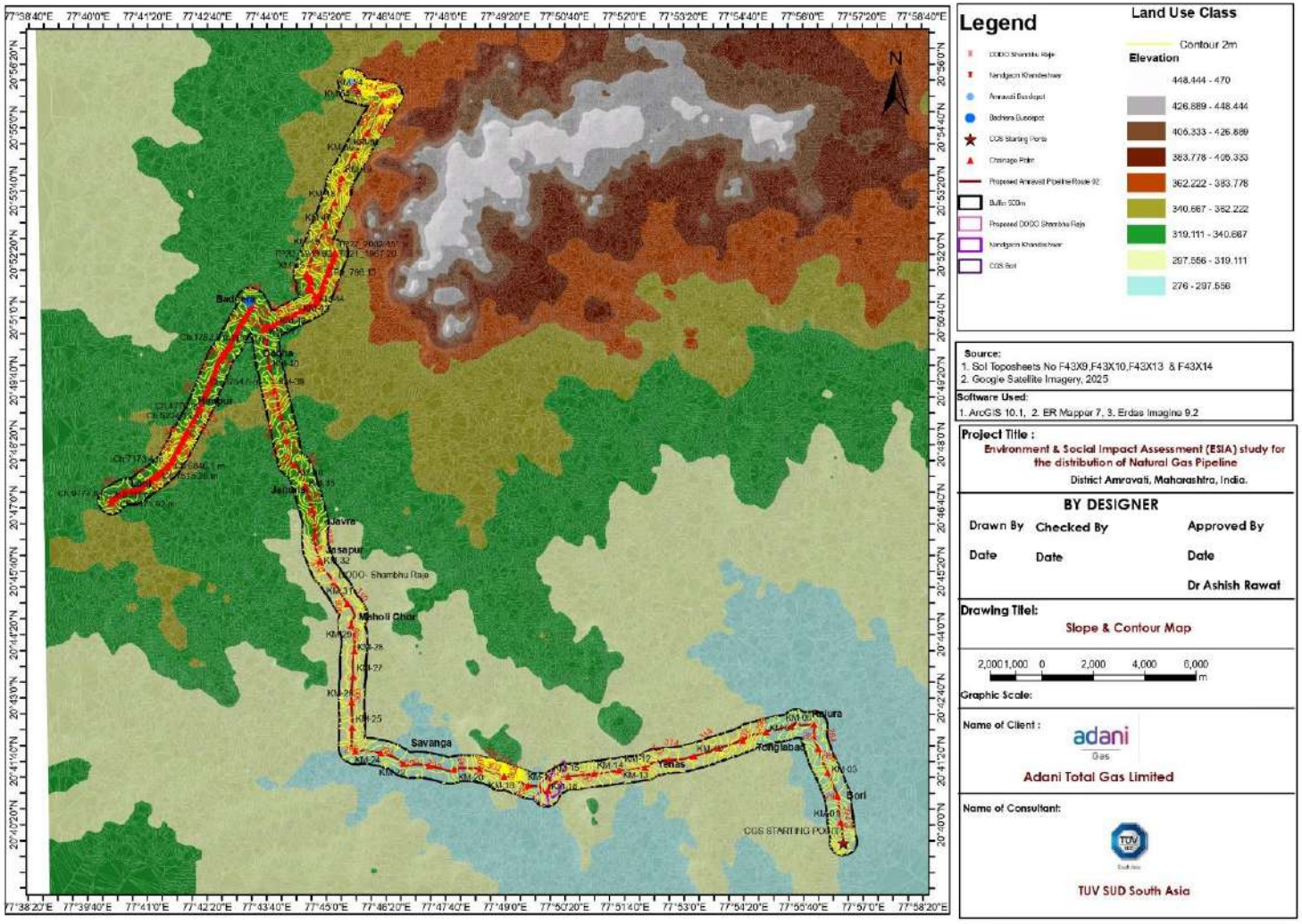
(4107.25 Sq Km) in AAP 2016-17.

III. Chikaldara, Dharni, Chandur Railway, Dhamangaon Railway, Teosa, Nandgaon Khandeshwar (3021.48 sq Kilometer) in AAP 2018-19.



(Source: Aquifer Map and Management Plan- Amravati District)

Figure 4-2: Base Map of Amravati District (Black Circle: Project AOI)



Source: TÜV SÜD GIS Mapping Study

Figure 4-3: Terrain and Contour Map of Project AOI

4.5.2 Geology

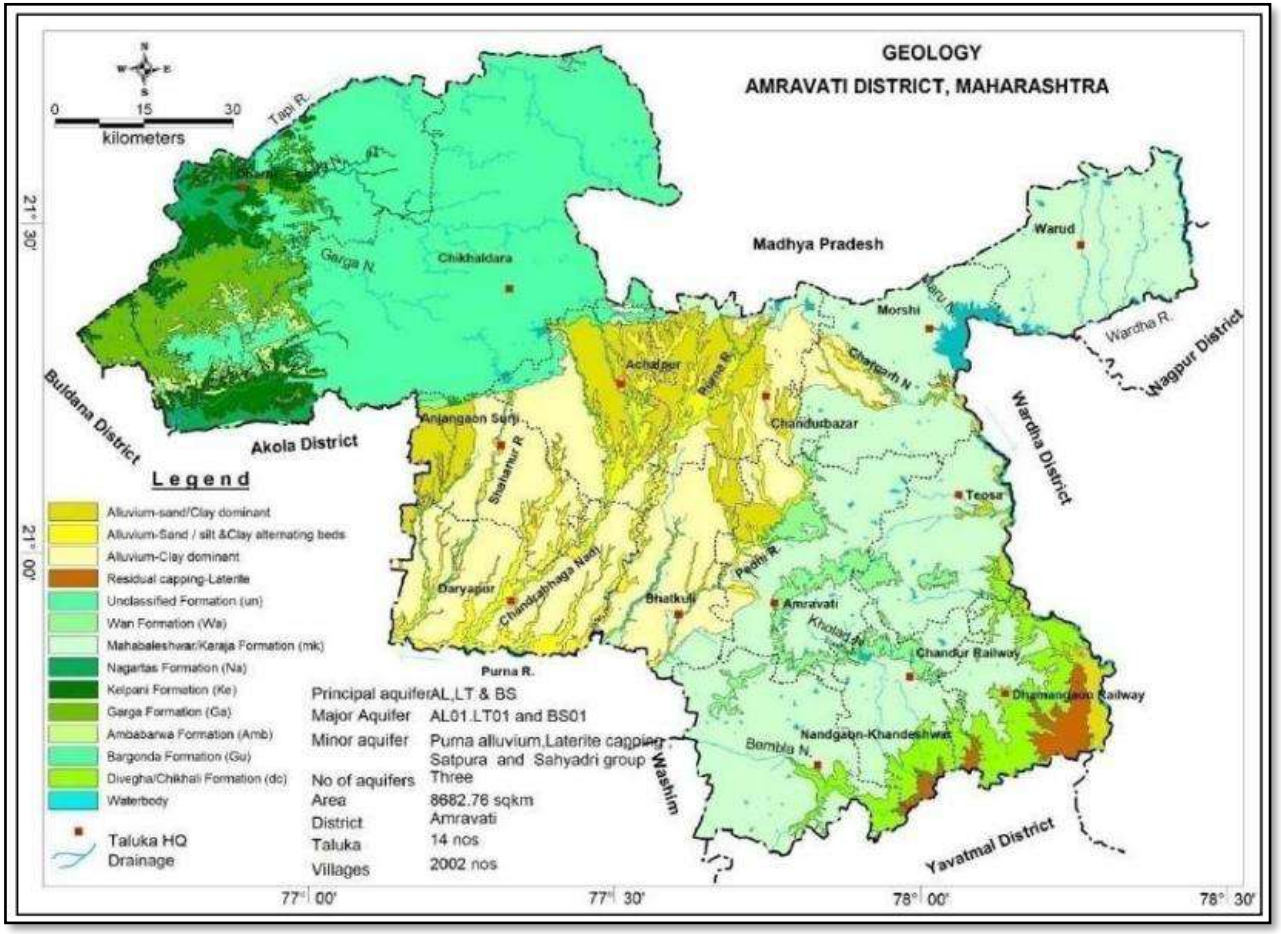
Basaltic lava flows are the major rock formations along with alluvium, Lameta beds, Gondwana Sediments and unclassified metamorphic rocks. About 70% of the area is underlain by Deccan Traps and the remaining by other soft rock formations, particularly the alluvium. The generalized stratigraphic sequence of the area is given below in the **Table 4-4**.

Table 4-4 Geological succession of Amravati district

Stratigraphy	Age	Lithology
Quaternary	Cainozoic	Alluvium; Laterite
Satpuda Group of Deccan trap Basalt	Upper Cretaceous to Palaeogene	Group of Aa to simple type of basaltic lava flows
North of Tapi lineament		
Lameta Group	Upper Cretaceous	Cherty nodule limestone; variegated clay & calcareous sandstone
Upper Gondwana	Lower Triassic to Cretaceous	Sandstone
South of Tapi lineament / Salburdi Fault		
Sahyadri Group of Deccan trap Basalt	Upper Cretaceous to Palaeogene	Rithpur Formation; Limestone (Intertrappean); Karanja Formation; Chikhali Formation; Unclassified Basalt

**Source: Aquifer Map and Management Plan- Amravati District*

As indicated in **Figure 4-4** the geological map of the Maharashtra state, the region exhibits varied lithological formations across different talukas. Amravati Block is primarily underlain by Deccan Trap Basalts, represented by formations such as the Ambenali Formation, Unclassified Basalt, and minor presence of Lateritic capping and Alluvium along riverbeds. In Chandur Railway Block, the geology is dominated by Deccan Trap Basalts, specifically the Ambajogai (Amb) and Borgaon (Br) Formations, with some stretches of Alluvium–sand/clay dominant in low-lying zones. Nandgaon Khandeshwar Block, lying further southeast, is geologically more diverse, comprising Borgaon Formation, Diveghat/Chikhali Formation, Unclassified Basalt, and patches of Residual Laterite and Alluvium deposits along seasonal streams.



**Source: Survey of India*

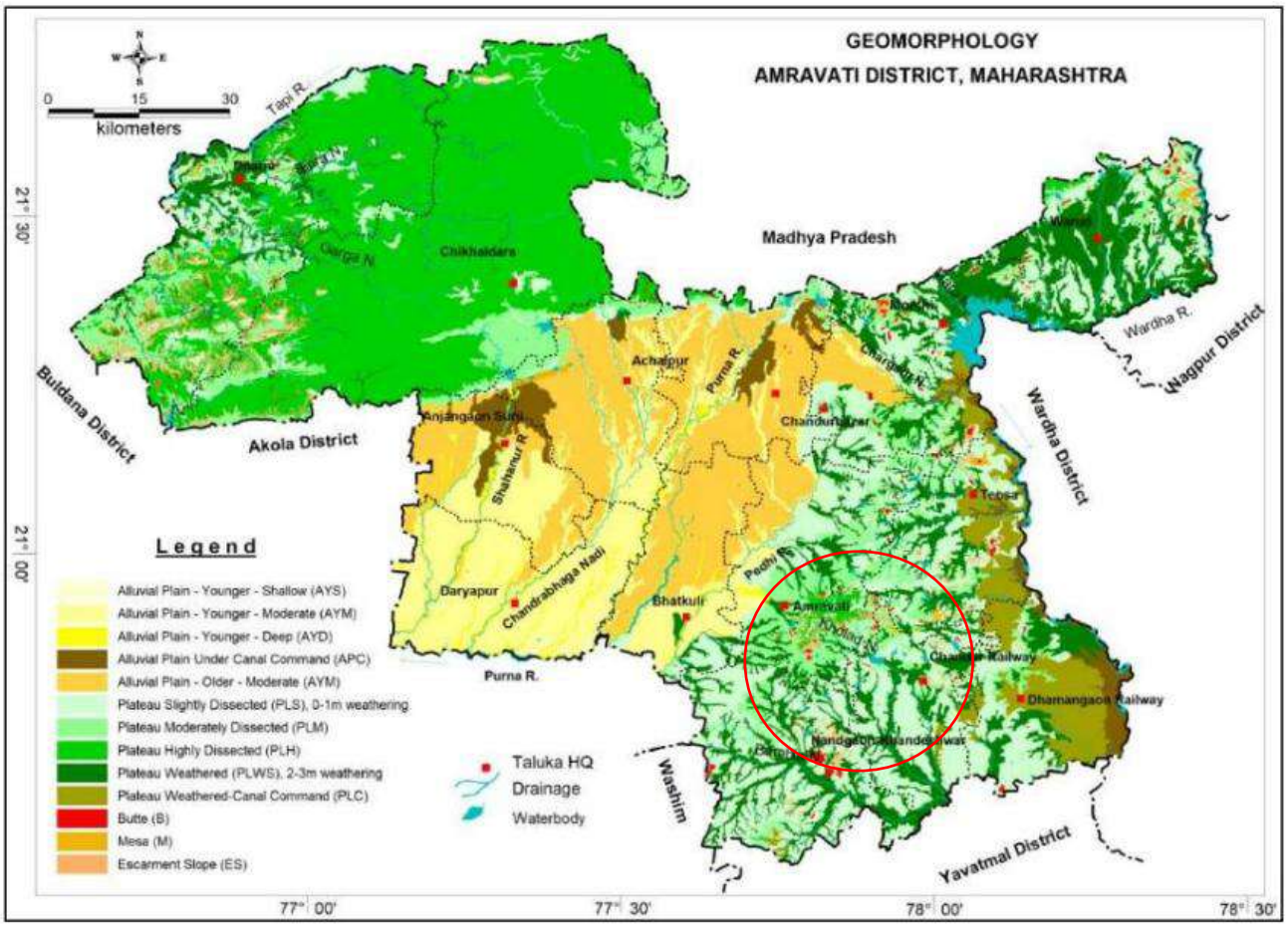
Figure 4-4: Geological Map of Amravati District

4.5.3 Geomorphology and Drainage

4.5.3.1 Geomorphology & Drainage

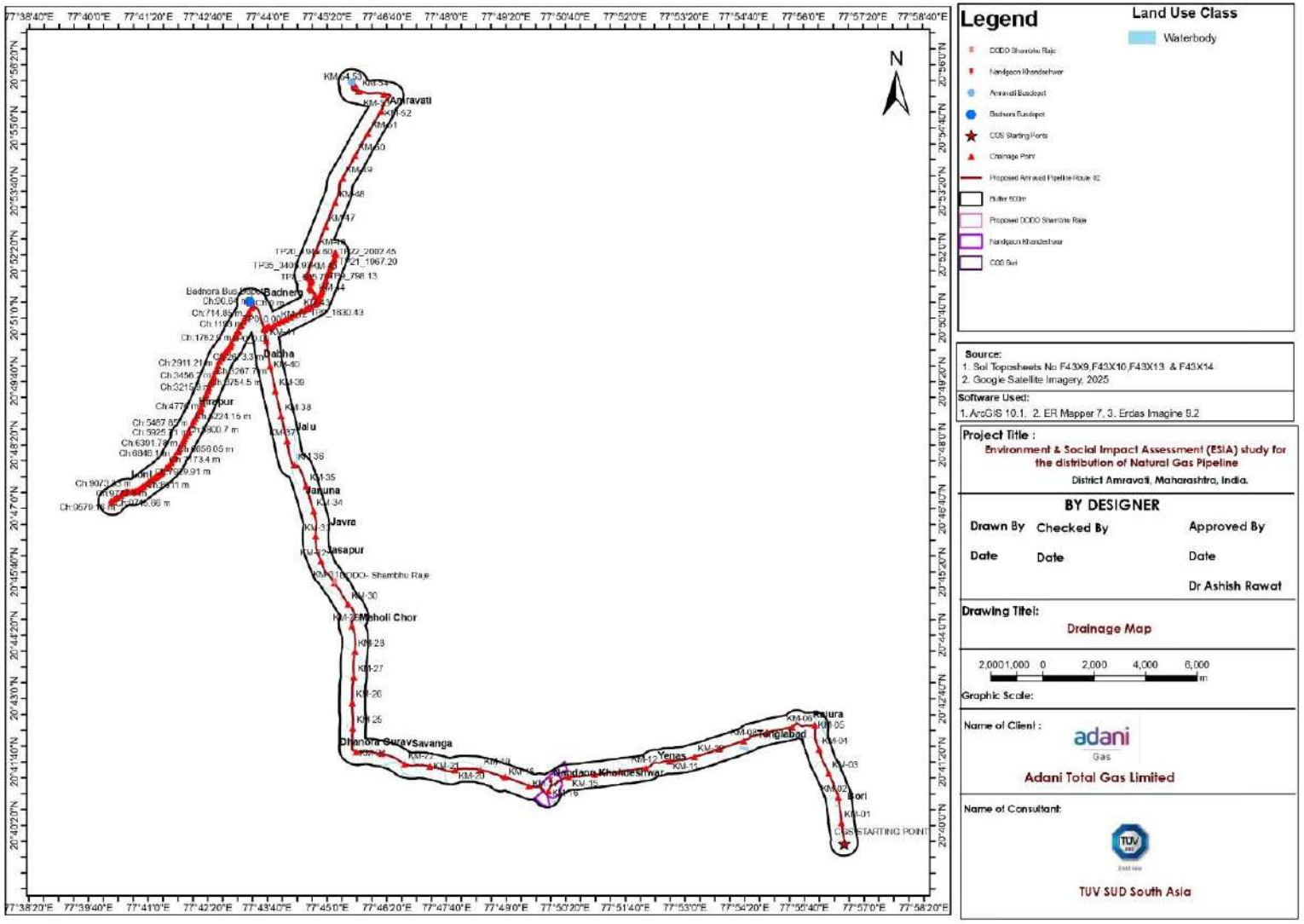
The district of Amravati as depicted in **Figure 4-5**, may broadly be divided into two geographical divisions: the Melghat hilly area, a highly forested area of the Satpudas and the plains area or the Paynghat below, traversed by a number of streams flowing southwards from the Satpuda Mountains. The Melghat hilly area is further sub-divided into the following subregions: (1) Gavilgarh ridge, (2) The southern forest zone. (3) The northern forest zone, (4) Upper Chandrabhaga valley, (5) the plains of Dharni and Bairagarh and (6) The Katkumbh plateau. The second geographical division, viz., the Payinghat or the plain area, may be further sub-divided into the following sub-regions: - (1) The Piedmont belt of light and medium black soils with abundant ground water supplies, sloping away from the Satpudas; (2) The region of deep and fertile soils of the south-west, where the sub-soil water is very often saline; (3) The regions of light red and medium black soils of Chandur and eastern Amravati; (4) Stretches of fertile black soils adjoining the Wardha in southern Morshi and south-eastern Chandur block.

Three major rivers namely Tapi, Purna and Wardha cover the Amravati district. The Purna rivers flows through the Gavilgarh hills in northeast-southwest direction along Chandur Bazar, Bhatkuli and Daryapur block and then turn eastwards demarcating the boundary between Amravati and Akola. Pedhi, Arna, Chandrabhaga and Shahanur forms the main tributaries of Purna River. The Wardha River flows through eastern boundary of the district with Tapi River flowing through the northwestern boundary. The district has dendritic drainage Pattern providing good agricultural output.



**Source: Aquifer Map and Management Plan- Amravati District*

Figure 4-5: Geomorphology & Drainage Map of Amravati District (Red Circle- Project Study Area)



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-6: Drainage Map of Project Study Area

4.5.4 Land use and Land Cover

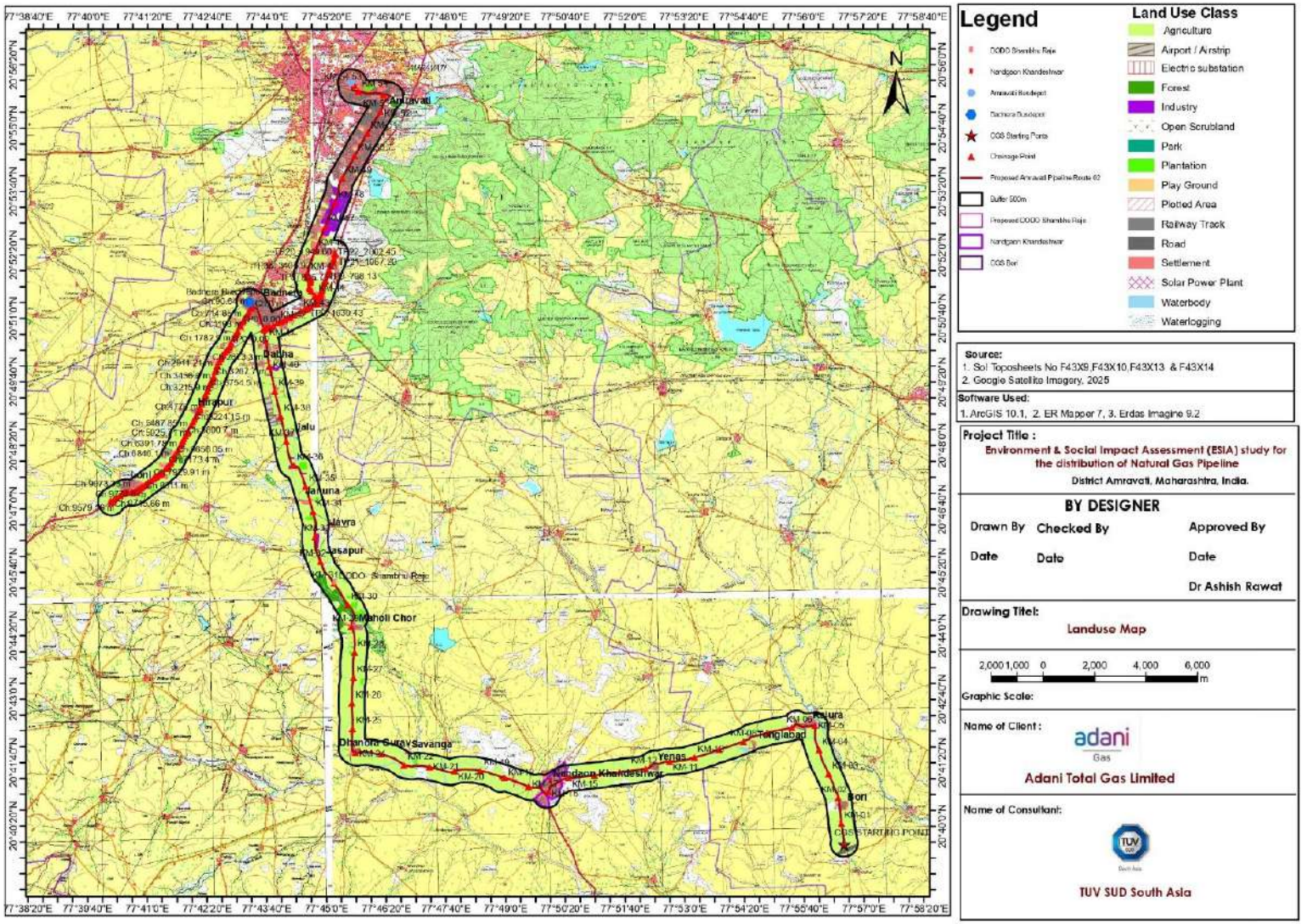
The landuse details and the thematic map available with the MRSAC, Nagpur has been collected and analysed with reference to the present agricultural practices, various land use etc. It has been observed that the land use classification of the study area (66.794 sq.km), the predominant land use is agriculture, which occupies approximately 42.645 sq.km, accounting for 63.85% of the total area. This is followed by settlements, covering 11.333 sq.km (16.97%), indicating significant residential and built-up presence. Open scrubland occupies 3.756 sq.km (5.62%), while road infrastructure accounts for 2.571 sq.km (3.85%). Waterbodies make up 1.696 sq.km (2.54%), reflecting natural and man-made water features.

Other land use types include industrial areas (1.186 sq.km, 1.78%), plotted areas (1.203 sq.km, 1.80%), and plantations (0.620 sq.km, 0.93%). Minor land coverage is also seen in features such as forest (0.873 sq.km, 1.31%), airport/airstrip (0.399 sq.km, 0.60%), parks (0.073 sq.km, 0.11%), playgrounds, railway lines, solar power installations, electric substations, and areas with seasonal waterlogging, all of which together account for less than 2% of the total area. The land use distribution indicates a predominantly agrarian landscape with urbanizing pockets and essential infrastructure integrated across the study region. The detailed land-use breakup of the study area is given in **Table 4-7** and Land Use map of study area is depicted in **Figure 4-5** as follows:

Table 4-7: Land use Details of Project Study Area

S.No	Land Use	Area in Sq. Km	Area in %
1	Agriculture	42.645	63.845
2	Airport / Airstrip	0.399	0.597
3	Electric substation	0.116	0.174
4	Forest	0.873	1.307
5	Industry	1.186	1.775
6	Open Scrubland	3.756	5.624
7	Park	0.073	0.109
8	Plantation	0.620	0.929
9	Play Ground	0.211	0.316
10	Plotted Area	1.203	1.802
11	Railway Line	0.064	0.095
12	Road	2.571	3.849
13	Settlement	11.333	16.968
14	Solar Power Plant	0.048	0.071
15	Waterbody	1.696	2.539
16	Waterlogging	0.088	0.132
17	Study Area	66.794	100.000

**Source: TÜV SÜD Land Use Study*



Source: TÜV SÜD GIS Mapping Study

Figure 4-5: Land Use Map of Project Study Area

4.5.5 Soil Quality

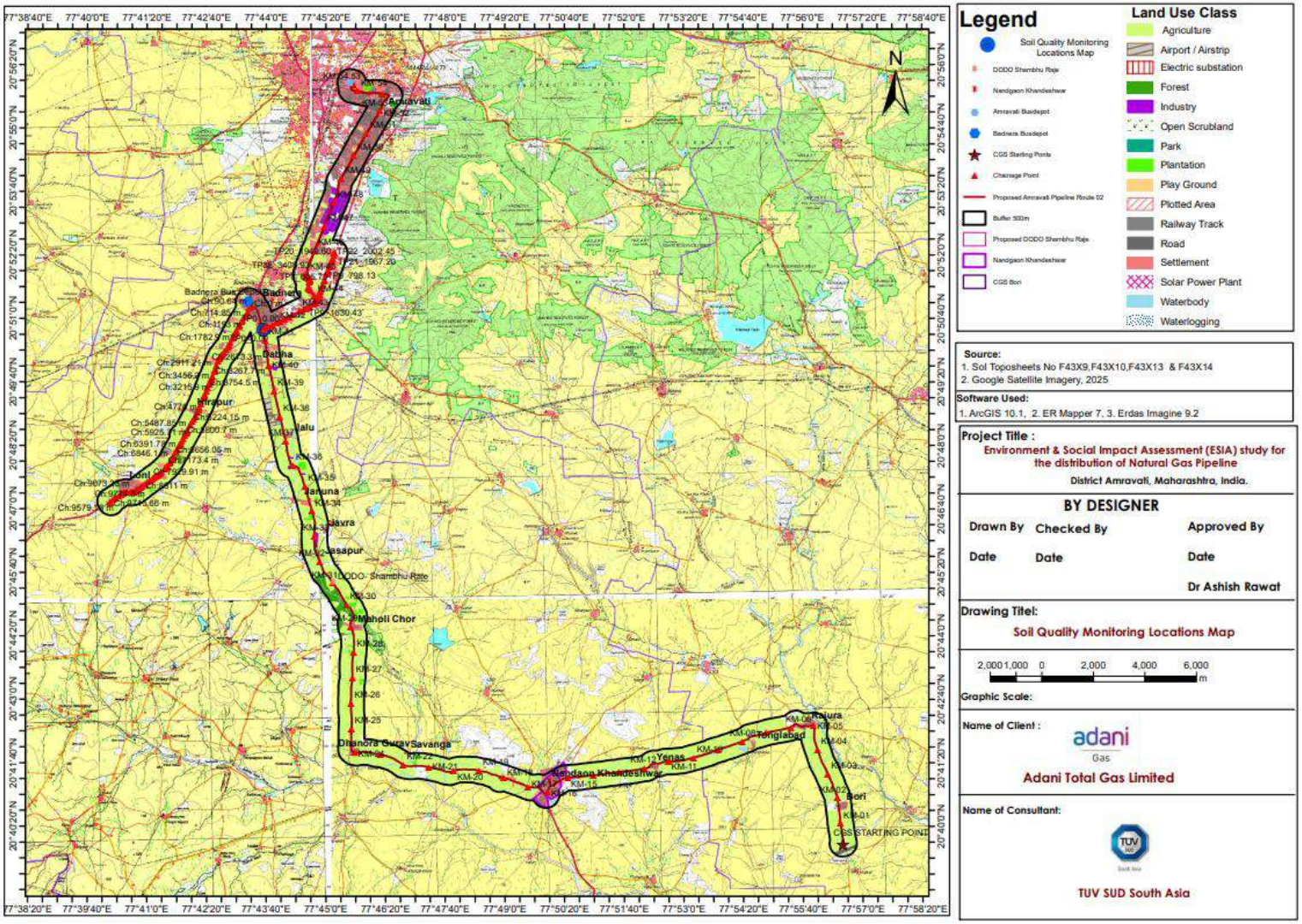
The soil in the Amravati District is derived from the Deccan basalt formation. Two types of soil; medium black soil occurring in central part are rich in clay content and deep black soil occur in northern and southern parts of the district. Along the major river/tributaries silty loam soil (>100 cm) is observed.

The soil samples were analyzed for various physical and chemical parameters of soil. The soil quality monitoring locations are provided in **Table 4-5** and **Figure 4-6.** The result of soil quality monitoring is provided in the **Table 4-6.**

Table 4-5: Soil Quality Monitoring Locations

Sl. No.	Location code	Location name	Coordinate detail
01	SQ-1	At Junctions of SH-06 and NH-53, Near Ch-42	20°50'40.24"N 77°43'48.49"E

**Source: Identified by TUV-SUD Team*



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-6: Soil Quality Monitoring Locations

Table 4-6: Soil Quality Analysis Result

S.no	Parameters	Unit	Results	Test Protocol
1.	Texture		Sandy clay Loam	IS: 2720 (part-4), 1985 Reaff:2015)
2.	Sand		36.3	IS: 2720 (part-4), 1985,(Reaff:2015)
3.	Silt	%	17.6	IS: 2720 (part-4), 1985,(Reaff:2015)
4	Clay		22.5	IS: 2720 (part-4), 1985,(Reaff:2015)
5	Porosity	%	49.1	STRL /STP/SOIL/01,
6.	Bulk Density	g/cc	1.23	STRL /STP/SOIL/01
7.	pH	….	7.52	STRL /STP/SOIL/01
8.	E. Conductivity	µs/cm	0.48	STRL /STP/SOIL/01
9.	Magnesium	mg/kg	42.3	STRL /STP/SOIL/01
10.	Calcium	mg/kg	210.2	STRL /STP/SOIL/01
11.	Chlorides	mg/kg	58.2	STRL /STP/SOIL/01
12.	Sodium	mg/kg	80.1	STRL /STP/SOIL/01
13.	Potassium	mg/kg	54.9	STRL /STP/SOIL/01
14	Organic Carbon	%	2.62	IS : 2720 (Part-24)-1976(R-2015)
15	Organic matter	%	4.56	IS : 2720 (Part-24)-1976(R..2015)
16.	Phosphorous	mg/kg	64.2	IS: 2720 (part-26),1987. (R:2011)
17.	SAR	meq	1.56	STRL /STP/SOIL/01
18.	Nitrogen (as N)	mg/kg	0.12	STRL /STP/SOIL/01
19.	Salinity (as NaCl)	%	0.28	STRL /STP/SOIL/01

Analysis of Results:

- **Soil Texture and Composition**:
  The soil in Amravati is classified as *Sandy Clay Loam*, which suggests moderate drainage capacity and decent water retention. As per the Soil Quality Analysis Results for SQ1 the composition includes sand (36.3%), silt (17.6%), and clay (22.5%), reflecting balanced structure for aeration and fertility. This texture supports crop cultivation requiring moderate moisture holding and nutrient availability.
- **Porosity and Bulk Density:**
  Porosity is moderate (41.2% & 48.3%), and bulk density is within acceptable limits (1.29–1.37 g/cc), suggesting good root penetration and aeration.
- **pH and Electrical Conductivity (EC):**
  The soil is neutral in pH (7.52) and exhibits low electrical conductivity (0.48 µS/cm), implying non-saline and chemically stable soil, well-suited for a wide range of agricultural crops.
- **Macronutrients:**
  Nitrogen is low at 0.12 mg/kg, which could restrict vegetative growth and may require supplementation. Phosphorus is high at 64.2 mg/kg, beneficial for seedling vigor and root development and Potassium is moderate at 54.9 mg/kg, adequate for plant metabolism and stress resistance.

In the sampled soil, Magnesium (42.3 mg/kg) and calcium (210.2 mg/kg) are present in adequate quantities, contributing to overall soil health and supporting essential plant functions. Sodium (80.1 mg/kg) and chlorides (58.2 mg/kg) are within non-toxic limits, indicating minimal risk of salt-induced stress on crops. The organic carbon content of 2.62% and organic matter at 4.56% suggest good soil

fertility and active microbial life, both of which are crucial for nutrient cycling and soil structure. Salinity is low at 0.28%, falling within safe thresholds for most crops.

The laboratory results of the secondary baseline monitoring is enclosed in the Error! Reference source not found.

4.5.6 Natural Hazards

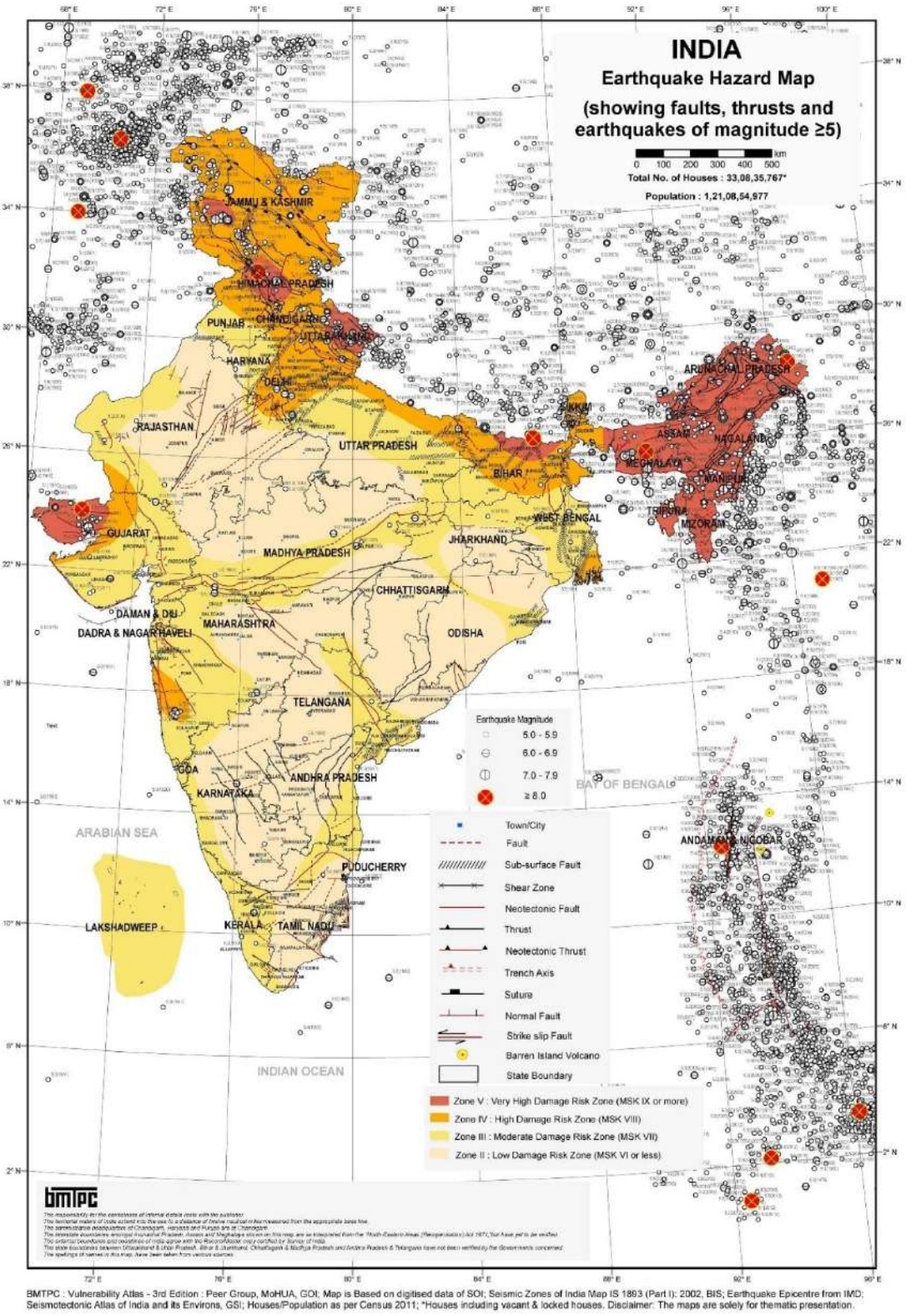
Natural hazards naturally occur physical phenomena caused either by rapid or slow onset events which can be geophysical (earthquakes, landslides, tsunamis, and volcanic activity), hydrological (floods), climatological (droughts, etc.), meteorological (cyclones and storms/wave surges) or biological (disease epidemics and insect/animal plagues). Natural hazards can have impacts on the development; hence assessment of the natural hazards in the area is important for any proposed development.

The State of Maharashtra is primarily prone to floods and earthquakes, with floods occurring frequently across coastal, western, and Vidarbha regions. Earthquakes of magnitude >5.0 have a moderate frequency, especially in the Koyna–Warna, Latur–Osmanabad, and Western Ghats zones.

In addition, Maharashtra is vulnerable to over 20 of the 33 hazard types identified by the High-Powered Committee of the Government of India. These include droughts, cyclones, landslides, lightning, heat waves, epidemics, and industrial and dam-related accidents, as detailed in the State Disaster Management Plan.

4.5.6.1 Seismicity

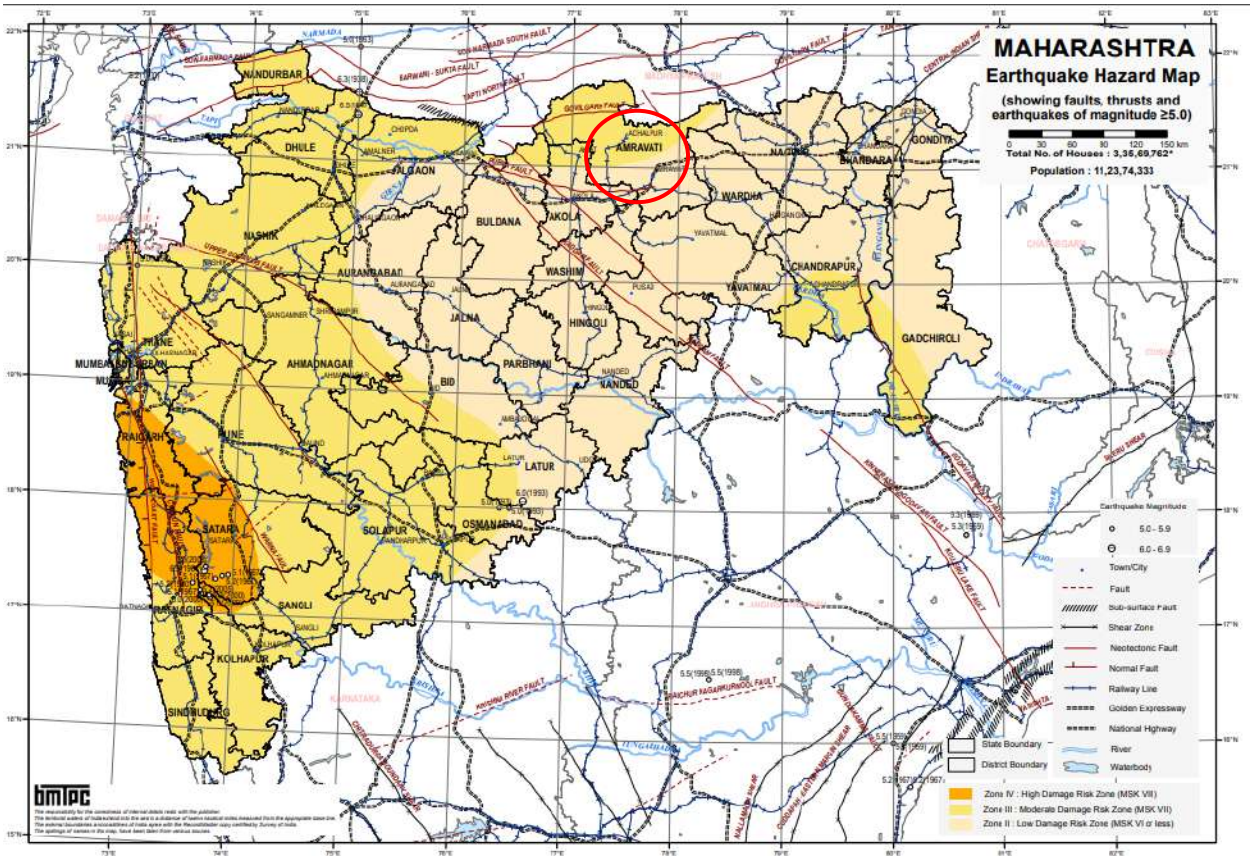
The state of Maharashtra lies in the Zone-II Low Risk Zone (MSK-VI or less), Zone-III Moderate Risk Zone and Zone-IV High Risk Zone. Whereas the study area located in Amravati falls under Zone-II Low Risk Zone (MSK-VI or less) in the rates of seismic activity, as shown in seismic map of India **Figure 4-7** and the seismic map of the state of Maharashtra in **Figure 4-8**. All the five stretches lie Low Damage Risk Zone (Zone-IV).



BMTPC : Vulnerability Atlas - 3rd Edition : Peer Group, MoHUA, GOI; Map is Based on digitised data of SOI; Seismic Zones of India Map IS 1893 (Part I): 2002, BIS; Earthquake Epicentre from IMD; Seismotectonic Atlas of India and its Environs, GSI; Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

**Source-BMTPC Vulnerability Atlas*

Figure 4-7: Earthquake Hazard Map of India

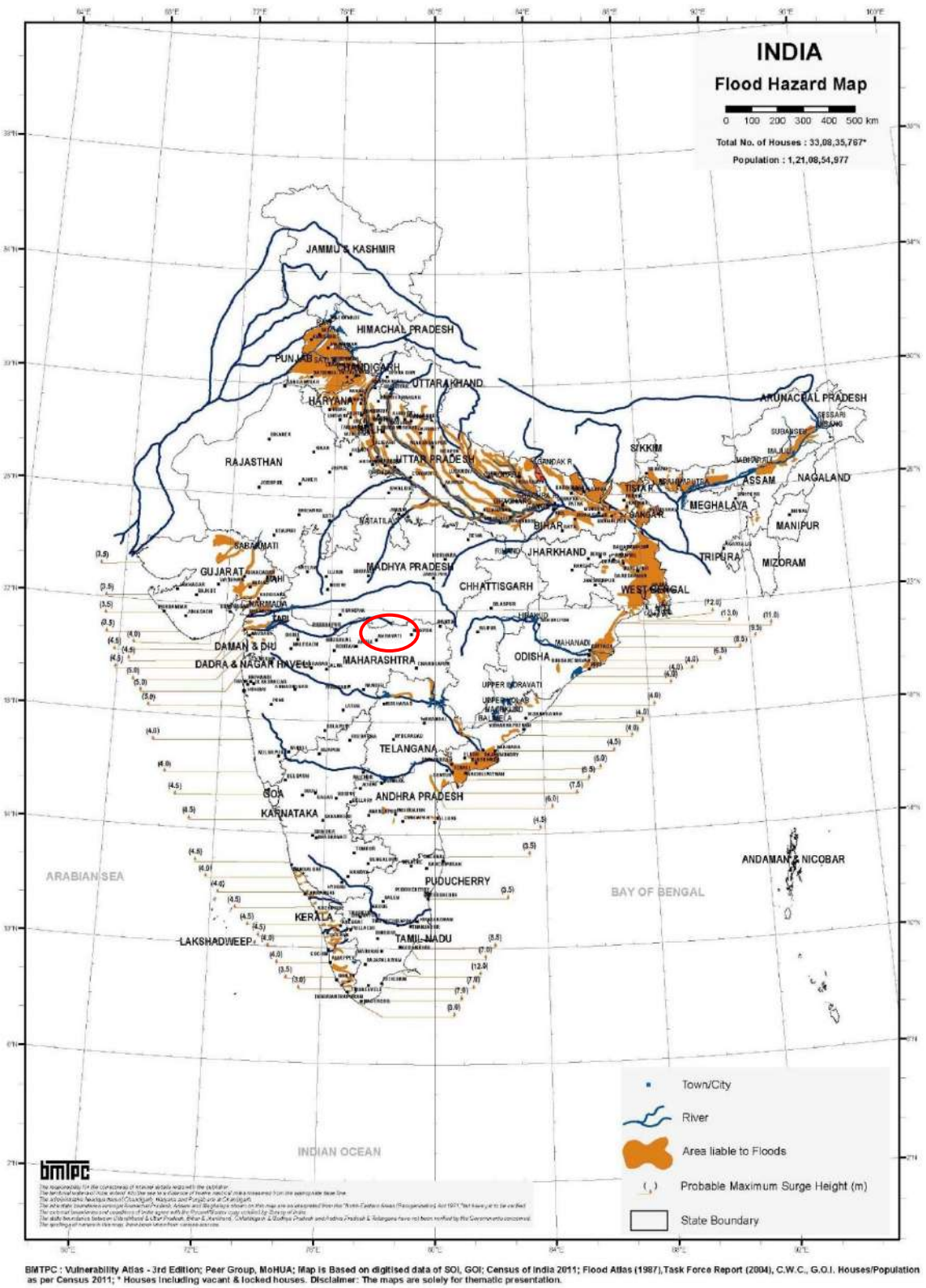


** BMTPC Vulnerability Atlas*

Figure 4-8: Earthquake Hazard Map of Maharashtra (Red Circle-Project Study Area)

4.5.6.2 Flood

The flood hazard in Amravati District (Maharashtra) is classified as **low**, meaning there is approximately a more than 1% probability of potentially damaging river floods occurring in the next decade, a return period equivalent to around 1 in 1,000 years. Unlike areas such as Akola, Amravati, though intersected by major rivers like the Purna, Wardha, and Tapti, does not typically face frequent or severe river flooding in an ordinary rainfall year. However, localized flood risks can arise in villages situated along the floodplains of small tributaries such as Purna, Pedhi, and Pil river, particularly where embankments are missing, or riverbeds are shallow and broad. These conditions may lead to surface flooding in low-lying or un-engineered areas during intense, prolonged rains. The Flood Hazard map of the India is provided in **Figure 4-9.** During the monsoon season, the state frequently receives a lot of rainfall, which causes rivers to overflow and inundate low-lying areas.

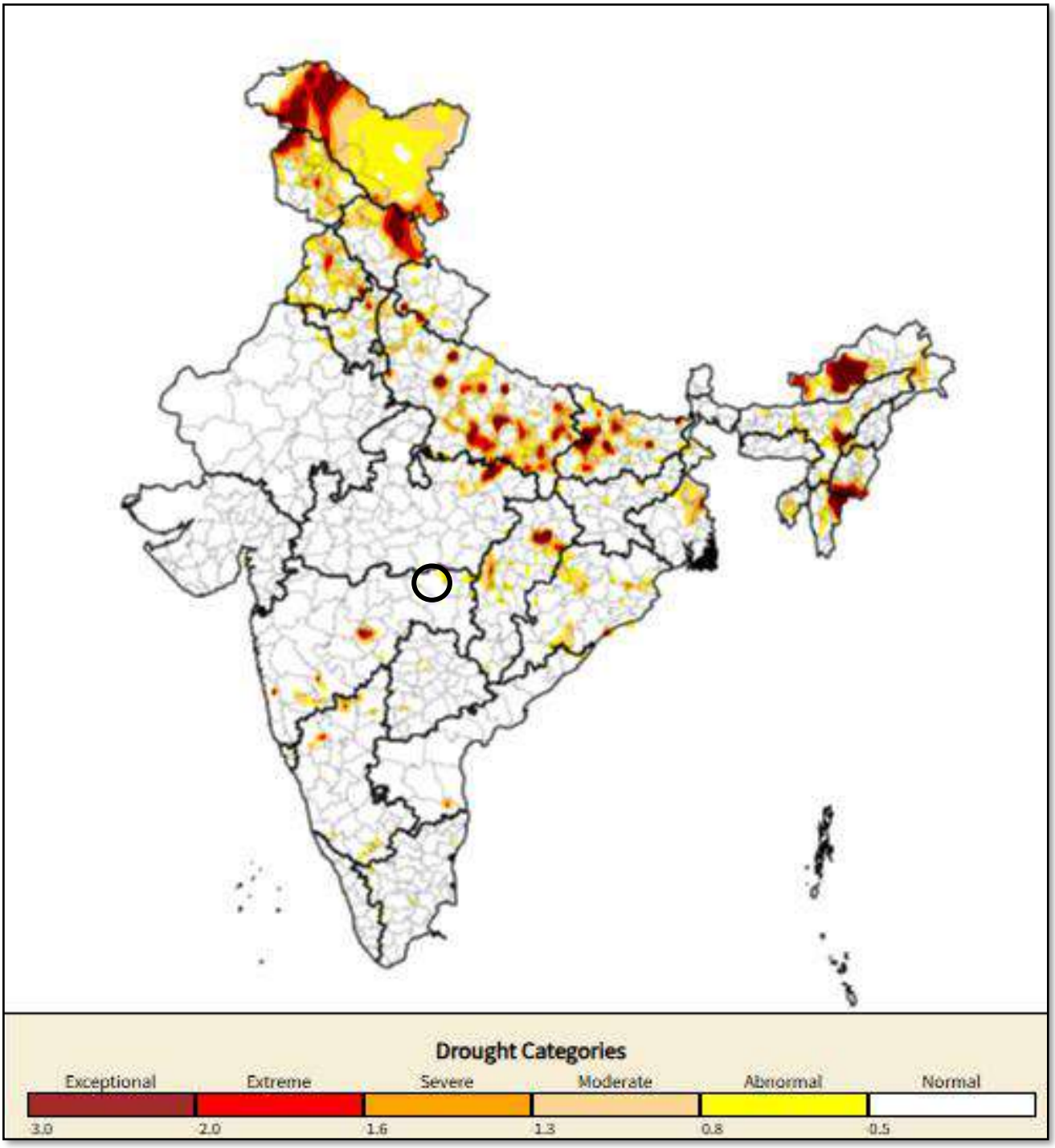


**Source-BMTPC Vulnerability Atlas*

Figure 4-9: Flood Hazard Map of India (Red Circle indicating Project Area)

4.5.6.3 Drought

Amravati district in Maharashtra in in Normal drought zone as depicted in the **Figure 4-10** Drought Prone Map of India. The region's climate is mostly dry, with extreme temperatures during the summer months and limited rainfall but the district is drained by Purna river and the several tertiary channel and tributaries of the Purna river hence the risk of draught in the region is less

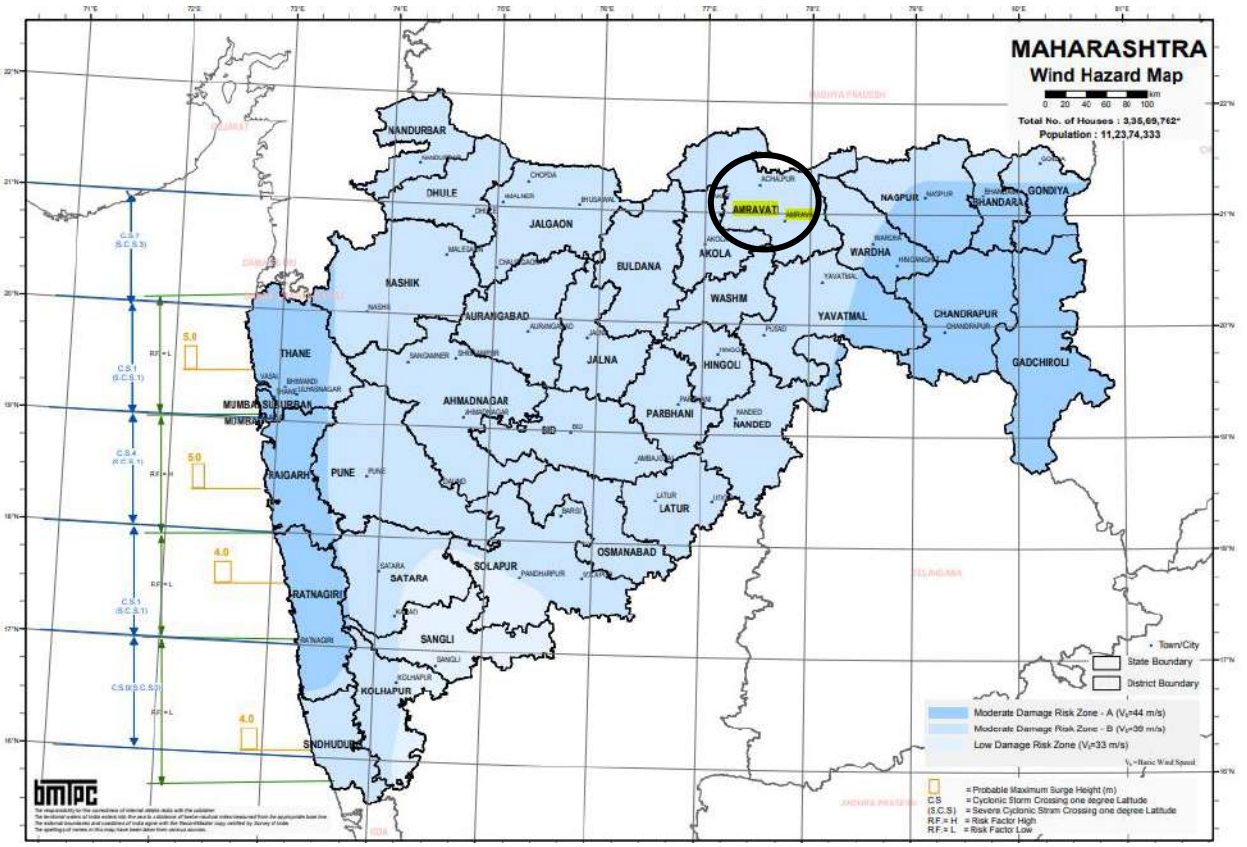


**Source: India Drought Monitor by IIT Gandhinagar*

Figure 4-10: Drought Prone Map of India (Black Circle indicating Project Area)

4.5.6.4 Wind Hazard

The project study area has been identified in Very High Damage Risk Zone - B (V_b=50 m/s), according to the Wind Hazard map of Maharashtra, Vulnerability Atlas of 3rd edition, 2019 prepared by BMTPC that has been depicted in **Figure 4-11** indicating project study area marked under Black circle.



**BMTPC Vulnerability Atlas*

Figure 4-11: Wind Hazard Map, Maharashtra (Project Area identified with "Black Circle")

4.5.7 Climate and Meteorology

The climate of study area is characterized by a hot summer and general dryness throughout the year except during the south-west monsoon season. In accordance with 3Köppen–Geiger Climate Classification system (Figure 4-15) the climate zone of project area of Amravati is Tropical Savanna, dry winter (Classification: Aw). The year may be divided into four seasons. The period from about the middle of November to the end of February constitutes the winter season. The summer season extends from March to June. This is followed by the south-west monsoon season which extends up to the end of September. October and November constitute the post-monsoon season. The climatological trends in the district is depicted in Figure 4-16. The average annual rainfall of the district is 846.5 mm (33.33"). The rainfall generally increases from the north-west towards the south-east in the district and varies from 767.3 mm. (30.21") at Telhara near the north-western border of the district to 926.8 mm. (36.49") at Washim near the south-eastern border of the district. The rainfall during the monsoon months constitutes about 85 per cent of the annual rainfall, July being the rainiest month. During the fifty-year period, 1901 to 1950, the

highest annual rainfall amounting to 150 per cent of the normal occurred in 1949, while the lowest annual rainfall, which was only 45 per cent of the normal occurred in 1920. In the same fifty-year period, the annual rainfall in the district was less than 80 per cent of the normal in ten years, two of them being consecutive. **Figure 4-13** depicts the precipitation data of the study area. The temperature trend of the study area is depicted in **Figure 4-15**. Temperature rises rapidly after February till May which is the hottest month of the year. In May, the mean daily maximum temperature at Amravati is 42.4 C and the mean daily minimum temperature is 27.5 C. The heat in the summer season is intense during the day and the nights are comparatively tolerable. During the period from April to June, on individual days, the day temperature rises up to about 46 C or 47 C. The afternoon heat is sometimes relieved by thunder showers. With the arrival of the south-west monsoon in the district by about mid-June there is an appreciable drop in the day's temperature and the weather becomes pleasant. After the withdrawal of the monsoon the day temperature increases gradually and a secondary maximum in day temperature is reached in October. However, night temperature decreases progressively after September. Both day and night temperatures decrease rapidly from October till December, which is the coldest month of the year. The mean daily maximum temperature during this month is 29.3 C and the mean daily minimum temperature is 11.9 C. In the rear of the western disturbances which move across north India in the winter months, cold waves affect the district at times and night temperatures may go down to about 2 to 4 C. Except during the south-west monsoon season when the humidity is between 60 to 80 per cent, the air is generally dry over the district. The summer months are the driest when the relative humidity is even less than 20 per cent in the afternoons on many days.

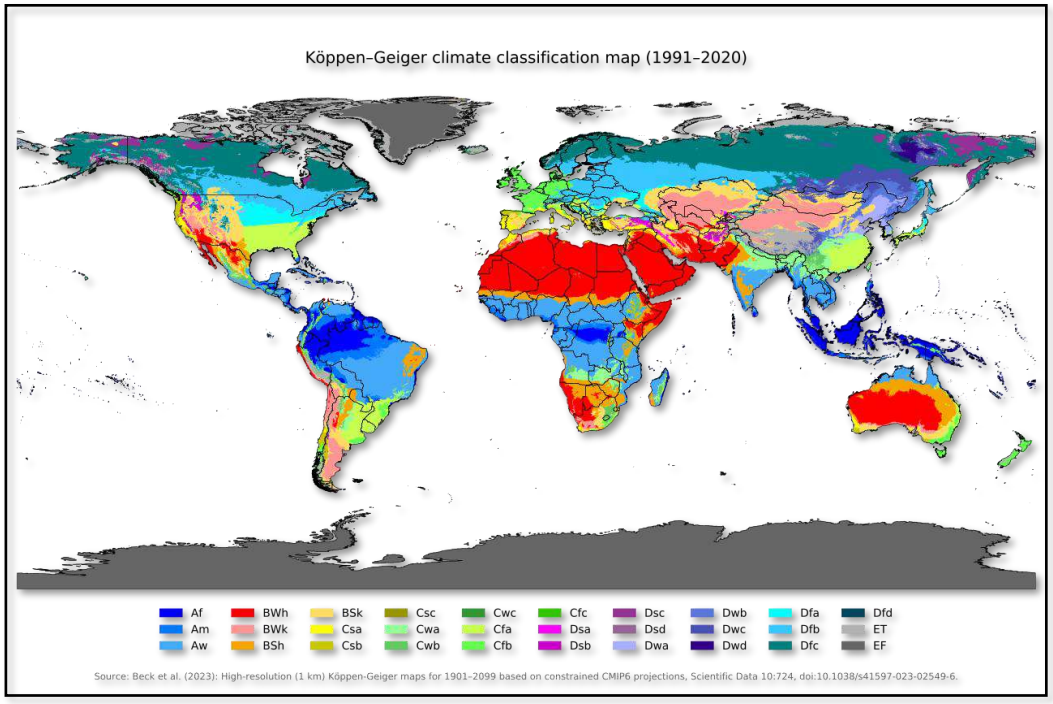
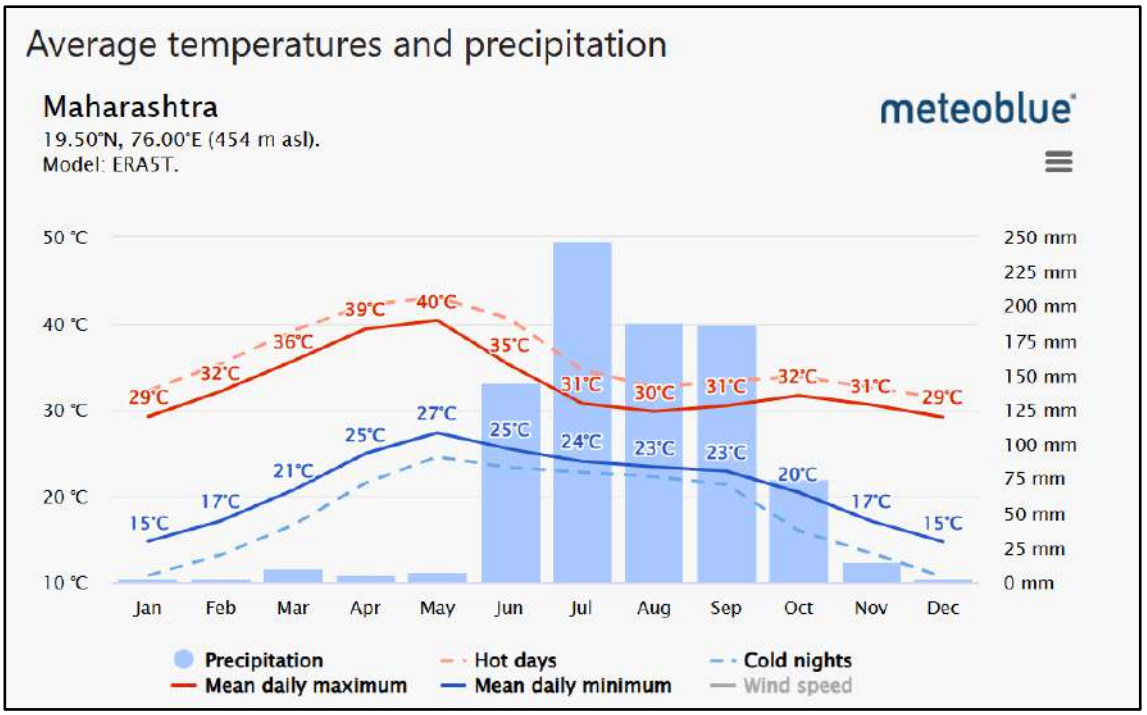
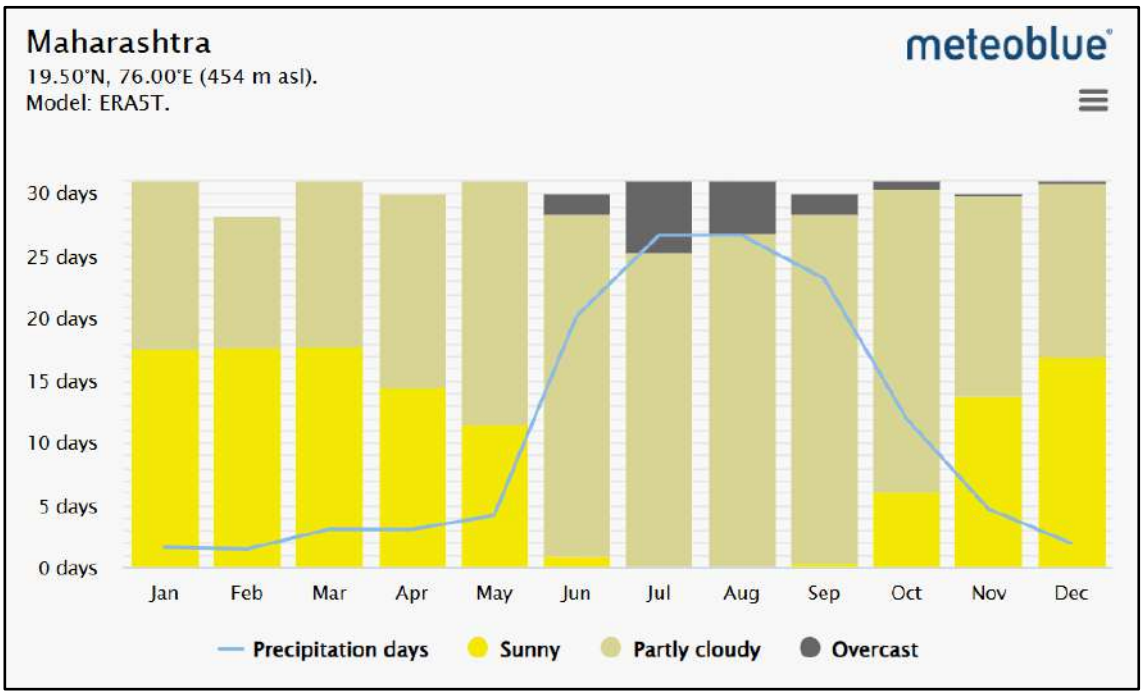


Figure 4-12: World Map of Köppen–Geiger Climate Classification



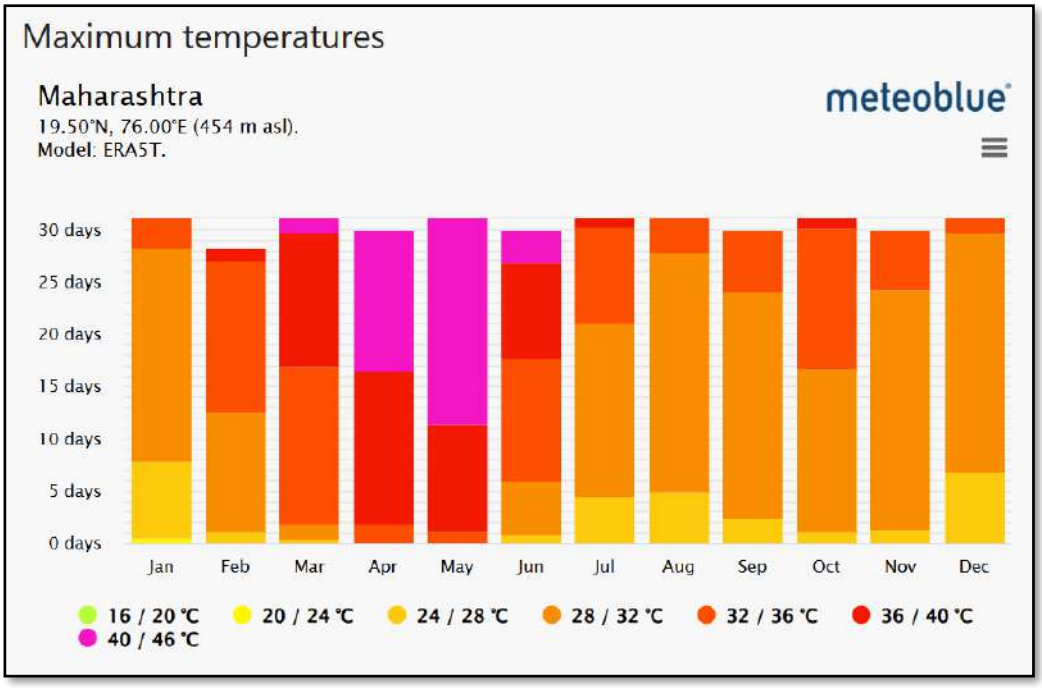
Source: Meteoblue.com

Figure 4-13: Climatological Trend in Study Area



Source: Meteoblue.com

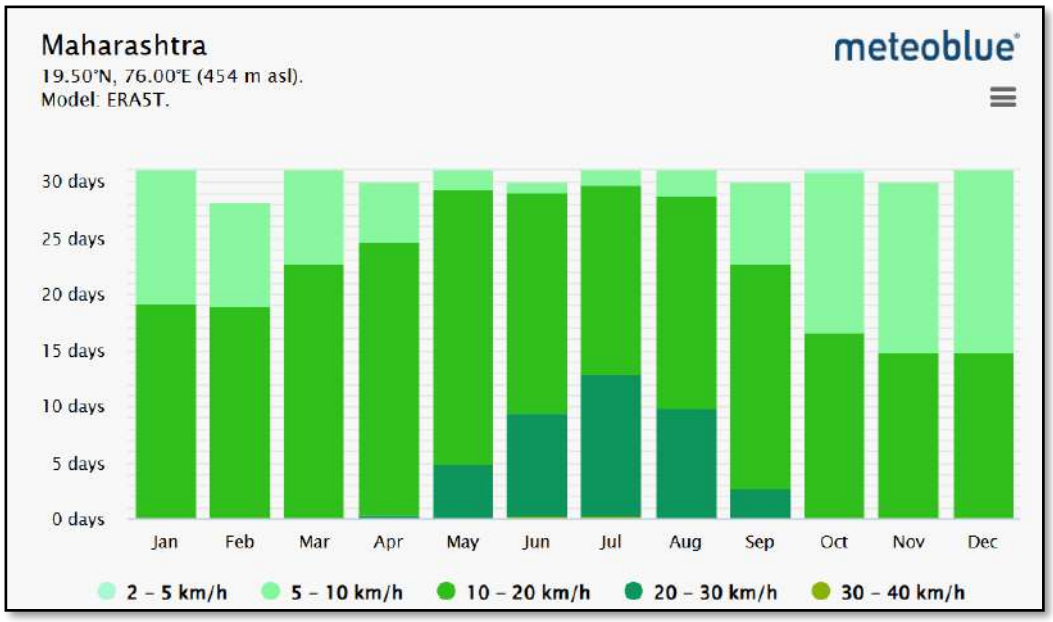
Figure 4-14: Precipitation Graph of Study Area



Source: Meteoblue.com

Figure 4-15: Temperature Trend in Study Area

Winds are generally light with some strengthening in speed in the latter part of the not season and in the early part of the monsoon season. The winds are mostly from the northeast or the east during the post monsoon and early cold weather seasons. By February, winds become westerly to northwesterly and continue to be so till June. In the south-west monsoon season, winds, from directions between. South-west and north-west are most common. The wind intensity analysis for study area is given in **Figure 4-16.**



Source: Meteoblue.com

Figure 4-16: Wind Intensity of Study Area

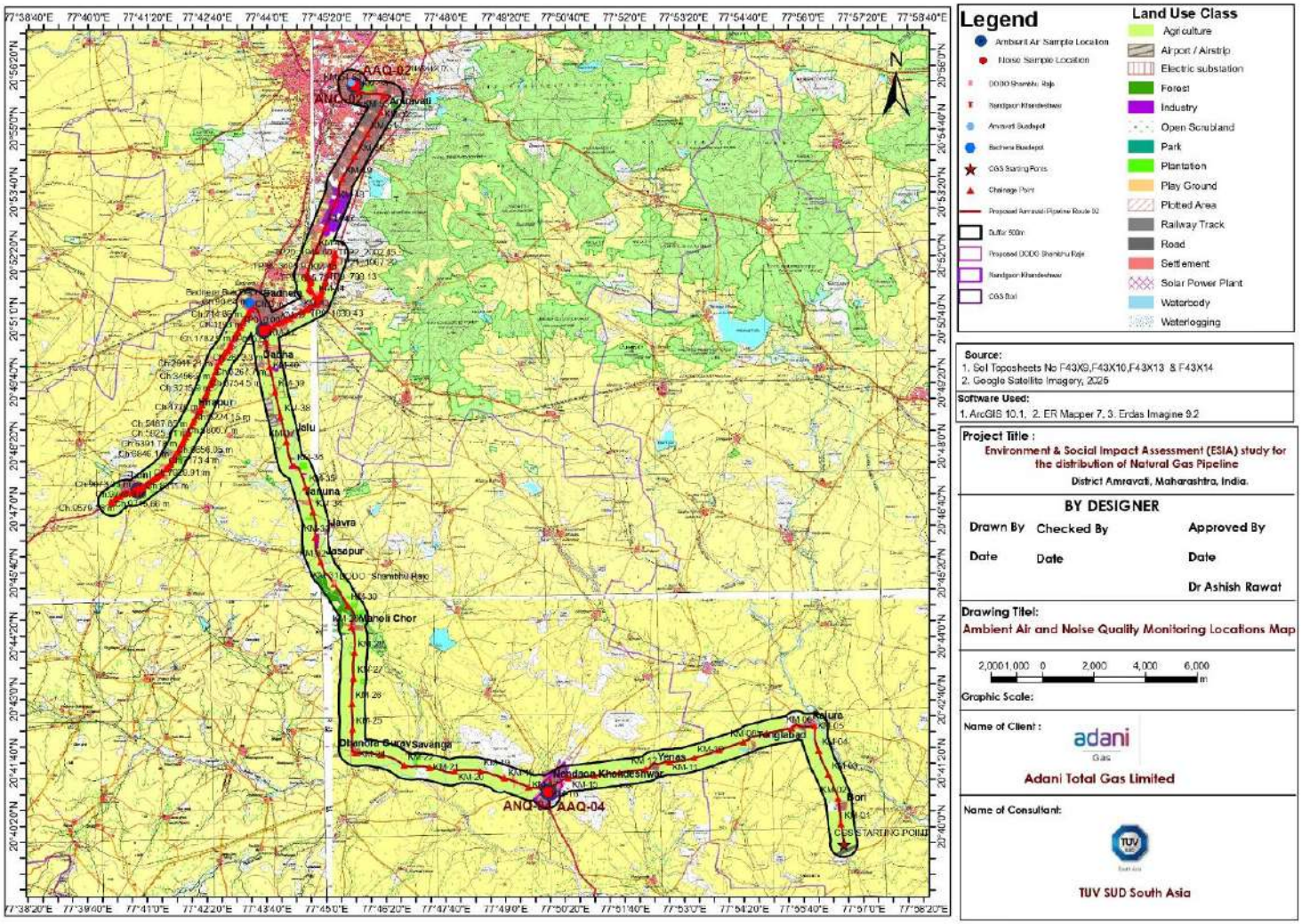
4.5.8 Ambient Air Quality

For the secondary ambient air quality monitoring the locations have been identified for all the Five stretches route as mentioned in

Table 4-7 and depicted in **Figure 4-17**. The sampling locations for air and noise quality are based on certain meteorological conditions such as wind direction, wind speed, surrounding receptors and in accordance with that, the monitoring sites are identified close to the proposed project activity area. The result of baseline ambient air monitoring is attached in the **Table 4-8**.

Table 4-7: Ambient Air Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	AAQ-01	At Junctions of SH-06 and NH-53, Near Ch-42	20°50'40.24"N 77°43'48.49"E
2.	AAQ-02	Near Amravati Bus Stand, Near Ch-54	20°55'47.43"N 77°45'55.53"E
3.	AAQ-03	Near Lori Village Near Ch-8.462	20°47'21.33"N 77°40'56.00"E
4.	AAQ-04	Nandgaon Village, At Ch-16	20°40'52.23"N 77°49'59.34"E



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-17: Ambient Air and Noise Monitoring Locations within Project AOI

Table 4-8: Air Quality Analysis Result

S. No.	Parameters	Unit	AAQ-01	AAQ-02	AAQ-03	AAQ-04	NAAQ Standards
1.	Particulate Matter (PM-10)	µg/m³	66.8	62.2	61.8	63.2	100
2.	Particulate Matter (PM-2.5)	µg/m³	13.2	13.8	14.1	13.9	60
3.	Sulphur Dioxide (SO2)	µg/m³	6.12	6.47	6.87	6.67	80
4.	Nitrogen Dioxide (NO2)	µg/m³	12.1	11.7	13.5	12.7	80
5.	Ozone (O3) -8Hr.	µg/m³	12.8	11.9	13.6	13.2	100
6.	Lead (Pb)	µg/m³	<1.0	<1.0	<1.0	<1.0	1.0
7.	Carbon Mono Oxide (CO)-1.0 Hr.	mg/m³	0.824	0.812	0.820	0.805	4.0
8.	Ammonia (NH3)	µg/m³	< 10	< 10	< 10	< 10	400
9.	Arsenic (As)	ng/m³	<1.0	<1.0	<1.0	<1.0	6
10.	Nickel (Ni)	ng/m³	<1.0	<1.0	<1.0	<1.0	20

Analysis of Result:

AAQ monitoring results for all four locations (AAQ-01 to AAQ-04) were assessed against the National Ambient Air Quality Standards (NAAQS), 2009. Trace metals such as Lead (Pb), Arsenic (As), and Nickel (Ni) were found in negligible concentrations, all recorded below 1.0 ng/m³, well within permissible limits. Ammonia (NH_3) levels were also below detection limits (<10 µg/m³) across all locations.

Particulate Matter (PM10 & PM2.5)

- PM10 concentrations ranged from 61.8 µg/m³ to 66.8 µg/m³, which are comfortably below the 24-hour NAAQS limit of 100 µg/m³.
- PM2.5 levels ranged between 13.2 µg/m³ and 14.1 µg/m³, significantly below the permissible limit of 60 µg/m³, indicating minimal risk of fine particulate pollution.

Gaseous Pollutants

- Sulphur Dioxide (SO_2) levels were between 6.12 µg/m³ and 6.87 µg/m³, well below the standard of 80 µg/m³.
- Nitrogen Dioxide (NO_2) levels ranged from 11.7 µg/m³ to 13.5 µg/m³, also far lower than the NAAQS limit of 80 µg/m³.
- Ozone (O_3) 8-hour concentrations varied between 11.9 µg/m³ and 13.6 µg/m³, which is within the safe threshold of 100 µg/m³.
- Carbon Monoxide (CO) was measured between 0.805 mg/m³ and 0.824 mg/m³, well under the 1-hour average limit of 4.0 mg/m³.

The Air Quality Index (AQI) across all four monitoring stations falls in the "**Satisfactory**" category as per CPCB classification. This indicates that the ambient air quality in the project area poses minimal health risks and is considered safe for the general population. The laboratory results of the secondary baseline monitoring is enclosed in the Error! Reference source not found.Annexure-07

4.5.9 Ambient Noise Quality

To study sound pressure levels (SPL) it will be measured by a sound level meter. Since loudness of sound is important for its effects on people, the dependence of loudness upon frequency must be considered in noise impact assessment. This has been achieved using A-weighting filters in the noise measuring instrument which gives a direct reading of approximate loudness. A-weighted equivalent continuous sound pressure level (Leq) values have been computed from the values of the A-weighted sound pressure level measured with the help of noise meter. Four (04) locations have been identified to carry out the secondary noise monitoring (as mentioned in **Table 4-9** and depicted in **Figure 4-17**) to identify the baseline noise level of the project surrounding areas, so that noise pollution during construction phase can be predicted and cumulative effect of ambient noise can be identified.

Table 4-9: Ambient Noise Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	ANQ-01	At Junctions of SH-06 and NH-53 near Ch-42	20°50'40.24"N 77°43'48.49"E
2.	ANQ-02	Near Amravati Bus Stand (Near Ch-54)	20°55'47.43"N 77°45'55.53"E
3.	ANQ-03	Near Lori Village Near Ch-8.462	20°47'21.33"N 77°40'56.00"E
4.	ANQ-04	Nandgaon Village, At Ch-16	20°40'52.23"N 77°49'59.34"E

Noise quality monitoring is conducted in each proposed project location for over a period of twenty-four hours (once) to obtain Leq values at uniform time intervals of 1 hour. In each hourly time interval Leq values it will be computed from SPL readings taken at uniform time intervals of 15 minutes. For each location, day and night-time Leq values will then be computed from the hourly Leq values so that comparison could be made with the national ambient noise standards. Day time Leq will be computed from the hourly Leq values between 6.00 a.m. - 10.00 p.m. and night-time Leq from the hourly Leq values between 10.00 p.m. - 6.00 a.m. The baseline ambient noise monitoring result is given in the **Table 4-10**.

Table 4-10: Ambient Noise Quality Monitoring Result

Sl. No.	Location	Location Code	Results in Db(A) Leq	
			Average Day Noise Level	Average Night Noise Level
1	ANQ-01 At Junctions of SH-06 and NH-53 near Ch-42 20°50'40.24"N 77°43'48.49"E	ANQ-01	48.2	39.8
2	ANQ-02 Near Amravati Bus Stand (Near Ch-54) 20°55'47.43"N 77°45'55.53"E	ANQ-02	50.9	38.8
3	ANQ-03 Near Lori Village Near Ch-8.462 20°47'21.33"N 77°40'56.00"E	ANQ-03	54.1	40.4
4	ANQ-04 Nandgaon Village, At Ch-16 20°40'52.23"N 77°49'59.34"E	ANQ-04	49.4	42.1

Limit for A Per CPCB Guidelines; Leq, dB (A)			
Sl. No.	**Zone**	**Day Time (6.00 AM to 10.00 PM)**	**Nighttime (10.00 PM to 6.00 AM)**
1	Residential area	55	45
2	Commercial area	65	55
3	Industrial area	75	70
4	Silence area	50	40

* Day Time	6.00 a.m. to 10.00 p.m	**Night Time	10.00 p.m. to 6.00 a.m

Ambient noise monitoring was carried out at four locations along the project corridor. The average daytime noise levels ranged from 48.2 dB(A) (ANQ-01) to 54.1 dB(A) (ANQ-03), while the average nighttime levels varied from 38.8 dB(A) (ANQ-02) to 42.1 dB(A) (ANQ-04). All recorded values fall within the CPCB-prescribed limits for residential areas, which are 55 dB(A) for daytime and 45 dB(A) for nighttime.

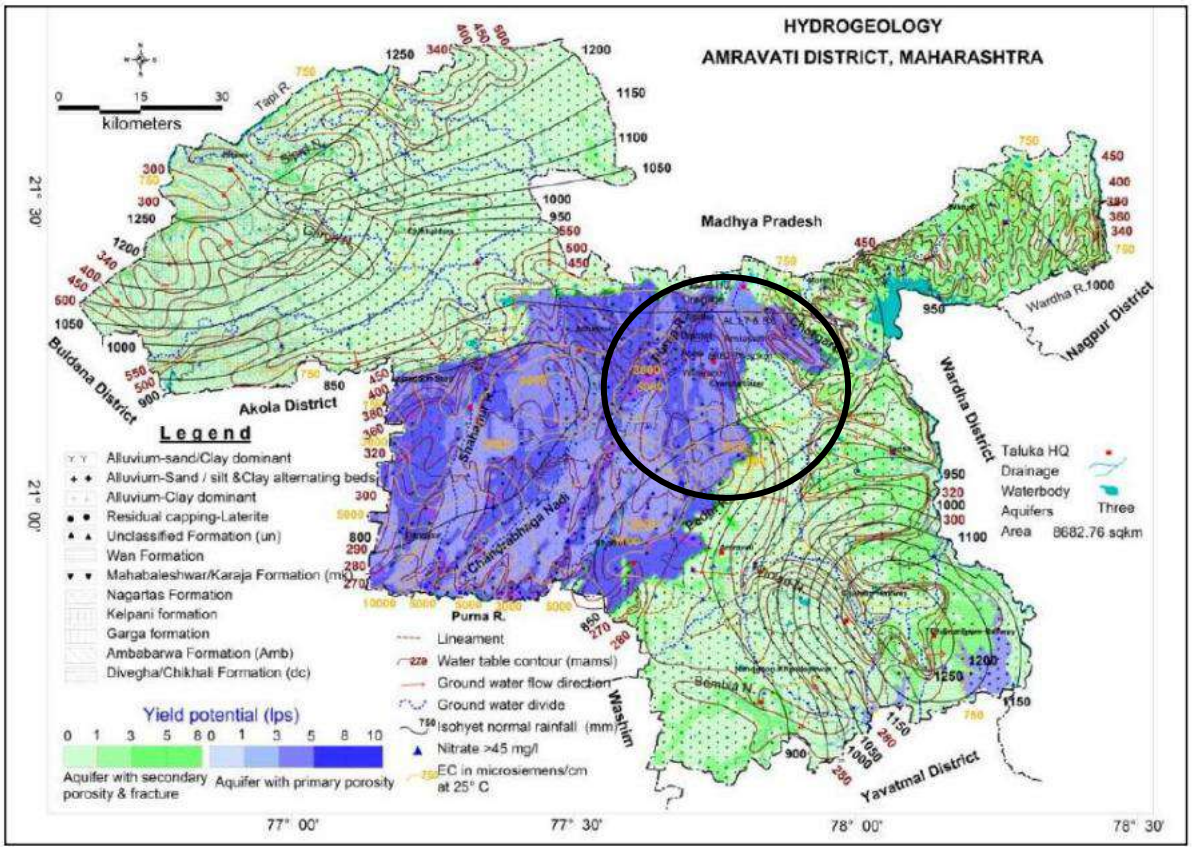
The highest daytime level was recorded at ANQ-03 (Near Lori Village) at 54.1 dB(A), and the highest nighttime level was observed at ANQ-04 (Nandgaon Village) at 42.1 dB(A). Despite being the highest, both values are within the acceptable range for residential zones and do not exceed the CPCB thresholds.

Overall, the monitoring results indicate that ambient noise levels in the study area are within permissible limits and do not pose a significant concern with respect to noise pollution. The laboratory results of the secondary baseline monitoring is enclosed in the **Annexure-07**

4.5.10 Hydrogeology and Ground Water Quality

4.5.10.1 Hydrogeology

CGWB has revealed the presence of 3 aquifer groups down to a depth of 350m. These aquifer groups comprise of fine to medium grained sand. Water table elevation ranges from 205 m to 240 m above msl. The ground water flows from northeast to southwest. The gradient of water table elevation is steeped in the northeast part and gentle in the southwest part of the study area. The gradient of ground water table is 1.08 m/km in northeast and 0.45 m/km southwest. Hydrogeological Map of district indicating project study area has been depicted in **Figure 4-18**.

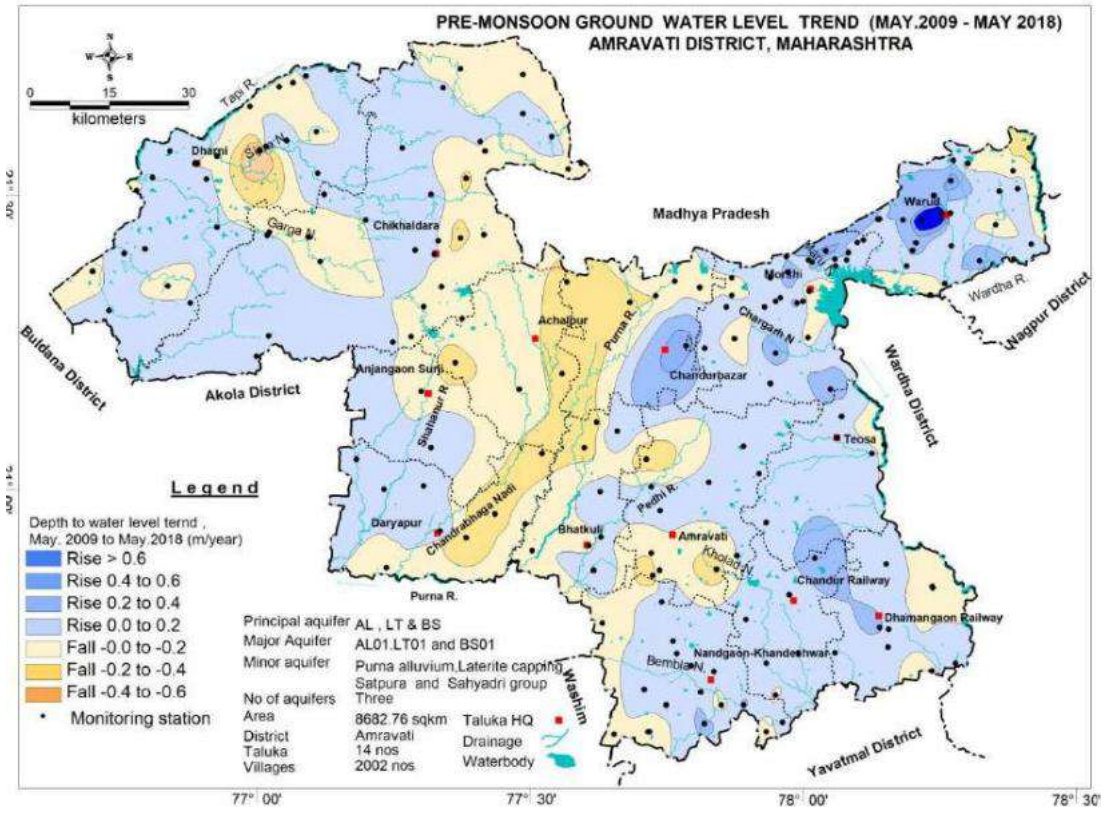


**Source: Aquifer Map and Management Plan, Amravati District*

Figure 4-18: Hydrogeological Map of Amravati District (Black Circle- Project Study Area)

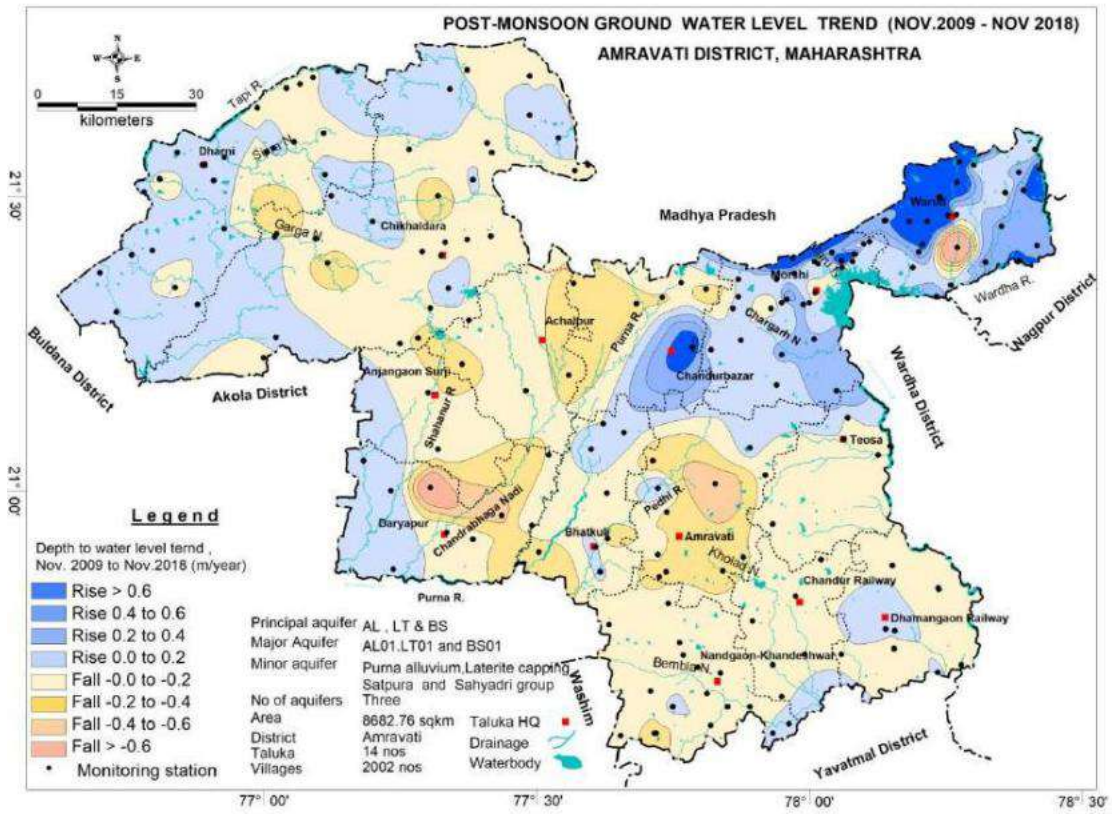
DEPTH TO WATER LEVEL

The depth to water level in the district ranges between 20-40 m bgl during pre-monsoon and 20-40 m bgl for post-monsoon. Maps indicating depth to water level during pre-monsoon & post-monsoon have been depicted in **Figure 4-19** and Error! Reference source not found.:



**Source: Aquifer Map and Management Plan, Amravati District*

Figure 4-19: Pre-Monsoon Water Level, Amravati District



Source: Aquifer Map and Management Plan, Amravati District

Figure 4-20: Post-Monsoon Water Level, Amravati District

GROUND WATER RESOURCES

Ground Water Resources are available in the different group of aquifers. The freshwater resources are estimated up to the depth of 300 m based on geophysical interpretations. The district is categorized as **Over-Exploited** as per Dynamic Groundwater Resources, 2013 assessment. [3]

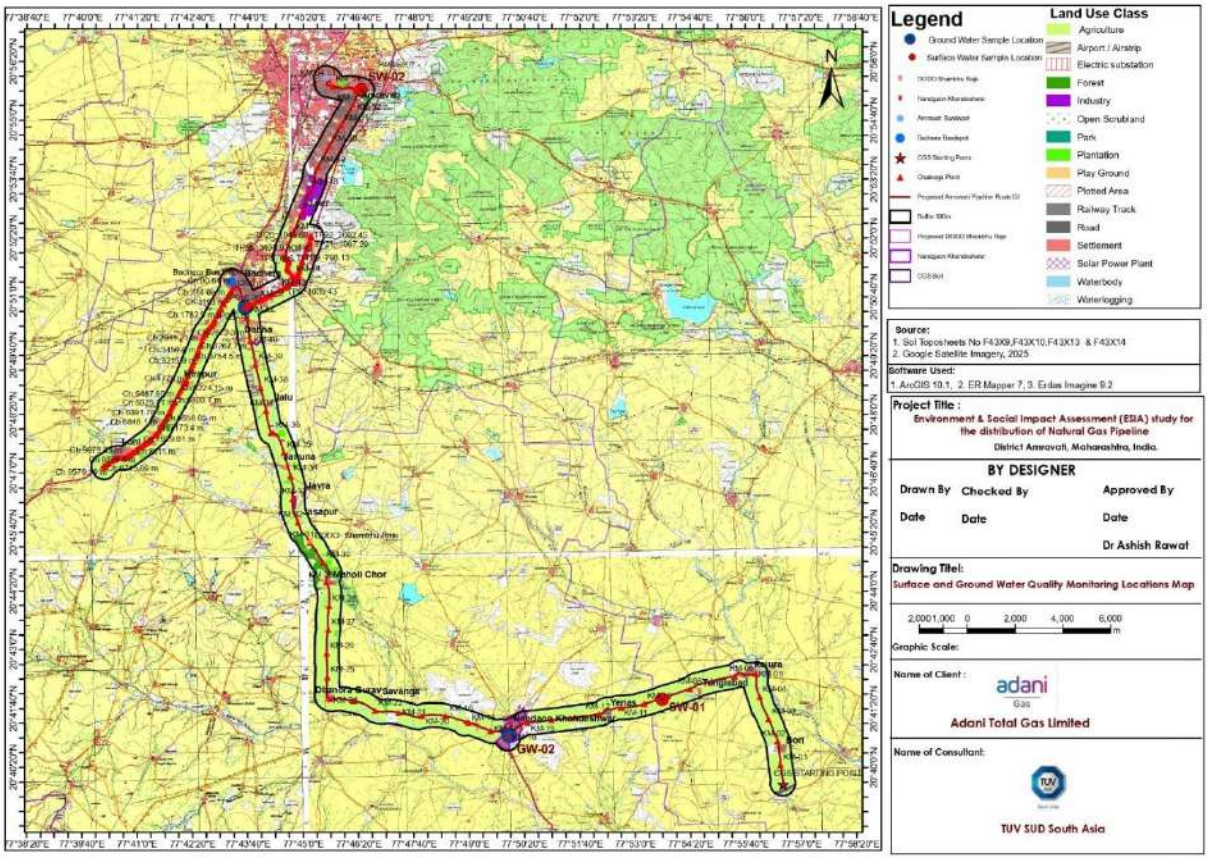
4.5.10.2 Ground Water Quality

To conduct the ground water monitoring in project study area, two (2) locations have been identified as mentioned in the **Table 4-11** and depicted in **Figure 4-21** below. The ground water quality and ground water situation of the area is studied during baseline monitoring and the ground water monitoring is results is attached in the **Table 4-12.**

Table 4-11: Ground Water Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	GWQ-1	At Junctions of SH-06 and NH-53 near Ch-42	20°50'40.24"N 77°43'48.49"E
2.	GWQ-2	Nandgaon Village, At Ch-16	20°40'52.23"N 77°49'59.34"E

[3] *Aquifer Mapping and Management Plan in Amravati District, Maharashtra*



Source: TÜV SÜD GIS Mapping Study

Figure 4-21: Surface and Groundwater Quality Monitoring Locations

Table 4-12: Ground Water Quality Monitoring Result

S. No.	Parameters	Limits (as per IS:10500-2012)		Results GW-01	Results GW-02	Test Methods
		Desirable Limit	Permissible Limit			
1	Color	--	--	0.1	0.1	IS : 3025(Pt-4) 1983, Reaff. 2017
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	IS : 3025(Pt-5) 1983, Reaff. 2017
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	IS : 3025(Pt-8)-1984, Reaff. 2017
4	Temperature	-	-	23.2	20.4	IS: 3025(Pt-9)1984 Reaff 2002
5	pH	6.5-8.5	No Relaxation	7.11	7.12	IS : 3025(Pt-11)1983, Reaff. 2017
6	Electric Conductivity	-	-	808	935	IS : 3025 (Pt-14)-2013
7	Total Hardness (as $CaCO_3$)	200	600	256.8	323.8	IS : 3025(Pt-21)1983, Reaff. 2014
8	Iron (as Fe)	0.3	No Relaxation	0.10	0.10	APHA 22nd Ed., 3120B (3111B (AAS),
9	Chlorides (as Cl)	250	1000	187.2	123.8	IS : 3025(Pt-32)1988, Reaff. 2014
10	Fluoride (as F)	1	1.5	< 0.5	< 0.5	APHA 22nd Ed., 4500F(D)
11	TDS	500	2000	671	659	IS: 3025(Pt-16)1984, Reaff. 2017
12	Calcium (as Ca^{2+})	75	200	48.9	56.6	IS :3025(Pt-40)1991, Reaff. 2014
13	Magnesium (as Mg^{2+})	30	100		47.8	APHA 22nd Ed., 3500-Mg (B)
14	Sulphate (as SO_4)	200	400	36.2	36.8	IS : 3025(Pt-24)1986, Reaff. 2014
15	Nitrate(as NO_3)	45	No Relaxation	26.1	25.0	IS : 3025(Pt-34)1988, Reaff. 2014
16	Alkalinity (as $CaCO_3$	200	600	312.1	318.8	IS: 3025(Pt-23)1986, Reaff. 2014
	Bacteriological Parameters					
1	Total Coli form	MPN/100 ml	Shall Not Be Detectable	Not Detected (<2)	Not Detected (<2)	IS : 1622-1981 (Reaff.2003)
2	E.coli	E.coli/100 ml	Shall Not Be Detectable	Absent .	Absent .	IS : 1622-1981 (Reaff-2003)

Analysis of Results:

1. **Physical and Chemical Parameters**: Both groundwater samples, GW-01 and GW-02, comply with the **desirable limits for most physical and chemical parameters** as specified in IS 10500:2012. The pH values (7.11 and 7.12), color, odour, taste, temperature, chloride (123.8–187.2 mg/l), sulphate (36.2–36.8 mg/l), nitrate (25.0–26.1 mg/l), and fluoride (<0.5 mg/l) are all within acceptable ranges. However, some parameters exceed the desirable limits:

- **Total Hardness**: GW-01 (256.8 mg/l) and GW-02 (323.8 mg/l) both exceed the desirable limit of 200 mg/l, though remain within the permissible limit of 600 mg/l.
- **Total Dissolved Solids (TDS)**: Measured at 671 mg/l (GW-01) and 659 mg/l (GW-02), both exceed the desirable limit of 500 mg/l, but are within the permissible limit of 2000 mg/l.
- **Magnesium**: GW-02 shows 47.8 mg/l, exceeding the desirable limit of 30 mg/l, yet remaining under the permissible limit of 100 mg/l.
- **Total Alkalinity**: Both samples have alkalinity values above the desirable limit of 200 mg/l (GW-01: 312.1 mg/l, GW-02: 318.8 mg/l), but below the permissible limit of 600 mg/l.

1. **Bacteriological Parameters**: Both samples meet the desirable and permissible limits for bacteriological parameters, indicating the water is microbiologically safe for consumption.

The laboratory results of the secondary baseline monitoring is enclosed in the **Annexure-07**

4.5.11 Surface Water Quality

Total Two (02) locations have been identified (as mentioned in the **Table 4-13** and map depicted in **Figure 4-21**. Both the samples were collected from the river and canal that flows within the project study area. The monitoring results are shown in the

Table 4-14.

Table 4-13: Surface Water Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	SWQ-1	At Junctions of SH-06 and NH-53 near Ch-42	20°50'40.24"N 77°43'48.49"E
2.	SWQ-2	Nandgaon Village, At Ch-16	20°40'52.23"N 77°49'59.34"E

Table 4-14: Surface Water Quality Monitoring Result

S.NO	Parameter	Unit	Result SW-01	Result SW-02
1	Turbidity	NTU	4.6	2.94
2	pH (at 25°C)	-	7.47	7.50
3	EC	µS/cm	871	910
4	Total Dissolve Solids	mg/l	410	426
5	Total Hardness as $CaCO_3$	mg/l	206	258
6	Calcium as Ca	mg/l	47.4	42.6
7	Magnesium as Mg	mg/l	20.7	26.6
8	Sodium as Na	mg/l	98.4	110.4
9	Potassium as K	mg/l	50.1	64.8

S.NO	Parameter	Unit	Result SW-01	Result SW-02
10	Chloride as Cl	mg/l	210.9	224.4
11	Sulphate as SO_4	mg/l	78.1	79.7
12	Nitrate as NO_3	mg/l	36.0	42.3
13	Total Alaklinity as $CaCO_3$	mg/l	256	268.8
14	Fluoride	mg/l	0.22	0.19

Analysis of Results:

Both SW-01 and SW-02 surface water samples meet the physical and chemical quality standards prescribed by IS 10500:2012 for drinking water. Parameters such as pH (7.47–7.50), turbidity (2.94–4.6 NTU), total dissolved solids (410–426 mg/l), total hardness (206–258 mg/l), and major ions including chlorides, sulphates, and nitrates are all within acceptable limits. Fluoride levels (0.19–0.22 mg/l) are also well below the permissible limit of 1.0 mg/l. The laboratory results of the secondary baseline monitoring is enclosed in the **Annexure-07.**

4.6 BIOLOGICAL ENVIRONMENT

Ecological studies are one of the important aspects of Environmental Impact Assessment (EIA) with a view to conserving biodiversity. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition, and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between themselves but also with the biotic components viz. physical and chemical components of the environment. Generally, biological communities are good indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important for the safety of flora and fauna. The biological environment includes terrestrial and aquatic ecosystems.

The observations and assessments of overall ecological scenario presented in this chapter include details of flora, fauna, natural habitats, protected areas, wildlife species and their migration corridors etc. Such baseline information provides a better understanding of the situation and overall ecological importance of the area. This baseline information viewed against industrial activities helps in predicting their impact on wildlife and their habitats in the region.

This section of report describes the methodology adopted for secondary data collection, diversity of higher flora and fauna recorded through primary field studies and the secondary data sourced from published scientific literature, habitat profile and ecosystem services profile and nearest designated areas of the project site.

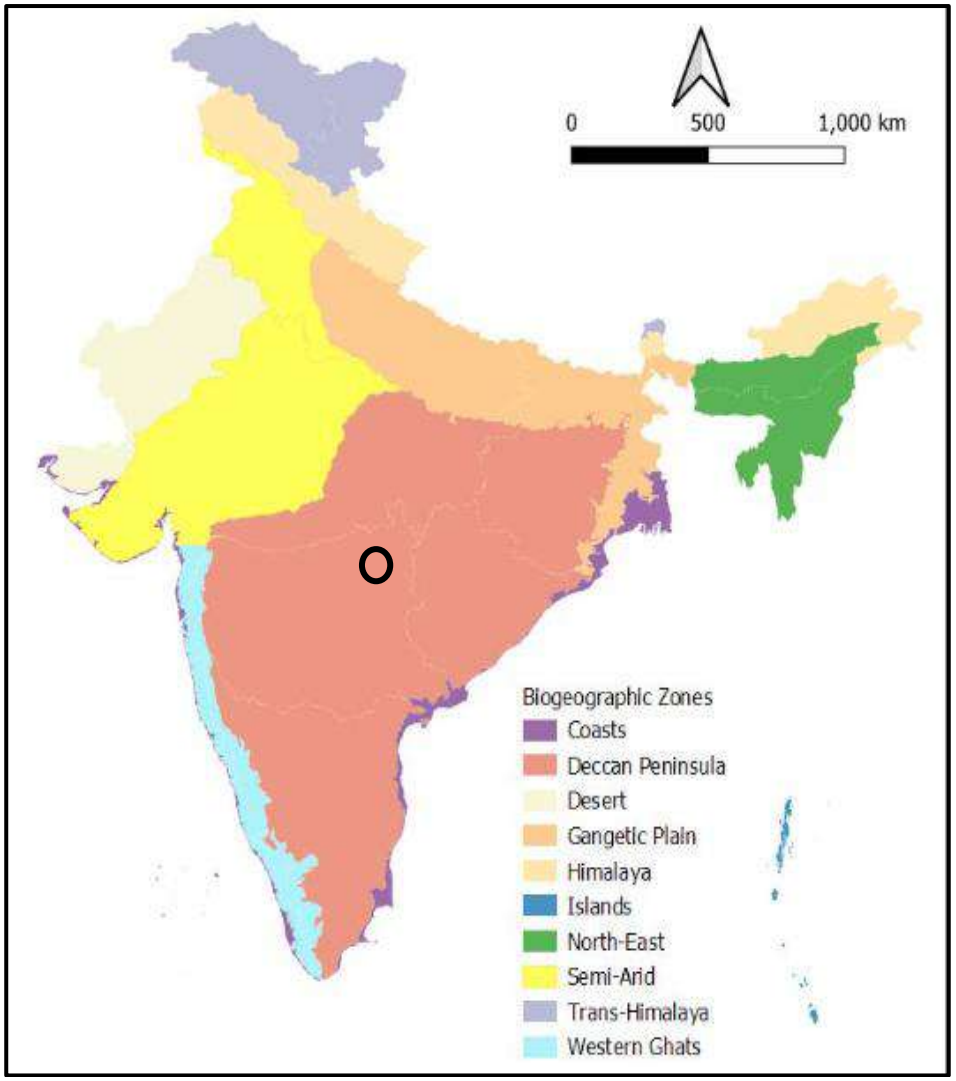
4.6.1 Scope and Objectives

The ecology & biodiversity study carried out at the project study area i.e., includes Project Footprint Area (Pipeline) and surrounding 05 km radius area of buffer zone. Based upon the study and findings, impacts were assessed and subsequently mitigation measures were recommended. Thus, further primary objectives for ecological surveys are elaborated as follows:

- Review and analyze the available literature data related to habitats, flora, and fauna of the site around proposed project and surrounding areas of 05 km radius (Buffer Zone).
- Identification of critical habitats, wildlife corridors, national parks, wildlife sanctuary, and any other areas of ecological significance.
- Identification of native, alien, exotic, rare, threatened, and endangered species (if any).
- Assessment of impacts of the project on ecology during construction and operation phase.
- Identification of any notified area under international conventions, national or local legislation for their ecological, landscape, cultural or other related values within the study site.
- Suggestion of mitigation measures to minimize/avoid adverse impacts on ecology during construction and operation phase.

4.6.2 Biogeographic Description of Study Area

According to the Biogeographic provinces of India published by Wildlife Institute of India (Rodgers, Panwar and Mathur, 2002), the project site falls under the Biogeographic Province: Deccan Peninsula (**Figure 4-22**).



*Source: https://indiaflora-ces.iisc.ac.in/bio_zones.php

Figure 4-22: Biogeographic Regions of India

4.6.3 Methodology for Ecological Survey

4.6.3.1 Desktop Review

A desktop review was conducted to determine the land use and land cover (Toposheet, Satellite imagery), Forest type (Champion and Seth, 1962), Bio-geographic provinces and zones (Rodgers, Panwar and Mathur 2000) and floral & faunal assemblage in the study area from published documents/papers etc. To provide representative ecological status for the project, existing critical habitats, scrubs/vegetative cover and water bodies around the project area and other factors were searched/collected and selected for ecological survey in and around such habitats. To conduct the survey, a core and buffer zone was delineated, so that ecological receptors and impacts on them can be established during the EIA process. The core and buffer zone are as follows:

- Project Footprint Area
- Area of Influence and the buffer zone

4.6.3.2 Baseline Survey

Secondary data collection and primary on-site survey were two components of the baseline survey. The secondary baseline survey was carried out to determine the existing ecological conditions and was designed to fill any data gaps, and to facilitate an adequate assessment of the project impacts upon local ecology and the development of appropriate mitigation measures. Prior to that, secondary data regarding sensitive ecological habitat (national park, sanctuary, ecological sensitive area, migratory corridor, habitat of endangered, vulnerable and range restricted species etc.) has been reviewed from desktop study and further flora & fauna in the project area was recorded through undertaking primary baseline phytosociological analysis, public consultation and through referring other authentic published documents to understand the major flora & fauna in the study area, assemblage of birds in the water bodies during peak winter in India, pressure on the local natural resources, presence of any Schedule-I species in the project area.

Based on secondary analysis of authenticated documents, inventory of floral and faunal species was made and are elaborated in the following section.

4.6.3.3 Study of Ecological Habitat

4.6.3.3.1 Forests

Amravati district lies in the Vidarbha region of Maharashtra and includes a mix of agricultural, forested, and urbanized areas. As per the Champion and Seth Classification (1968), forests in the region fall primarily under the Tropical Dry Deciduous Forests category. These forests are dominated by species like Tectona grandis (Teak), Diospyros melanoxylon (Tendu), Anogeissus latifolia (Dhaora), and Terminalia tomentosa (Saja). The Recorded Forest Area (RFA) in Amravati district is approximately 4,310.27 sq km, which constitutes about 40% of the district's total geographical area (FSI, 2021). This includes Reserved Forests (RFs), Protected Forests (PFs), and Unclassed Forests, majorly concentrated in the Melghat Tiger Reserve, which is a critical ecological zone. The Melghat Tiger Reserve (MTR), located in the Satpura hill ranges in northern Amravati, forms the core of the forest landscape. It comprises the Gugamal National Park, Melghat Wildlife Sanctuary, and surrounding buffer areas. Due to the presence of this reserve, significant forest tracts in the district are protected under the Wildlife Protection Act, 1972.

According to the Forest Survey of India (FSI) State of Forest Report 2021, Amravati district reported a slight net gain in forest cover of approximately 5.25 sq km between 2019 and 2021, primarily due to reforestation efforts and improved satellite assessment.

Under the Forest (Conservation) Act, 1980, forest diversion for non-forestry purposes is regulated. As per MoEF&CC data (2020), several smaller forest land parcels were diverted in Amravati for linear infrastructure and irrigation projects in the last decade, subject to compensatory afforestation and NPV norms.

Agroforestry practices have also been promoted in Amravati under the Maharashtra Agroforestry Policy, 2016, particularly on degraded agricultural lands to reduce pressure on natural forests and supplement rural livelihoods. Teak, bamboo, and subabul (Leucaena leucocephala) are commonly grown under agroforestry schemes.

4.6.3.3.2 Scrubland

In Amravati district, scrubland occupies a significant portion of uncultivated and degraded lands, primarily distributed across fallow areas, open forest edges, and grazing zones. As per the Bhuvan LULC data (2015–16), scrublands in the district cover approximately 211.39 sq. km, with an additional 819.47 sq. km categorized as scrub forest. Scrubland is commonly found in non-irrigated zones and near forested patches, especially in the southern and southeastern parts of the district. According to satellite assessments and thematic forest mapping, these open scrub areas are prevalent near villages such as Dhanora Gurav, Bori, and Javra, and serve as transitional ecosystems between agricultural land and dense forest cover

4.6.3.3.3 Cropping Pattern of Study Area

The agricultural land use in Amravati district is characterized by a diverse cropping pattern and is predominantly rainfed. The primary crop rotation followed in the region includes cotton, soybean, and wheat. According to Bhuvan data (2015–16), the total agricultural land in Amravati comprises approximately 6,773.62 sq. km of crop land, 1,001.41 sq. km of fallow land, and 344.59 sq. km of plantation area. Key crops cultivated during the Kharif season include cotton, soybean, and pigeon pea (tur), while wheat, chickpea (gram), and safflower are commonly grown during the Rabi season. In areas with access to irrigation, particularly through small and medium reservoirs and canal systems, perennial and plantation crops such as banana, citrus, and papaya are also cultivated. Despite the presence of these irrigation sources in select pockets, the majority of the district continues to rely heavily on rainfed agriculture.

4.6.3.3.4 Water Bodies

Amravati district has a modest but ecologically relevant network of **rivers, reservoirs, and canals**, as seen in the **Drainage Map**. Major Water bodies in the district include:

- **Rivers/Streams/Canals**: 130.45 sq. km
- **Reservoirs/Lakes/Ponds**: 146.73 sq. km
- **Inland wetlands**: 0.21 sq. km

Notable water bodies in the region include:

- **Wardha River** (Western boundary)
- **Pak River** (Northern catchment)
- **Upper Tapi basin streams** (Southern reaches)

These water bodies are largely **seasonal**, fed by monsoon precipitation and play a vital role in local agriculture and biodiversity support. The list of water bodies in the study area is provided in the Error! Reference source not found..

4.6.3.3.5 Protected Area and Eco-sensitive Areas

The Melghat Tiger Reserve (MTR), located in the northwestern part of Amravati, is the only designated Protected Area (PA) within the district boundary. It is located outside the 10 km radius of the current pipeline corridor but influences the broader ecological setting.

The reserve consists of:

- Gugamal National Park
- Melghat Wildlife Sanctuary
- Buffer zones and reserved forests covering multiple ranges in Chikhaldara and Dharni talukas

No other National Parks, Wildlife Sanctuaries, Ramsar Sites, or Conservation Reserves fall within the 10 km study area buffer of the pipeline. However, seasonal wetlands and water bodies may serve as resting and feeding grounds for local and migratory birds.

Data collected and gathered information from primary and secondary sources on flora, fauna, protected area, natural habitats, wildlife species etc., were analyzed and results are presented below in **Table 4-15**.

Table 4-15: Details of Eco-sensitive Areas of Project Study Area

Ecological Sensitive Habitat	Description
National Parks/ Wildlife Sanctuary/ Biosphere reserves/ Elephant Reserve/ Any Other Reserves	None within 10 km However, Gugamal National Park and Melghat Wildlife Sanctuary are around 100 km away from the study area.
Important Bird Areas (IBAs)	None within 10 km radius study area
Ramsar Wetland Site	None within 10 km radius study area
Wildlife Corridors & Routes	Nil
Breeding/nesting areas of endangered species	Nil

**Source: BirdLife International (2022) Country profile: India (http://datazone.birdlife.org/country/india)*
https://wiienvis.nic.in/Database/ramsar_wetland_sites_8224.aspx
https://wiienvis.nic.in/Database/IBA_8463.aspx

4.6.3.3.6 Migratory Birds and Migratory Pathway

Amravati lies along the broader Central Asian Flyway (CAF), which extends from the Palearctic to the Indian subcontinent. While no Important Bird Areas (IBAs) or designated wetlands exist within the project influence zone (10 km), transient visitation by waterfowl and migratory species (such as ducks, herons, and storks) is possible in post-monsoon months (October–March), especially around reservoirs and tanks in villages like Dhanora Gurav, Badnera, and Nandgaon Khandeshwar.

These birds utilize agricultural wetlands and ephemeral streams as staging areas during their southward migration. However, no large-scale congregation sites or globally significant roosting habitats have been recorded within the direct impact zone.

4.6.3.3.7 Floral Diversity

A detailed secondary study in both project area and study area has been carried out to assess the present floristic composition in the region. The present study documented 180 plant species for both core zone and buffer zone area of study area up to 10 km radius.

CORE ZONE HABITAT

Tabulated details of flora recorded in the study area have been provided below in **Table 4-18** below:

Table 4-16: List of Floral species in Study Area

S. No	Scientific Name	Common Name	Family	IUCN Status
Trees				
1	*Acacia catechu*	Black Cutch	Fabaceae	Not Evaluated
2	*Acacia leucophloea*	White Bark Acacia	Fabaceae	Least Concern
3	*Acacia nilotica*	Gum Arabic Tree	Fabaceae	Least Concern
4	*Acacia pennata*	Climbing Acacia	Fabaceae	Least Concern
5	*Adina cordifolia*	Haldu	Rubiaceae	Not Evaluated
6	*Aegle marmelos*	Golden Apple	Rutaceae	NearThreatened
7	*Ailanthus excelsa*	Indian Tree of Heaven	Simaroubaceae	Not Evaluated
8	*Albizia amara*	Krishna Siris	Fabaceae	Least Concern
9	*Albizia lebbeck*	Woman's Tongue	Fabaceae	Least Concern
10	*Albizia odoratissima*	Black Siris	Fabaceae	Least Concern
11	*Albizia procera*	White siris	Mimosaceae	Least Concern
12	*Alstonia scholaris*	Indian Devil Tree	Apocynaceae	Least Concern
13	*Annona reticulata*	Sugar Apple	Anonaceae	Least Concern
14	*Annona squamosa*	Custard Apple	Anonaceae	Least Concern
15	*Anogeissus latifolia*	Axle Wood Tree	Combretaceae	Not Evaluated
16	*Araucaria columnaris*	Christmas Tree	Araucariaceae	Least Concern
17	*Azadiracta indica*	Neem	Meliaceae	Not Evaluated
18	*Bambusa arundinacea*	Bamboo	Poaceae	Not Evaluated
19	*Bauhinia malabarica*	Malabar Bauhinia	Caesalpiniaceae	Least Concern
20	*Bauhinia purpurea*	Purple Orchid Tree	Fabaceae	Least Concern
21	*Bauhinia racemosa*	Bidi Leaf Tree	Fabaceae	Not Evaluated
22	*Bombax ceiba*	Cotton Tree	Malvaceae	Least Concern
23	*Boswellia serrata*	Indian Frankincense	Burseraceae	Not Evaluated
24	*Bridelia retusa*	Spinous Kino Tree	Phyllanthaceae	Least Concern
25	*Buchanania lanzan*	Cuddapah Almond	Anacardiaceae	Not Evaluated
26	*Butea monosperma*	Flame Of The Forest	Fabaceae	Least Concern
27	*Careya arborea*	Wild Guava	Lecythidaceae	Not Evaluated
28	*Carica papaya*	Papaya	Caricaceae	Data Deficient
29	*Cassia fistula*	Golden Shower Tree	Caesalpiniaceae	Least Concern
30	*Cassine glauca*	Ceylon Tea	Celastraceae	Not Evaluated
31	*Ceiba pentandra*	Kapok Tree	Bombacaceae	Least Concern
32	*Chloroxylon swietenia*	Ceylon Satinwood	Rutaceae	Vulnerable
33	*Cleistanthus collinus*	Garari	Phyllanthaceae	Vulnerable
34	*Cochlospermum religiosum*	Butter Cup Tree	Bixaceae	Not Evaluated

S. No	Scientific Name	Common Name	Family	IUCN Status
35	*Cocos nucifera*	Coconut	Arecaceae	Not Evaluated
36	*Dalbergia latifolia*	East Indian Rosewood	Fabaceae	Vulnerable
37	*Dalbergia paniculata*	Patri	Fabaceae	Not Evaluated
38	*Dalbergia sissoo*	Indian Rosewood	Fabaceae	Least Concern
39	*Delonix regia*	Gulmohar	Caesalpinioideae	Least Concern
40	*Diospyros melanoxylon*	Coromandel Ebony	Ebenaceae	Not Evaluated
41	*Diospyros montana*	Vishtendu	Ebenaceae	Not Evaluated
42	*Emblica officinalis*	Gooseberry	Phyllanthaceae	Least Concern
43	*Erythrina variegata*	Indian Coral Tree	Fabaceae	Least Concern
44	*Ficus benghalensis*	Indian Banyan	Moraceae	Not Evaluated
45	*Ficus hispida*	Hairy Fig	Moraceae	Least Concern
46	*Ficus religiosa*	Sacred Fig	Moraceae	Not Evaluated
47	*Flacourtia indica*	Governor's Plum	Salicaceae	Least Concern
48	*Gardenia latifolia*	Indian Boxwood	Rubiaceae	Not Evaluated
49	*Gardenia turgida*	Karumba	Rubiaceae	Not Evaluated
50	*Garuga pinnata*	Garuga	Burseraceae	Not Evaluated
51	*Gmelina arborea*	Gamhar	Verbenaceae	Least Concern
52	*Grevillea robusta*	Silver Oak	Proteaceae	Least Concern
53	*Grewia tiliifolia*	Dhaman	Malvaceae	Not Evaluated
54	*Helicteres isora*	Indian Screw Tree	Malvaceae	Not Evaluated
55	*Lagerstroemia parviflora*	Small Flowered Crape Myrtle	Lythraceae	Not Evaluated
56	*Lannea coromandelica*	Indian Ash Tree	Anacardiaceae	Least Concern
57	*Leucaena leucocephala*	Wild Tamarind	Mimosoideae	Not Evaluated
58	*Madhuca indica*	Mahua	Sapotaceae	Not Evaluated
59	*Mangifera indica*	Mango	Anacardiaceae	Data Deficient
60	*Manilkara hexandra*	Ceylon Iron Wood	Sapotaceae	Not Evaluated
61	*Mitragyna parvifolia*	Kaim	Rubiaceae	Not Evaluated
62	*Moringa oleifera*	Drumstick	Moringaceae	Least Concern
63	*Nyctanthes arbor-tristis*	Tree of Sadness	Oleaceae	Least Concern
64	*Ougeinia oojeinensis*	Sandam	Fabaceae	Not Evaluated
65	*Phoenix sylvestris*	Silver Date Palm	Arecaceae	Not Evaluated
66	*Phyllanthus emblica*	Indian Gooseberry	Phyllanthaceae	Least Concern
67	*Polyalthia longifolia*	False Ashok	Annonaceae	Not Evaluated
68	*Pongamia pinnata*	Indian Beech Tree	Fabaceae	Least Concern
69	*Prosopis juliflora*	Mesquite	Mimosoideae	Not Evaluated
70	*Psidium guajava*	Guava	Myrtaceae	Least Concern
71	*Pterocarpus marsupium*	Indian Kino Tree	Fabaceae	Near Threatened
72	*Schleichera oleosa*	Ceylon Oak	Sapindaceae	Least Concern
73	*Schrebera swietenioides*	Weaver's Beam Tree	Oleaceae	Not Evaluated
74	*Semecarpus anacardium*	Marking Nut	Anacardiaceae	Not Evaluated
75	*Soymida febrifuga*	Indian Redwood	Meliaceae	Not Evaluated
76	*Sterculia urens*	Gum Karaya	Malvaceae	Not Evaluated

S. No	Scientific Name	Common Name	Family	IUCN Status
77	*Syzygium cumini*	Jamun	Myrtaceae	Least Concern
78	*Tamarindus indica*	Tamarind	Casalpinaceae	Least Concern
79	*Tamilnadia uliginosa*	Divine Jasmine	Rubiaceae	Not Evaluated
80	*Tectona grandis*	Teak	Lamiaceae	Endangered
81	*Terminalia arjuna*	Arjuna	Combretaceae	Not Evaluated
82	*Terminalia bellirica*	Baheda	Combretaceae	Not Evaluated
83	*Terminalia chebula*	Yellow Myrobalan	Combretaceae	Least Concern
84	*Vitex negundo*	Five-leaved Chaste Tree	Lamiaceae	Least Concern
85	*Wrightia tinctoria*	Sweet Indrajao	Apocynaceae	Least Concern
86	*Ziziphus jujuba*	Indian Jujube	Rhamnaceae	Least Concern
87	*Ziziphus mauritiana*	Chinese Date	Rhamnaceae	Least Concern
88	*Ziziphus xylopyrus*	Kath Ber	Rhamnaceae	Not Evaluated
Shrubs				
89	*Abutilon indicum*	Indian Mallow	Malvaceae	Not Evaluated
90	*Balanites aegyptiaca*	Desert Date	Zygophyllaceae	Not Evaluated
91	*Calotropis gigantea*	Milkweed	Asclepidaceae	Not Evaluated
92	*Calotropis procera*	Giant Milkweed	Apocynaceae	Not Evaluated
93	*Carissa carandas*	Karonda	Apocynaceae	Not Evaluated
94	*Casearia tomentosa*	Mojal	Salicaceae	Not Evaluated
95	*Cassia auriculata*	Avaram	Caesalpinaceae	Not Evaluated
96	*Datura metel*	Devil's Trumpet	Solanaceae	Not Evaluated
97	*Dendrocalamus strictus*	Calcutta Bamboo	Poaceae	Not Evaluated
98	*Dodonaea viscosa*	Hop Bush	Sapindaceae	Least Concern
99	*Gardenia gummifera*	Gummy Gardenia	Rubiaceae	Least Concern
100	*Hibiscus rosa-sinensis*	Hibiscus	Malvaceae	Not Evaluated
101	*Hygrophila auriculata*	Marsh Barbel	Acanthaceae	Least Concern
102	*Justicia adhatoda*	Malabar Nut	Acanthaceae	Not Evaluated
103	*Kydia calycina*	Kydia	Malvaceae	Least Concern
104	*Lantana camara*	Lantana	Verbenaceae	Not Evaluated
105	*Maytenus emarginata*	Baikal	Celastraceae	Not Evaluated
106	*Miliusa velutina*	Miliusa	Annonaceae	Not Evaluated
107	*Mimosa hamata*	Hooked Mimosa	Fabaceae	Not Evaluated
108	*Nerium oleander*	Oleander	Apocynaceae	Least Concern
109	*Phoenix acaulis*	Dwarf Date Palm	Arecaceae	Not Evaluated
110	*Tephrosia purpurea*	Common Tephrosia	Fabaceae	Not Evaluated
111	*Xylia xylocarpa*	Burma Ironwood	Fabaceae	Least Concern
Herbs				
112	*Achyranthes aspera*	Prickly Chaff Flower	Amaranthaceae	Not Evaluated
113	*Agave americana*	Century Plant	Asparagaceae	Least Concern
114	*Aloe barbadensis*	Aloe Vera	Asphodelaceae	Least Concern
115	*Alternanthera sessilis*	Sessile Joyweed	Amarantheceae	Not Evaluated
116	*Amaranthus spinosus*	Spiny Amaranth	Amaranthaceae	Not Evaluated

S. No	Scientific Name	Common Name	Family	IUCN Status
117	*Amaranthus viridis*	Slender Amaranth	Amaranthaceae	Not Evaluated
118	*Amorphophallus paeoniifolius*	Elephant Yam	Araceae	Least Concern
119	*Andrographis paniculata*	King of Bitters	Acanthaceae	Not Evaluated
120	*Argemone mexicana*	Mexican Prickly Poppy	Papaveraceae	Not Evaluated
121	*Barleria prionitis*	Porcupine Flower	Acanthaceae	Least Concern
122	*Cajanus scarabaeoides*	Showy Pigeonpea	Fabaceae	Least Concern
123	*Cassia tora*	Stinking Cassia	Fabaceae	Not Evaluated
124	*Cleome viscosa*	Asian Spider Flower	Cleomaceae	Not Evaluated
125	*Croton bonplandianus*	Croton	Euphorbiaceae	Not Evaluated
126	*Curculigo orchioides*	Golden Eye-grass	Hypoxidaceae	Not Evaluated
127	*Cyperus rotundus*	Java Grass	Cyperaceae	Least Concern
128	*Digitaria ciliaris*	Wild Crabgrass	Poaceae	Not Evaluated
129	*Euphorbia hirta*	Asthma Weed	Euphorbiaceae	Not Evaluated
130	*Grewia hirsuta*	Kukurbicha	Tiliaceae	Not Evaluated
131	*Hyptis suaveolens*	American Mint	Lamiaceae	Not Evaluated
132	*Indigofera tinctoria*	True Indigo	Fabaceae	Not Evaluated
133	*Jatropha gossypiifolia*	Bellyache Bush	Euphorbiaceae	Least Concern
134	*Martynia annua*	Devil's Claw	Martyniaceae	Not Evaluated
135	*Mimosa pudica*	Touch-me-not	Fabaceae	Least Concern
136	*Ocimum basilicum*	Sweet Basil	Lamiaceae	Not Evaluated
137	*Oxalis corniculata*	Creeping Wood Sorrel	Oxalidaceae	Not Evaluated
138	*Parthenium hysterophorus*	Carrot Weed	Asteraceae	Not Evaluated
139	*Phyllanthus niruri*	Gale of the Wind	Euphorbiaceae	Not Evaluated
140	*Sida acuta*	Common Wireweed	Malvaceae	Not Evaluated
141	*Solanum xanthocarpum*	Yellow-fruit nightshade	Solanaceae	Not Evaluated
142	*Stylosanthes hamata*	Caribbean Stylo	Fabaceae	Not Evaluated
143	*Tribulus terrestris*	Puncture Vine	Zygophyllaceae	Least Concern
144	*Tridax procumbens*	Coat Buttons	Asteraceae	Not Evaluated
145	*Typha angustifolia*	Narrowleaf Cattail	Typhaceae	Least Concern
146	*Vanda tessellata*	Checkered Vanda	Orchidaceae	Least Concern
147	*Woodfordia fruticosa*	Fire Flame Bush	Lythraceae	Least Concern
148	*Xanthium strumarium*	Common Cocklebur	Asteraceae	Not Evaluated
Climbers				
149	*Abrus precatorius*	Rosary Pea	Fabaceae	Not Evaluated
150	*Aristolochia indica*	Indian Bithwort	Aristolochiaceae	Not Evaluated
151	*Asparagus racemosus*	Wild Asparagus	Liliaceae	Not Evaluated
152	*Bauhinia vahlii*	Maloo Creeper	Fabaceae	Not Evaluated
153	*Capparis zeylanica*	Ceylon Caper	Capparaceae	Not Evaluated
154	*Celastrus paniculatus*	Black Oil Plant	Celastraceae	Not Evaluated
155	*Cocculus hirsutus*	Broom Creeper	Menispermaceae	Not Evaluated
156	*Cryptolepis buchananii*	Wax Leaved Climber	Apocynaceae	Not Evaluated

S. No	Scientific Name	Common Name	Family	IUCN Status
157	*Cuscuta reflexa*	Cuscuta	Convolvulaceae	Not Evaluated
158	*Epipremnum aureum*	Money Plant	Araceae	Not Evaluated
159	*Gloriosa superba*	Glory Lily	Colchicaceae	Least Concern
160	*Hemidesmus indicus*	Indian Sarasaparilla	Apocynaceae	Not Evaluated
161	*Mucuna pruriens*	Velvet Bean	Fabaceae	Not Evaluated
162	*Nyctanthes arbortristis*	Night-flowering jasmine	Oleaceae	Not Evaluated
163	*Piper betle*	Betel Pepper	Piperacae	Not Evaluated
164	*Tinospora cordifolia*	Heart-leaved Moonseed	Menispermaceae	Not Evaluated
165	*Ziziphus oenoplia*	Jackal Jujube	Rhamnaceae	Not Evaluated
Grasses				
166	*Apluda mutica*	Mauritian Grass	Poaceae	Not Evaluated
167	*Aristida adscensionis*	Common Needle Grass	Poaceae	Not Evaluated
168	*Aristida funiculata*	Short-lived Perennial Grass	Poaceae	Not Evaluated
169	*Chrysopogon aciculatus*	Love Grass	Poaceae	Not Evaluated
170	*Chrysopogon fulvus*	Reddish-Yellow Beard Grass	Poaceae	Not Evaluated
171	*Cynodon dactylon*	Bermuda Grass	Poaceae	Not Evaluated
172	*Dichanthium annulatum*	Marvel Grass	Poaceae	Not Evaluated
173	*Eragrostis amabilis*	Japanese Love Grass	Poaceae	Not Evaluated
174	*Heteropogon contortus*	Spear Grass	Poaceae	Not Evaluated
175	*Imperata cylindrica*	Cogon Grass	Poaceae	Not Evaluated
176	*Isilema laxum*	Musal Grass	Poaceae	Not Evaluated
177	*Sehima nervosum*	Rat-Tail Grass	Poaceae	Not Evaluated
178	*Themeda quadrivalvis*	Grader Grass	Poaceae	Not Evaluated
179	*Vetiveria zizanioides*	Vetiver	Poaceae	Not Evaluated
Hydrophytes				
180	*Ipomoea carnea*	Pink Morning Glory	Convolvulaceae	Not Evaluated

**Not Evaluated: species has not yet been assessed for its risk of extinction based on the IUCN's criteria*
***Data Deficient: insufficient information to make a proper conservation status assessment of IUCN criteria*

4.6.4 Faunal Diversity

Diversity of faunal distribution shows the health of ecosystem. The project study area is predominantly occupied by agricultural land masses. Thus, faunal diversity of the study area has been identified as very low.

4.6.4.1 Mammals

Mammals occupy higher tropical levels in many ecosystems and respond quickly to the changes in their habitats, therefore, serves as best indicators of the ecosystem health. Hence, the baseline information on distribution and abundance of mammals is prepared. A qualitative check list of mammals based on their

presences and absence using indirect evidence and signs such as footprints, dens, droppings, diggings, scrap marks, etc. in the study area was prepared. The following list of mammal species as presented in **Table 4-17** were predominantly recorded in the project study area.

Table 4-17: List of Mammals Species in Project Study Area

Sl. No.	Scientific Name	Common Name	IWPA, 2022	IUCN Conservation Status
1	Antilope cervicapra	Black Buck	I	Least Concern
2	Axis axis	Spotted Deer	II	Least Concern
3	Bandicota indica	Greater Bandicoot Rat	-	Least Concern
4	Boselaphus tragocamelus	Nilgai	II	Least Concern
5	Canis aureus	Jackal	I	Least Concern
6	Felis chaus	Jungle Cat	I	Least Concern
7	Funambulus palmarum	Three-striped Palm Squirrel	-	Least Concern
8	Hystrix indica	Indian Porcupine	I	Least Concern
9	Lepus nigricollis	Indian Hare	II	Least Concern
10	Rattus rattus	House Rat	-	Least Concern
11	Semnopithecus entellus	Northern Plains Gray Langur	II	Least Concern
12	Sus scrofa	Wild Boar	II	Least Concern
13	Urva edwardsii	Grey Mongoose	I	Least Concern

**Sources: TÜV SÜD Primary Survey and secondary data Study*
IUCN-The IUCN Red List of Threatened Species. Version 2023-1.
Schedules I to II: Indian Wildlife (Protection) Act, 2022. LC: Least Concern, IUCN Red List of Threatened Species

4.6.4.2 Herpetofauna

The diversity of amphibian and reptilian species in an ecosystem is cumulatively called Herpeto-faunal diversity. Amphibians are fauna which can survive on land as well as in water. They inhabit a wide variety of habitats with most species living within terrestrial, fossorial, arboreal or freshwater aquatic ecosystems. Their presence witnesses the richness of ecosystems. They are omnivorous in feeding habits. The following (**Table 4-18** and **Table 4-19**) species of herpetofauna were observed in the study area.

Table 4-18: Reptile Species recorded in Project Study Area

S. No	Scientific Name	Common Name	IWPA, 2022	IUCN Conservation Status
Reptiles				
1	*Amphiesma stolatum*	Buff Striped Keelback	II	Least Concern
2	*Boiga trigonata*	Indian Gamma Snake	II	Least Concern
3	*Calotes versicolor*	Oriental Garden Lizard	-	Least Concern
4	*Chamaeleo zeylanicus*	Indian Chameleon	I	Least Concern
5	*Daboia russelii*	Russell's Viper	I	Least Concern
6	*Dendrelaphis tristis*	Daudin's Bronzeback	II	Least Concern
7	*Eryx conicus*	Rough-tailed Sand Boa	-	Near Threatened
8	*Eutropis carinata*	Keeled Indian Mabuya	-	Least Concern
9	*Lycodon aulicus*	Indian Wolf Snake	II	Least Concern
10	*Macropisthodon plumbicolor*	Green Keelback	II	Least Concern

11	*Naja naja*	Indian Cobra	I	Least Concern
12	*Ptyas mucosa*	Indian Rat Snake	I	Least Concern
13	*Python molurus*	Indian Rock Python	I	Near Threatened
14	*Varanus bengalensis*	Bengal Monitor Lizard	I	Near Threatened

Table 4-19: Amphibian Species recorded in Project Study Area

S. No	Scientific Name	Common Name	IWPA, 2022	IUCN Conservation Status
Amphibians				
15	*Duttaphrynus melanostictus*	Common Indian Toad	-	Least Concern
16	*Hoplobatrachus tigerinus*	Indian Bull Frog	II	Least Concern
17	*Polypedates maculatus*	Indian Tree Frog	-	Least Concern

**Sources: TÜV SÜD Primary Survey and secondary data Study*
IUCN-The IUCN Red List of Threatened Species. Version 2023-1.
Schedules I to II: Indian Wildlife (Protection) Act, 2022. LC: Least Concern, IUCN Red List of Threatened Species

4.6.4.3 Avifauna

One hundred twenty-four (124) species of Avifauna have reported ranges that fully or partially overlap the study area. Among the 124 bird species 62 species were directly sighted during the primary survey. Out of 124 species 84 terrestrial and 01 are aquatic species are reported in study area. The list of avifauna observed or reported in study area is presented in **Table 4-20**.

Table 4-20: List of Avifaunal species in Project Study Area

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
1	*Accipiter badius*	Shikra	Resident	I	Least Concern
2	*Acridotheres tristis*	Common Myna	Resident	II	Least Concern
3	*Acrocephalus dumetorum*	Blyth's Reed Warbler	Winter Migrant	II	Least Concern
4	*Actitis hypoleucos*	Common Sandpiper	Winter Migrant	II	Least Concern
5	*Aegithina tiphia*	Common Iora	Resident	II	Least Concern
6	*Alcedo atthis*	Common Kingfisher	Resident	II	Least Concern
7	*Amandava amandava*	Red Munia	Resident	II	Least Concern
8	*Amaurornis phoenicurus*	White-breasted Waterhen	Resident	II	Least Concern
9	*Ammomanes phoenicura*	Rufous-tailed Lark	Resident	II	Least Concern
10	*Anas acuta*	Northern Pintail	Winter Migrant	II	Least Concern
11	*Anas crecca*	Common Teal	Winter Migrant	II	Least Concern
12	*Anas poecilorhyncha*	Indian Spot-billed Duck	Resident	II	Least Concern

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
13	*Anastomus oscitans*	Asian Openbill	Resident	II	Least Concern
14	*Anhinga melanogaster*	Oriental Darter	Resident	II	Near Threatened
15	*Anser indicus*	Bar-headed Goose	Winter Migrant	II	Least Concern
16	*Anthus rufulus*	Paddyfield Pipit	Resident	II	Least Concern
17	*Anthus trivialis*	Tree Pipit	Winter Migrant	II	Least Concern
18	*Apus affinis*	Little Swift	Resident	II	Least Concern
19	*Ardea alba*	Great Egret	Resident	II	Least Concern
20	*Ardea cinerea*	Grey Heron	Resident	II	Least Concern
21	*Ardea intermedia*	Intermediate Egret	Resident	II	Least Concern
22	*Ardea purpurea*	Purple Heron	Resident	II	Least Concern
23	*Ardeola grayii*	Indian Pond Heron	Resident	II	Least Concern
24	*Argya caudata*	Common Babbler	Resident	II	Least Concern
25	*Argya malcolmi*	Large Grey Babbler	Resident	II	Least Concern
26	*Argya striata*	Jungle Babbler	Resident	II	Least Concern
27	*Athene brama*	Spotted Owlet	Resident	II	Least Concern
28	*Aythya ferina*	Common Pochard	Winter Migrant	I	Vulnerable
29	*Butastur teesa*	White-eyed Buzzard	Resident	I	Least Concern
30	*Butorides striata*	Striated Heron	Resident	II	Least Concern
31	*Cacomantis passerinus*	Grey-bellied Cuckoo	Resident	II	Least Concern
32	*Caprimulgus affinis*	Savanna Nightjar	Resident	II	Least Concern
33	*Caprimulgus asiaticus*	Indian Nightjar	Resident	II	Least Concern
34	*Cecropis daurica*	Red-rumped Swallow	Resident	II	Least Concern
35	*Centropus sinensis*	Greater Coucal	Resident	II	Least Concern

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
36	*Ceryle rudis*	Pied Kingfisher	Resident	II	Least Concern
37	*Charadrius dubius*	Little Ringed Plover	Winter Migrant	II	Least Concern
38	*Chrysomma sinense*	Yellow-eyed Babbler	Resident	II	Least Concern
39	*Ciconia episcopus*	Woolly-necked Stork	Resident	II	Vulnerable
40	*Cinnyris asiaticus*	Purple Sunbird	Resident	II	Least Concern
41	*Cisticola juncidis*	Zitting Cisticola	Resident	II	Least Concern
42	*Clamator jacobinus*	Pied Cuckoo	Summer Migrant	II	Least Concern
43	*Columba livia*	Rock Pigeon	Resident	-	Least Concern
44	*Copsychus fulicatus*	Indian Robin	Resident	II	Least Concern
45	*Copsychus saularis*	Oriental Magpie-Robin	Resident	II	Least Concern
46	*Coracias benghalensis*	Indian Roller	Resident	II	Least Concern
47	*Corvus splendens*	House Crow	Resident	-	Least Concern
48	*Cypsiurus balasiensis*	Asian Palm-Swift	Resident	II	Least Concern
49	*Dendrocitta vagabunda*	Rufous Treepie	Resident	II	Least Concern
50	*Dendrocygna javanica*	Lesser Whistling Duck	Resident	II	Least Concern
51	*Dicrurus leucophaeus*	Ashy Drongo	Resident	II	Least Concern
52	*Dicrurus macrocercus*	Black Drongo	Resident	II	Least Concern
53	*Egretta garzetta*	Little Egret	Resident	II	Least Concern
54	*Elanus caeruleus*	Black-winged Kite	Resident	II	Least Concern
55	*Emberiza melanocephala*	Black-headed Bunting	Winter Migrant	II	Least Concern
56	*Eremopterix griseus*	Ashy-crowned Sparrow Lark	Resident	II	Least Concern
57	*Eudynamys scolopaceus*	Asian Koel	Resident	II	Least Concern
58	*Euodice malabarica*	Indian Silverbill	Resident	II	Least Concern

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
59	*Falco tinnunculus*	Common Kestrel	Winter Migrant	II	Least Concern
60	*Fulica atra*	Eurasian Coot	Winter Migrant	II	Least Concern
61	*Glareola lactea*	Small Pratincole	Resident	II	Least Concern
62	*Gracupica contra*	Asian Pied Starling	Resident	II	Least Concern
63	*Gymnoris xanthocollis*	Yellow-throated Sparrow	Resident	II	Least Concern
64	*Halcyon smyrnensis*	White-throated Kingfisher	Resident	II	Least Concern
65	*Hierococcyx varius*	Common Hawk Cuckoo	Resident	II	Least Concern
66	*Himantopus himantopus*	Black-winged Stilt	Resident	II	Least Concern
67	*Hirundo rustica*	Barn Swallow	Winter Migrant	II	Least Concern
68	*Hirundo smithii*	Wire-Tailed Swallow	Resident	II	Least Concern
69	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	Summer Migrant	II	Least Concern
70	*Iduna caligata*	Booted Warbler	Winter Migrant	II	Least Concern
71	*Jynx torquilla*	Eurasian Wryneck	Resident	II	Least Concern
72	*Lanius cristatus*	Brown Shrike	Winter Migrant	II	Least Concern
73	*Lanius schach*	Long-tailed Shrike	Resident	II	Least Concern
74	*Lanius vittatus*	Bay-backed Shrike	Resident	II	Least Concern
75	*Leptocoma zeylonica*	Purple-rumped Sunbird	Resident	II	Least Concern
76	*Limosa limosa*	Black-tailed Godwit	Winter Migrant	II	Near Threatened
77	*Lonchura punctulata*	Scaly-breasted Munia	Resident	II	Least Concern
78	*Mareca penelope*	Eurasian Wigeon	Winter Migrant	II	Least Concern
79	*Merops orientalis*	Green Bee-eater	Resident	II	Least Concern
80	*Microcarbo niger*	Little Cormorant	Resident	II	Least Concern
81	*Milvus migrans*	Black Kite	Resident	II	Least Concern

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
82	*Mirafra erythroptera*	Indian Bushlark	Resident	II	Least Concern
83	*Motacilla alba*	White Wagtail	Winter Migrant	II	Least Concern
84	*Motacilla cinerea*	Grey Wagtail	Winter Migrant	II	Least Concern
85	*Motacilla flava*	Western Yellow Wagtail	Winter Migrant	II	Least Concern
86	*Motacilla maderaspatensis*	White-browed Wagtail	Resident	II	Least Concern
87	*Mycteria leucocephala*	Painted Stork	Resident	II	Near Threatened
88	*Ocyceros birostris*	Indian Grey Hornbill	Resident	II	Least Concern
89	*Oriolus kundoo*	Indian Golden Oriole	Resident	II	Least Concern
90	*Orthotomus sutorius*	Common Tailorbird	Resident	II	Least Concern
91	*Ortygornis pondicerianus*	Grey Francolin	Resident	II	Least Concern
92	*Passer domesticus*	House Sparrow	Resident	II	Least Concern
93	*Pastor roseus*	Rosy Starling	Summer Migrant	II	Least Concern
94	*Pavo cristatus*	Indian Peafowl	Resident	I	Least Concern
95	*Phalacrocorax carbo*	Great Cormorant	Resident	II	Least Concern
96	*Phoenicurus ochruros*	Black Redstart	Winter Migrant	II	Least Concern
97	*Plegadis falcinellus*	Glossy Ibis	Winter Migrant	II	Least Concern
98	*Ploceus philippinus*	Baya Weaver	Resident	II	Least Concern
99	*Porphyrio poliocephalus*	Grey-headed Swamphen	Resident	II	Least Concern
100	*Prinia inornata*	Plain Prinia	Resident	II	Least Concern
101	*Prinia socialis*	Ashy Prinia	Resident	II	Least Concern
102	*Pseudibis papillosa*	Red-naped Ibis	Resident	II	Least Concern

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
103	*Psilopogon haemacephalus*	Coppersmith Barbet	Resident	II	Least Concern
104	*Psittacula cyanocephala*	Plum-headed Parakeet	Resident	II	Least Concern
105	*Psittacula eupatria*	Alexandrine Parakeet	Resident	II	Near Threatened
106	*Psittacula krameri*	Rose-ringed Parakeet	Resident	II	Least Concern
107	*Pycnonotus cafer*	Red-vented Bulbul	Resident	II	Least Concern
108	*Saxicola caprata*	Pied Bushchat	Resident	II	Least Concern
109	*Spatula clypeata*	Northern Shoveler	Winter Migrant	II	Least Concern
110	*Spatula querquedula*	Garganey	Winter Migrant	II	Least Concern
111	*Spilopelia chinensis*	Spotted Dove	Resident	II	Least Concern
112	*Spilopelia senegalensis*	Laughing Dove	Resident	II	Least Concern
113	*Streptopelia decaocto*	Eurasian Collared Dove	Resident	II	Least Concern
114	*Streptopelia tranquebarica*	Red Collared Dove	Resident	II	Least Concern
115	*Sturnia pagodarum*	Brahminy Starling	Resident	II	Least Concern
116	*Taccocua leschenaultii*	Sirkeer Malkoha	Resident	II	Least Concern
117	*Tachybaptus ruficollis*	Little Grebe	Resident	II	Least Concern
118	*Terpsiphone paradisi*	Indian Paradise-Flycatcher	Resident	II	Least Concern
119	*Treron phoenicopterus*	Yellow-footed Green Pigeon	Resident	II	Least Concern
120	*Tringa glareola*	Wood Sandpiper	Winter Migrant	II	Least Concern
121	*Tringa ochropus*	Green Sandpiper	Winter Migrant	II	Least Concern

Sl. No.	Scientific Name	Common Name	Migration Status	IWPA, 2022	IUCN Status
122	*Upupa epops*	Common Hoopoe	Resident	II	Least Concern
123	*Vanellus indicus*	Red-wattled Lapwing	Resident	II	Least Concern
124	*Zosterops palpebrosus*	Indian White-eye	Resident	II	Least Concern

**Sources: TÜV SÜD Primary Survey and secondary data Study*

IUCN-The IUCN Red List of Threatened Species. Version 2023-1.

Schedules I to II: Indian Wildlife (Protection) Act, 2022. LC: Least Concern, IUCN Red List of Threatened Species

4.6.4.4 Aquatic Ecology

FISH SPECIES: The following fish species have been recorded within the study area.

Table 4-21: Details of Fish Species recorded in Study Area

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status	Occurence
Fishes					
1	*Labeo Catla*	Catla	-	Least Concern	Dams and Rivers
2	*Cirrhinus mrigala*	Mrigal Carp	-	Least Concern	Common in Dams and Rivers
3	*Labeo bata*	Bata	-	Least Concern	Freshwater
4	*Labeo rohita*	Rohu	-	Least Concern	Reservoirs

4.7 SOCIO-ECONOMIC ENVIRONMENT

The primary objective of socio-economic study is to assess the current socio-economic status of the villages and community within the project area and to assess the potential impact of the project on the community in terms of livelihood, health, education, and others. The study is also used to understand the existing issues and concerns of the community based on which mitigation measures and other community development activities are designed.

This section envisages to present the socio-economic baseline of the project influence area and the project footprint area along with the synopsis of the stakeholder consultations conducted on the site.

4.7.1 Methodology

A mixture of both quantitative and qualitative approach has been adopted in the current socio-economic study. The study has been conducted based on primary and secondary data. While primary data has been collected through reconnaissance survey and public consultations/focused group discussions/individual interviews within the villages/towns/district headquarters falling on the proposed project alignment, secondary data has been collected from the Census of India 2011 and district statistical handbook, state and district portal. The details regarding population composition, number of literates, working population and access to basic facilities and others have been collected from secondary sources and analyzed.

Villages and areas located along 50 metres aerial distance from the proposed pipeline project has been considered as project impact areas. The villages and areas falling along the proposed route include Kirjawala, Bori, Rajura, Tongalabad, Yenas, Shahapur, Mund Nishankrao, Onkar Kheda, Shirpur, Sawanga Gurav, Dhanora Gurav, Ganeshpur, Maholi Chor, Jasapur, Januna, Jalu, Dabha, and parts of Amravati (Municipal Corporation).

4.7.2 Concept and Definition of Terms Used

a) **Household:** A group of people who normally live together and take their meals from a common kitchen are called a household. People living in a household may be related or unrelated or a mix of both. However, if a group of related or unrelated people live in a house but do not take their meals from the common kitchen, then they are not part of a common household. Each person is treated as a separate household. There may be one member households, two member households or multi-member households.

b) **Density:** is a statistic that tells you how many people live in a certain geographical area. This type of measurement is called arithmetic density and is reported as the total number of people per land area.

c) **Sex Ratio:** Sex ratio is the ratio of females to males in each population. It is expressed as 'number of females per 1000 males'.

d) **Literates:** All persons aged up to 7 years and above who can both read and write with understanding in any language are taken as literate. It is not necessary for a person to have received any formal education or passed any minimum educational standard for being treated as literate. People who are blind but can read in Braille are also treated as literates.

e) **Literacy Rate:** Literacy rate of population is defined as the percentage of literates to the total population aged 7 years and above.

f) **Work:** Work is defined as participation in any economically productive activity with or without compensation, wages, or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. The work may be part time or full time or unpaid work in a farm, family enterprise or in any other economic activity.

g) **Worker:** All persons engaged in 'work' are defined as workers. Persons who are engaged in cultivation of land or milk production even solely for domestic consumption are also treated as workers.

h) **Main Workers:** Those workers who had worked for a major part of the reference period (i.e., 6 months or more in the case of a year) are termed as Main Workers.

i) **Marginal Workers:** Those workers who did not work for a major part of the reference period (i.e., less than 6 months) are termed as Marginal Workers.

j) **Work Participation Rate (WPR):** The work participation rate is the ratio between the labour force and the overall size of their cohort (national population of the same age range). In the present

study the work participation rate is defined as the percentage of total workers (main and marginal) to total population.

4.8 STATE PROFILE (MAHARASHTRA)

Maharashtra is the second most populous state in India, with a total population of 112,374,333 as per the Census 2011. This represents approximately 9.28% of the country's total population. Of the total population, 58,243,056 were male and 54,131,277 were female, resulting in an overall sex ratio of 929 females per 1,000 males, which is slightly lower than the national average of 943. The state has a geographical area of 307,713 square kilometers, leading to a population density of 365 persons per square kilometer—less than the national average of 382 persons per square kilometer.

Maharashtra demonstrates strong human development indicators, particularly in education. The overall literacy rate in the state was recorded at 82.34%, which is significantly higher than the national average of 72.98%. Male literacy in Maharashtra stood at 88.38%, while female literacy was 75.87%.

The state's population is divided between rural and urban areas, with 54.78% residing in rural regions and 45.22% in urban centers. The sex ratio in rural areas was 952 females per 1,000 males, which is notably higher than the urban sex ratio of 903.

In terms of employment, 49,427,878 individuals in Maharashtra were engaged in work-related activities. Of these, 43,762,890 (88.5%) were classified as main workers, while 5,664,988 (11.5%) were marginal workers, indicating seasonal or part-time employment. The total non-working population stood at 62,946,455, with a higher proportion of females (37,320,274) than males (25,626,181).

Source: Maps of India

Figure 4-23: State Map of Maharashtra

4.8.1 District Profile (Amravati)

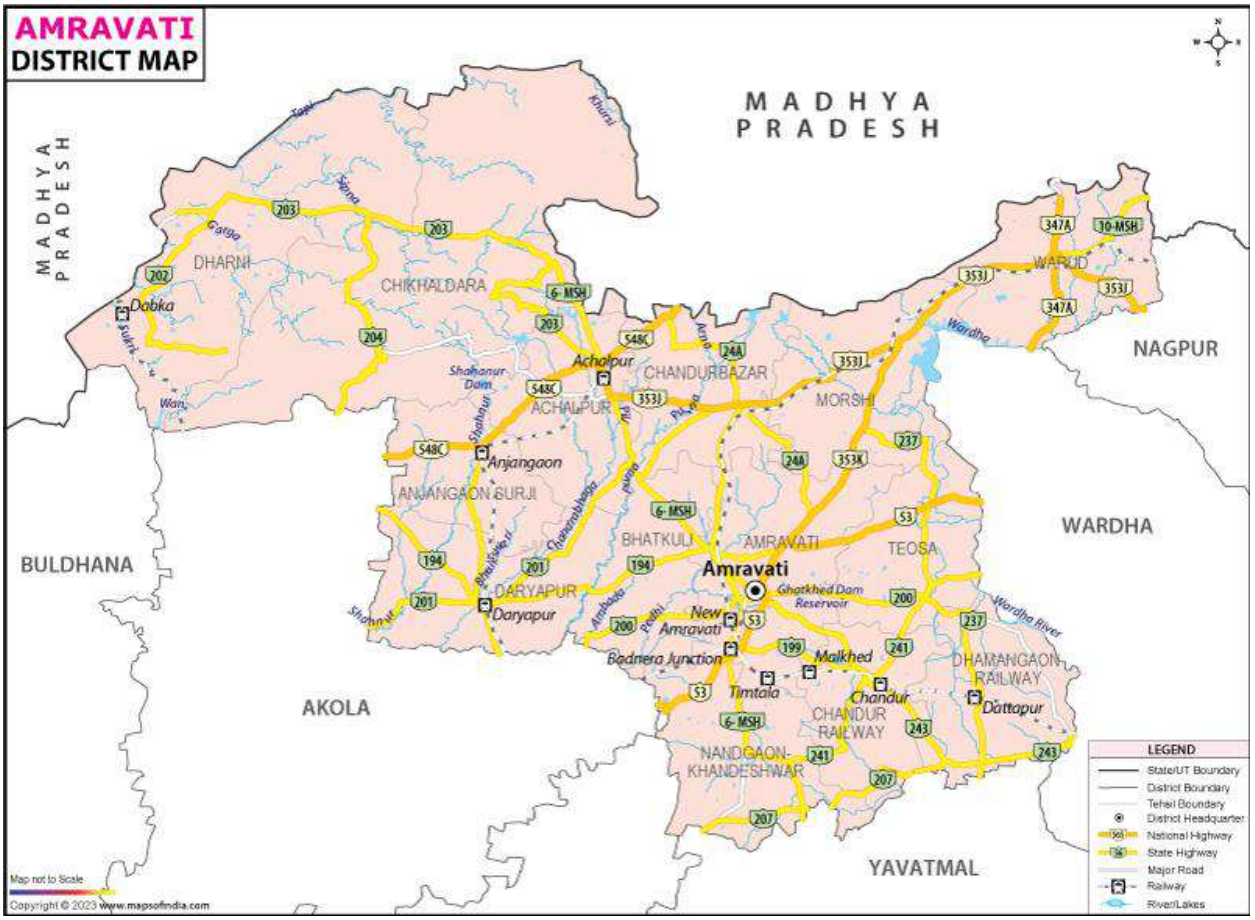
Amravati is located between 20°32’ and 21°46’ north latitude and 76°37’ and 78°27’ east longitude in the eastern part of Maharashtra. It is bordered by Akola district to the west, Wardha district to the south, Nagpur to the southeast, and Betul district of Madhya Pradesh to the north. The Purna River, a tributary of the Tapti, flows along the northern parts, influencing agriculture and settlement patterns.

Administratively, Amravati district is divided into 14 tehsils—Amravati, Achalpur, Chandur Railway, Daryapur, Morshi, Warud, Teosa, Nandgaon Khandeshwar, Bhatkuli, Anjangaon Surji, Dharni, Chikhaldara, Chandur Bazar, and Tiosa. These tehsils are further grouped under 6 sub-divisions. The district consists of 14 development blocks, aligned with the tehsils.

As per the 2011 Census of India, Amravati comprises 1,886 villages, out of which 24 villages were recorded as uninhabited. The district includes 9 statutory towns and 7 census towns, indicating a growing pattern of urbanization. The total population stood at 2,888,445, with 1,486,703 males and 1,401,742 females. Of this, 72.4% lived in rural areas, while 27.6% resided in urban areas. The population density was recorded at 237 persons per square kilometer, and the sex ratio was 943 females per 1,000 males, higher than the state average.

The literacy rate in the district was 93.03% among males and 80.61% among females, contributing to an overall literacy rate of 87.38%. Scheduled Castes (SCs) constituted 19.0% of the population, while Scheduled Tribes (STs) formed a significant 21.4%, with a large concentration in the tehsils of Dharni and Chikhaldara, which are part of the Melghat tribal region.

The economy of Amravati is largely agrarian, with cotton, soybean, and tur (pigeon pea) being major kharif crops, while wheat, gram, and sunflower are cultivated during the rabi season. The district benefits from a combination of black cotton soil and irrigation from medium and minor projects. Allied activities such as sericulture, dairy, and poultry contribute to rural livelihoods. Industrial development is concentrated around Amravati city, with growth in textile processing, food processing, and small-scale engineering industries. The Vidarbha region’s economic potential is further supported by connectivity to Nagpur and inclusion in the Amravati Growth Centre under MIDC.



Source: Maps of India

Figure 4-24: District Map of Amravati (Maharashtra)

4.8.2 Block Profile

The project area lies within Amravati district and traverses three administrative blocks, **Chandur Railway**, **Nandgaon Khandeshwar**, and **Amravati**, spanning a mix of rural and urban landscapes. According to the Census of India 2011, the region comprises over 300 villages and includes the major urban center of Amravati city, which falls under the Amravati block and serves as the district headquarters.

- Chandur Railway Block has a total population of 96,907, with a literacy rate of 86.80% and a sex ratio of 934 females per 1000 males. The block is predominantly rural and agrarian, comprising 92 villages.
- Nandgaon Khandeshwar Block is home to 129,810 residents across 104 villages, with a literacy rate of 85.76%. The socio-economic structure is similarly dominated by agriculture and allied livelihoods.
- Amravati Block contains both rural villages and urban zones, including Amravati city. The total population stands at 788,327, with 647,057 residing in urban areas. The block has a literacy rate of 92.12% and a sex ratio of 949. The rural segment includes 104 villages.

4.8.3 Demography

Table 4-22 provides an overview of the project area that encompasses three blocks—Chandur Railway, Nandgaon Khandeshwar, and Amravati—in Amravati district, Maharashtra. As per Census 2011, these

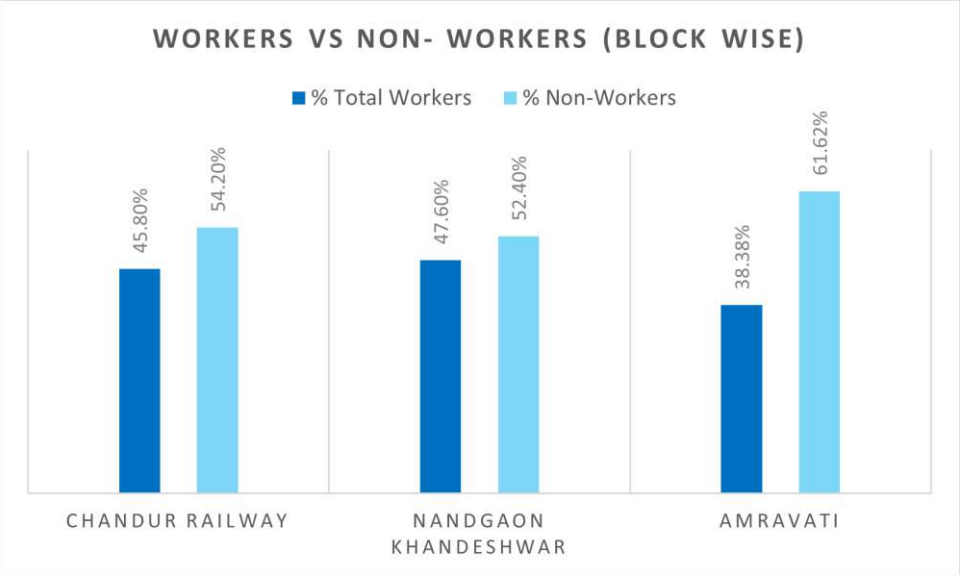
blocks exhibit a moderately balanced gender distribution, relatively high literacy rates (above 76%), and notable representation of Scheduled Castes (ranging from 21% to 24%) and smaller proportions of Scheduled Tribes. The demographic profile reflects a mix of rural and semi-urban characteristics, which is essential to consider in planning project interventions under the ESIA.

Table 4-22: Demographic Details

Sl. No.	Block Name	Area (in Ha.)	No. of HH	Total Population	Percent Male	Percent Female	Percent SC	Percent ST	Literacy Rate
1	Chandur Railway	559.30	9,269	77,131	51.84	48.47	21.39	5.37	76.65
2	Nandgaon Khandeshwar	786.95	32,514	1,29,810	51.35	48.65	23.49	4.31	76.83
3	Amravati	782.59	33,141	1,41,270	51.84	48.16	23.74	6.24	77.77

4.8.4 Working Population

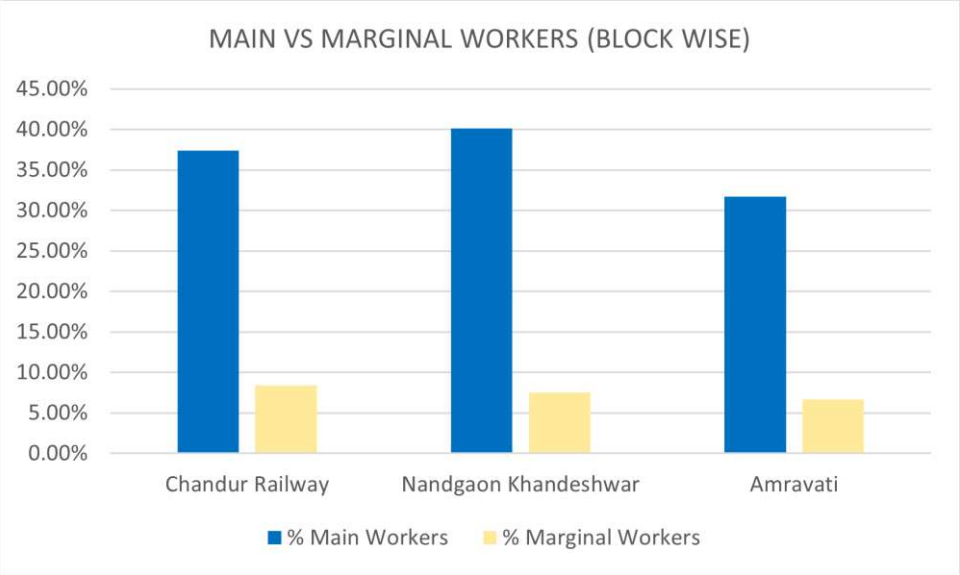
As per Census 2011 data, the proportion of non-working population is higher across all three blocks. Nandgaon Khandeshwar block records the highest working population at 47.60%, followed closely by Chandur Railway at 45.80%. Amravati block shows the lowest proportion of working population at 38.38%, with the highest non-working share of 61.62%, as illustrated in the chart below in **Figure 4-25**.



**Source: Census,2011*

Figure 4-25: Segregation of Workers and Non-Workers (Block Wise)

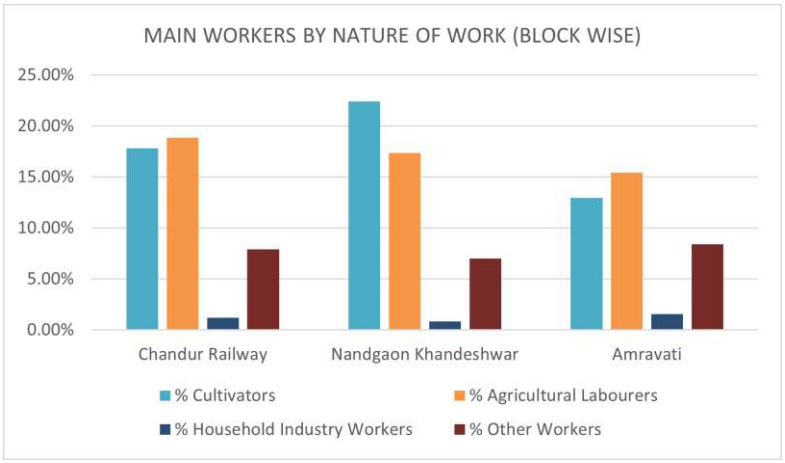
Figure 4-26 provides graphical representation of the proportion of main and marginal workers for each block. As per Census 2011 data, all blocks show a significantly higher share of main workers compared to marginal workers. Nandgaon Khandeshwar block recorded the highest proportion of main workers at 40.09%, followed by Chandur Railway (37.39%) and Amravati (31.74%). Marginal workers form a relatively smaller portion of the workforce in all blocks, ranging between 6.64% and 8.41%, indicating a predominance of more stable employment types in the region.



Source: Census,2011

Figure 4-26: Segregation of Main and Marginal Workers (Block Wise)

Figure 4-27 illustrates the distribution of main workers by nature of work across the three blocks. Agriculture remains the primary occupation, with Nandgaon Khandeshwar recording the highest share of cultivators (22.40%) and Chandur Railway showing a near-equal distribution between cultivators and agricultural labourers. Amravati block shows a relatively higher share of other workers (8.41%), suggesting greater engagement in non-agricultural activities. Household industry workers form a minor share across all blocks.



Source: Census,2011

Figure 4-27: Segregation of Main Working Population by Nature of Work

4.9 PROJECT IMPACT AREA

The project impact area has been established as those villages which are located at a linear distance of 20 meters to 50 meters, which were identified as Bori, Rajura, Tonglabad, Yenas, Sawanga Gurav, Dhanora Gurav, Maholi Chor, Jasapur, Januna, Jalu, Dabha, Badnera, Hirapur, Loni and parts of Amravati (Municipal Corporation).

4.9.1 Demography

Table 4-26 provides demographic details of the villages identified in the Project Impact Area. Among these, Rajura is the largest village in terms of area (1854.79 hectares) and population (2,745 persons), while Jasapur is the smallest, with a population of only 165 individuals and an area of 187.04 hectares.

Scheduled Caste (SC) population is significantly high in several villages—Jalu (39.90%), Jawra (31.1%), and Dabha (26.33%)—with over a quarter of their population belonging to SC communities. In contrast, Scheduled Tribe (ST) population is present in most villages, though generally in low proportions; the highest being in Jawara (10.87%).

The average literacy rate across the villages is approximately 77%, with Jasapur recording the lowest literacy rate at 69.69%, and Dhanora Gurav and Yenas reporting the highest rates, both above 81%. These figures highlight a relatively literate population base in the project area, with some variability across villages.

Table 4-23: Demography- Project Impact Area

Sl. No.	Village Name	Area (in Ha.)	No. of HH	Total Pop	Percent Male	Percent Female	Percent SC	Percent ST	Literacy Rate
1	Bori	975.69	373	1388	51.9	48	20.75	5.98	77.67
2	Rajura	1854.79	703	2745	50.96	49.03	22.73	5.17	75.50
3	Tonglabad	676.25	248	991	51.6	48.4	22.8	2.21	77.30
4	Jawra	666.18	305	1189	51.7	48.27	31.1	0.92	78.39
5	Dabha	887.87	817	3179	53.79	46.20	26.33	3.01	80.97
6	Loni	1338.85	933	3901	50.93	49.06	22.91	1.79	77.62
7	Jalu	646.48	228	832	51.60	48.4	39.90	0.24	80.77
8	Janunu	679.46	299	1310	51.29	48.70	18.78	2.44	73.43
9	Jawara	579.69	217	929	51.13	48.86	17.22	10.87	75.56
10	Jasapur	187.04	46	165	54.54	45.45	19.39	0.60	69.69
11	Maholi Chor	1728.43	549	2295	49.89	50.10	22.00	2.22	77.95
12	Yenas	529.61	414	1494	52.40	47.59	10.37	5.96	81.05
13	Dhanora Gurav	388.64	372	1561	50.09	49.90	8.84	0.64	81.22
14	Sawanga Gurav	499.57	102	407	50.12	49.87	1.71	0.49	76.41

**Source: Census,201*

4.9.2 Education Facilities

Table 4-27 provides educational details of the villages identified in the Project Impact Area. All fourteen villages reported the presence of both pre-primary and primary schools within their boundaries. The number of pre-primary institutions ranges from 1 to 10 per village, with Loni having the highest number (10), suggesting a relatively strong early childhood education infrastructure in that settlement. Each village also has at least one primary school, ensuring foundational education access is locally available and within walking distance for children. This distribution indicates that basic education infrastructure is adequately in place across the project impact area, with no immediate gaps in access to early or primary education services.

Table 4-24: Educational Facilities- Project Impact Area

S. No.	Village Name	Pre- Primary	Primary
1.	Bori	2	1
2.	Rajura	3	1
3.	Tonglabad	2	1
4.	Jawra	2	1
5.	Dabha	5	1
6.	Loni	10	5
7.	Jalu	2	1
8.	Janunu	2	1
9.	Jawara	2	1
10.	Jasapur	1	1
11.	Maholi Chor	3	2
12.	Yenas	2	1
13.	Dhanora Gurav	3	1
14.	Sawanga Gurav	2	1

**Source: Census,2011*

4.9.3 Health Facilities

Table 4-28 provides Health details of the villages identified in the Project Impact Area. Out of the fourteen surveyed villages, only one village, Loni, reportedly had a Primary Health Centre (PHC) located within the village. For the remaining villages, access to PHC facilities varied from 5 to 10 km. Three villages, Bori, Dabha, and Jalu, reported that the nearest PHC was located more than 10 km away, highlighting limited immediate access to healthcare services in these locations.

Table 4-25: Health Facilities- Project Impact Area

S. No.	Village Name	PHC
1.	Bori	More than 10 Km away
2.	Rajura	5-10 km away
3.	Tonglabad	5-10 km away
4.	Jawra	Within 5 km
5.	Dabha	More than 10 km away

S. No.	Village Name	PHC
6.	Loni	1 present
7.	Jalu	Nore than 10 km away
8.	Janunu	5-10 km away
9.	Jawara	5-10 km away
10.	Jasapur	Within 5 km
11.	Maholi Chor	Within 5 km
12.	Yenas	Within 5 km
13.	Dhanora Gurav	5-10 km away
14.	Sawanga Gurav	Within 5 km

**Source: Census,2011*

4.9.4 Drinking Water Facilities

Table 4-29 provides details of the drinking water facilities available in the villages based on the data from Census 2011. All fourteen villages within the Project Impact Area have access to both tap water and hand pump facilities. This dual provision suggests a reasonably reliable infrastructure for drinking and domestic water supply across the region.

Table 4-26: Drinking Water Facilities- Project Impact Area

S. No.	Village Name	Tap Water	Hand Pump	River
15.	Bori	Yes	Yes	No
16.	Rajura	Yes	Yes	No
17.	Tonglabad	Yes	Yes	No
18.	Jawra	Yes	Yes	No
19.	Dabha	Yes	Yes	No
20.	Loni	Yes	Yes	No
21.	Jalu	Yes	Yes	No
22.	Janunu	Yes	Yes	No
23.	Jawara	Yes	Yes	No
24.	Jasapur	Yes	Yes	No
25.	Maholi Chor	Yes	Yes	No
26.	Yenas	Yes	Yes	No
27.	Dhanora Gurav	Yes	Yes	No
28.	Sawanga Gurav	Yes	Yes	No

**Source: Census,2011*

4.10 SITE VISIT OBSERVATIONS

The social sensitivity analysis for the natural gas pipeline project proposed in the five stretches of Amravati district indicates the proposed route of the running parallel to the city roads, state and national highway. It has also been observed that the route passes through heavy traffic areas and sensitive areas like

hospitals, schools and colleges within the city. These primary observations during site visit are essential for risk assessment and ensuring that the necessary safety protocols and community engagement measures are implemented throughout the project lifecycle. Key observation of all the stretches and potential mitigation measures has been elucidated.

4.10.1 Stretch-01 (Bori Village to Nandgaon Khandeshwar)

Length of the Stretch -15 km

Sensitivities Identified:

- The pipeline alignment intersects State Highway 294 for 10.427 km, indicating interaction with a major transportation corridor that may have implications for traffic safety management and construction planning.
- The proposed gas pipeline route also crosses through Nala at eight locations, wherein underground laying of pipelines shall be done. As this drain/nala are active drain, permission from the Water Resource Department needs to be taken for the same
- The route passes in close proximity to a Zila Parishad Madhyamik School in Yenas Village. As per IFC PS4 (Community Health, Safety, and Security), this qualifies as a sensitive receptor due to potential exposure of schoolchildren to construction-related risks including dust, noise, and traffic hazards.
- The alignment runs adjacent to high density area of Yenas Village, suggesting potential temporary disturbances to residential and agricultural areas, and requiring stakeholder engagement in line with IFC PS1 (Assessment and Management of Environmental and Social Risks).
- The pipeline passes near Samaj Mandir and Shiv Mandir, both of which are community religious structures.
- A portion of the alignment lies in proximity to Rajura Substation, which is an operational electricity distribution node. Coordination with utility authorities will be essential to prevent disruption or safety risks during pipeline construction and operation.

4.10.2 Stretch- 02 (Shri Khandeshwar Shiva Temple to Shiv Shakti Gaushevashram)

Length of the Stretch -15 km

Sensitivities Identified:

- The pipeline alignment intersects State Highway 14 for around 14 km, that may have implications for traffic safety management and construction planning.
- The pipeline passes Jallu Nadi twice, once at Ch 21611.95 and then at Ch 29333.12.
- The proposed gas pipeline route also crosses through Nala at nine locations, wherein underground laying of pipelines shall be done. As this drain/nala are active drain, permission from the Water Resource Department needs to be taken for the same
- The pipeline passes through three stretches of Protected Forest, 0.49 km, 0.22 km and 0.14 km each.
- The starting section passes through a crowded part of the town, Onkar Kheda in Nandgaon Khandeshwar between chainage (km) 15 to 17, with many houses, people, and active daily movement. Construction in this area could cause temporary inconvenience to residents due to noise,

dust, or restricted access. The presence of schools, markets, or narrow internal roads further increases the sensitivity of this area.

- The pipeline further passes Dhanora Gurav village settlement, which includes homes, farmland, and local community infrastructure. The route may affect agricultural activities or village pathways.
- Two petrol pumps, Nayara and HPCL, are located close to the pipeline route. These are considered sensitive because they store and dispense fuel, making safety and coordination essential while carrying out any digging or pipeline work nearby.
- A healthcare facility, New Life Multi specialty Hospital is situated close to the pipeline path. Hospitals are particularly sensitive locations because of the need for quiet, clean surroundings and easy access for emergency services.

4.10.3 Stretch-03 (From DODO Sambhu Raje to Gajanan Maharaj Temple)

Length of the Stretch -10 km

Sensitivities Identified:

- The pipeline alignment intersects State Highway 14 for around 12 km, that may have implications for traffic safety management and construction planning.
- The proposed gas pipeline route also crosses through Kondeshwar and other 7 Nalas at eight locations, wherein underground laying of pipelines shall be done. As this drain/nala are active drain, permission from the Water Resource Department needs to be taken for the same

4.10.4 Stretch-04 (Gajanan Temple to Amravati Bus Depot)

Length of the Stretch -15 km

Sensitivities Identified:

- The pipeline alignment intersects State Highway 242-A for 1.96 km and SH 14 for 7.30 km, which may have implications for traffic safety management and construction planning.
- The pipeline passes through Nal Nadi at Ch-53417.56.
- The pipeline passes through a major drain at Ch- 42200.5 and major lined drain at Ch- 48196.19
- Railway crossing – The proposed gas pipeline route crosses through the railway crossing at two locations, Ch 43157.54 and at 45500.27.
- The pipeline route passes through NH 53 and SH 242-A.
- The stretch also passess through a 24-inch water supply pipeline at Ch 50678.71.

4.10.5 Stretch-05 (Surat Kolkata Highway Crossing to BPCL RP Bhagwat Petroleum)

Length of the Stretch – 11.2 Km (1.42 Km + 9.8 Km)

Sensitivities Identified:

- The pipeline route passes through NH 53 and SH 242-A throughout its total length of 9.775 km.
- The pipeline route passes through a Major drain and 4 Nala along its path.
- The pipeline passes an 8-inch power supply pipeline at Ch- 4712.74

4.11 PROPOSED MITIGATION MEASURES

National Highway/PWD Road/Municipal Corporation Road/Village Road

Excavation of the road for laying of pipes may pose traffic issues and inconvenience to the commuters. Proper barricading and night signages need to be put in place to avoid any such incidents, especially during the night time. Permission from the Municipal Corporation, PWD has been taken for the laying of gas pipelines, however, the permission from NHAI has been received.

Railway Crossings

Potential disruption or delays in construction due to railway permission requirements, safety risks to workers and local commuters, possible traffic congestion during construction, need for diversion planning to avoid accidents, and temporary access restrictions near crossings for local communities during construction activities. Permission needs to be taken for laying of pipeline. Additionally proper planning for avoiding any incident, accidents needs to be put in place to ensure worker safety and avoid traffic congestion.

Presence of Heavy Traffic Area

Traffic congestion and safety risks during construction, temporary disruption of access to commercial establishments, increased noise and dust levels, potential delays for emergency services, and need for stakeholder consultations and traffic management planning. Prior information on the laying schedule of pipeline laying needs to be intimated to the shop owners and other commercial establishments to ensure minimum convenience.

Nala/ Drains – The proposed route traverses through the Drains at various points, for which prior permission from the Water Resource Department has been obtained.

Sensitive Receptors - Since this stretch passes through both rural and urban areas along the residential areas, hospitals, schools, colleges , and industrial areas, prior measures need to be taken prior and during the laying of gas pipelines. Potential noise and dust impacts during construction, disruption of access for patients, emergency services, and daily commuters, safety risks for pedestrians and nearby traffic, possible operational impacts on nearby institutions and industries, community concerns or complaints during construction, and the need for mitigation measures (dust suppression, barricading, clear signage, scheduling of noisy works) and stakeholder engagement to reduce disruption and maintain access.

5 ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

5.1 INTRODUCTION

The proposed project may have impact on the environment & social conditions during construction and operation phases. This chapter describes various environmental impacts identified and assessed for during construction and operation phases of the project. The identification of impacts has been done based on review of available project information, discussions with local community and representatives of project proponent and other sector-specific professionals.

During the construction phase, the impacts may be regarded as temporary or short-term, while long term impacts may be observed during the operation stage. The major potential impacts associated with the proposed project are impact on soil, impact on water resources and area drainage, air quality degradation, noise impacts, impact on ecological environment, impact on agriculture, land use changes, impact on health and safety, impact on socio-economic features, impact on community activities, impact on cultural heritage and impact on aesthetics. These impacts can occur at any stage i.e., the construction stage and the operation stage.

The identified impacts due to the proposed project can be mitigated through the incorporation of appropriate measures at different stages of the project. This will ensure the best design with minimal damage to or loss of significant or sensitive features such as roadside vegetation, local water resources, etc.

5.2 IMPACT APPRAISAL CRITERIA

The identification of impacts has been done based on baseline environmental and social survey, review of available project information, discussions with local community and representatives of **ATGL** and other sector specific professionals. The criteria employed to appraise the proposed impacts on various social and environmental components has been presented as **Table 5-1** below.

Table 5-1: Impact Appraisal Criteria

Criteria	Sub-Classification	Defining Limit	Remarks
Spread: refers to area of direct influence from the impact of a particular project activity.	Insignificant/ Local spread	Impact is restricted within the project site.	Except for ecology (which is defined as loss of vegetation and wildlife habitat.
	Medium Spread	Impact is spread from up to 2 km from the boundary of the project.	Except for ecology (which is defined as loss of vegetation and wildlife habitat.
	High Spread	Impact is spread up to 2 km to 5 km from footprint boundary of the project.	Except for ecology (which is defined as loss of vegetation and wildlife habitat.

Criteria	Sub-Classification	Defining Limit	Remarks
Duration: based on duration of impact and the time taken by an environmental component to recover back to current state	Insignificant/ Short Duration	When impact is likely to be restricted for duration of less than 1 year.	The anticipated recovery of the affected environmental component within 2 years.
	Medium Duration	When impact extends up to 3 years.	With an anticipated recovery of the affected environmental component within 6 years.
	Long Duration	When impact extends beyond 3 years.	With anticipated recovery of prevailing condition to happen within 6 years or beyond or upon completion of the project life.
Intensity: defines the magnitude of Impact	Insignificant intensity	When resulting in changes in the environmental baseline conditions is up to 10%.	However, it shall be reconsidered where the baseline values are already high.
	Low intensity	When resulting in changes in the baseline conditions up to 20%.	For ecology it refers to minimal changes in the existing ecology in terms of their reproductive capacity, survival, or habitat change.
	Moderate intensity	When resulting in changes in the baseline conditions for up to 30%.	For ecology, it refers to changes that are expected to be recoverable.
	High intensity	When change resulting in the baseline conditions beyond 30%.	While for ecology, high intensity refers to changes that result in serious destruction to species, productivity, or their habitat.
Nature: refers to whether the effect is considered beneficial or adverse	Beneficial		Useful to Environment and Community.
	Adverse		Harmful to Environment and Community.
Likelihood: refers the possibility of a risk event occurring	Low	Will most likely not occur	Low likelihood refers that the impact will most likely not occur.
	Moderate	Possible to occur	Moderate likelihood refers that the chances of impacts are possible to occur.
	High	Likely to occur	High likelihood refers that a particular risk or impact will likely occur.

Impact identification is a continual process and completes only when the effects of the identified impact are assigned a mitigation strategy. The impacts shall be assessed based on the following criteria:

- Significance of the impact
- Duration of the impact

- Mitigation measures
- Residual impacts

5.3 ASSESSMENT OF IMPACT SIGNIFICANCE

A project specific significance assessment matrix has been developed to assess the impacts based on the appraisal criteria developed above. A reference impact significance matrix is given in **Table 5-2** below.

Table 5-2: Impact Significance Criteria

Spread	Duration	Intensity	Likelihood	Overall Significance	
				Adverse	Beneficial
Local	Short	Low	Low	Insignificant	Insignificant
Local	Short	Moderate	Moderate	Minor	Minor
Local	Medium	Low	Low	Minor	Minor
Local	Medium	Moderate	Moderate	Minor	Minor
Medium	Short	Low	Low	Minor	Minor
Local	Long	Low	Low	Minor	Minor
Local	Long	Low	Moderate	Minor	Minor
Local	Short	High	High	Moderate	Moderate
Local	Short	High	Moderate	Moderate	Moderate
Local	Medium	Moderate	High	Moderate	Moderate
Local	Medium	High	High	Moderate	Moderate
Local	Long	Moderate	Moderate	Moderate	Moderate
Medium	Short	Moderate	Moderate	Moderate	Moderate
Medium	Medium	Low	Low	Moderate	Moderate
Medium	Medium	Moderate	Moderate	Moderate	Moderate
Medium	Medium	Moderate	High	Moderate	Moderate
Medium	Long	Low	Low	Moderate	Moderate
Medium	Long	Moderate	Moderate	Moderate	Moderate
High	Short	Low	Low	Moderate	Moderate
High	Short	Moderate	Moderate	Moderate	Moderate
High	Medium	Low	Low	Moderate	Moderate
High	Medium	Moderate	Moderate	Moderate	Moderate
High	Long	Low	Low	Moderate	Moderate
Local	Long	High	High	Major	Major
Medium	Short	High	High	Major	Major
Medium	Long	High	High	Major	Major
High	Short	High	High	Major	Major

Spread	Duration	Intensity	Likelihood	Overall Significance	
				Adverse	Beneficial
High	Medium	High	High	Major	Major
High	Long	Moderate	Moderate	Major	Major
High	Low	Low	Low	Major	Major
High	Low	High	High	Major	Major

The impacts for the proposed project have been covered under following subsections:

- Construction Phase
- Operational phase

The social impacts associated with construction and operations stages have been assessed qualitatively and, in some cases, quantitatively (subject to availability of data), using professional judgement and based on experience from similar projects.

5.4 IDENTIFICATION OF ENVIRONMENTAL IMPACTS

The identification of impacts has been done based on baseline environmental and social survey, review of available project information, discussions with local community and representatives of **ATGL** and other sector specific professionals. The environmental impacts associated with the proposed project on various environmental components such as air, water, noise, soil, flora, fauna, land, socioeconomic, etc. has been identified using Impact Identification Matrix as depicted in **Table 5-3**:

Table 5-3: Impact Identification Matrix for NG Pipeline Route

Components	Physical				Biological		Socio-Economic		
	Ambient Air Quality	Ground/Surface Water (Qty/Quality)	Ambient Noise Quality	Land (Land use, Topography, drainage, soil)	Flora	Fauna	Livelihood and Occupation	Infrastructure	Health & Safety
AUGMENTATION OF FACILITIES									
CONSTRUCTION PHASE									
Civil and mechanical works	•	•	•	•	•	•	•	•	•
Movement of vehicles	•		•	•	•	•		•	•
Hydro testing									•
Waste generation, handling, and disposal			•	•	•	•			•
OPERATION PHASE									
Operation of pumps and compressors	•	•	•						
Storage of Gas/ Crude	•								•
Cleaning & maintenance									
Movement of vehicles		•		•					
Waste generation, handling, and disposal		•		•	•	•		•	•
Leakage from Pipeline	•	•			•	•			•

Components	Physical				Biological		Socio-Economic		
	Ambient Air Quality	Ground/Surface Water (Qty/Quality)	Ambient Noise Quality	Land (Land use, Topography, drainage, soil)	Flora	Fauna	Livelihood and Occupation	Infrastructure	Health & Safety
LAYING OF NEW PIPELINE									
CONSTRUCTION PHASE									
Preparation of Right of way	•	•	•	•	•	•	•	•	•
Pipe laying	•		•	•	•	•	•	•	•
Chemical use/handling	•	•		•					•
Movement of vehicles	•		•						
Waste generation, handling, and disposal	•	•		•					
OPERATION PHASE									
Operation of compressors	•	•	•						
Cleaning & maintenance	•			•					

5.5 IMPACTS DURING CONSTRUCTION PHASE

The construction activities shall comprise of following activities that may impact the environmental and social aspects, as described in sections below:

- Site Preparation
- Labour Engagement
- Material Handling and Storage
- Construction Demobilization

5.5.1 Topography, Land use and Drainage

Impact- Context and Receptors

Laying of natural gas pipeline will be done within depth of 2 m in land while pipeline will be laid as per standard protocols and procedures. There will be limited change in topographic characteristics of project footprint area. The alteration in surface drainage pattern of the area due to construction activities will be limited to smaller areas located in project footprint.

Receptors:

- **Topography**: Minor undulations and natural landforms
- **Land Use**: Urban roads, agricultural fields, forest patches
- **Drainage**: Natural drains, canals, and seasonal watercourses

Embedded/In-Built Control

- Using trenchless construction methods like Horizontal Directional Drilling (HDD) for prominent urban landscape, canal crossings, railway crossings and wherever possible, to avoid direct excavation in the canals and minimize disruption to water flow and the surrounding ecosystem.

- Implement soil erosion control measures like silt fences, sedimentation ponds, and planting grass cover in disturbed areas to minimize soil loss, especially in agricultural fields and forest areas.
- Design and layout the pipeline route to avoid impacting high-value agricultural areas as much as possible.
- Defined RoW to minimize land disturbance
- Temporary restoration of land post-construction
- Stormwater diversion measures during trenching

Impact Magnitude

- There will be very limited change in the topographic character of the project footprint area. The alteration in surface drainage pattern of the area due to construction activities, if not maintained with appropriate control measures is probable. The natural flow of storm water will not be altered on contiguous larger area. Intensity of the effect can be considered as moderate (temporary but noticeable changes in landform and drainage), and duration of the effect would be Medium (during the construction phase) in nature, there is high likelihood of the impact that it may occur. Hence, impact magnitude is assessed to be **Moderate.** However, with controlled and managed construction work in the Urban area, water side, railways and forest and agricultural land side may reduce the impact magnitude to **Minor**.

Impact Significance

- As per the impact significant assessment matrix **(Table 5-2)**, the impact has been assessed as **Moderate**, which can be mitigated, and magnitude of impact can be **Minor** with use of mitigation measures.

Mitigation Measures

- Project shall ensure trenching follows natural contours to minimize disruption to the topography especially during the pre-construction and construction phase
- Anti-buoyancy measures will be adapted during laying out of pipeline within water bodies.
- Ensure topsoil removal and its preservation during construction, so it can be returned to the disturbed area to facilitate faster vegetation regrowth.
- Use mulching and vegetative cover to stabilize disturbed soil and reduce erosion during and after construction.
- If construction duration is less, then the duration of impact can be reduced to short.

Residual Impact Significance

- After implementation of mitigation measures, the significance of residual impacts for construction activities will be **Minor**.

Table 5-4: Impact Significance for Topography and Drainage

Impact	Impact on Topography & Drainage

Impact nature		Negative				
Impact Type		Indirect				
Impact Scale		Uncontrolled construction work and waste generating from construction site may contaminate drainage of the area				
Impact Magnitude (Without Mitigation)		Negative-Moderate				
Aspect	**Scenario**	**Spread**	**Duration**	**Intensity**	**Likelihood**	**Overall**
Topography and Drainage	Without Mitigation	Medium	Medium	Moderate	High	Moderate
	With Mitigation	Local	Medium	Low	Low	Minor

5.5.2 Water Resources and Availability

Impacts- Context and Receptors

During construction phase, water will be primarily required for domestic activities by staff and to sprinkle for dust suppression. Additionally, the pipeline is crosses two rivers and drains in its right of way. Freshwater will be sourced from private tankers. There will be generation of sewage by construction workers. As the pipeline crosses several canals, and natural drains, there is a possibility that deterioration of water quality during construction phase can occur due to wastewater disposal from the workers camp and sludge generated from construction sites. Inappropriate disposal of fuel & lubricants could also lead to water contamination. Additionally, there is a possibility of contamination of water bodies during laying of NG pipeline in the creeks coming within ROW of the pipeline.

Embedded/In-Built Control

NIL

Impact Magnitude

Water requirement for construction works will be temporary just during construction phase and short-lived while domestic water requirement for construction workers will be needed during the entire construction phase. The construction phase will be duration of around 12 months with peak construction period of 3 to 6 months. Hence, the magnitude of impact is assessed as **medium/ moderate.**

Impact Significance

As per the impact significant assessment matrix **(Table 5-3),** a combination of medium-term impact duration, moderate intensity, moderate likelihood, and local level spread the impact magnitude has been assessed as **Moderate.**

Mitigation Measures

- Quality of construction wastewater emanating from the construction site will be controlled through suitable drainage system with sediment traps (silting basin as water intercepting ditch) for arresting the silt / sediment load before its disposal into the main natural drainage system around the site.

- The trench shall be excavated only so far in advance of pipe laying that it does not cause increased soil erosion and silting of water bodies.
- The discharge of the trench de-watering pumps shall be conveyed either to drainage channel or to natural drains after passing through a catch pit for settling the silt.
- The trench shall be excavated to the exact gradient specified so that no making of the sub-grade by back filling is required and the concrete bed, where required, may be prepared with greatest ease giving a uniform and continuous bearing and support for the pipe.
- All the construction and preparatory activities to be conducted during dry seasons only.
- Construction materials to be stacked together by fencing it with brick or earth to prevent spillage into the water bodies, also these materials to be stacked away from the water bodies.
- Concrete shall be evaluated in accorder with IS: specification and shall have a minimum compressive strength to avoid pressure on water body.
- Aggregates will be clean and free from injurious amounts of salt, alkali, deleterious substances, or organic impurities as per IS-383 & evaluated as per IS-2386 to avoid contamination of water bodies.
- Proper sanitation facilities to be provided at the construction site to prevent health related problems due to water contamination.
- Waste disposal and sanitation to workers in the construction camp will be properly maintained or taken care off to check their entry into the water bodies like ponds, streams etc.
- Vehicle maintenance and refuelling will be confined to areas near construction camps designed to trap discarded lubricants and fuel spills from entering the water bodies.
- Drinking water supply for the workers in the construction camps to meet the Indian National Standards. Assess the portability of the supplied water to the construction labour camps water quality to be periodically monitored.
- Garbage to be collected in tanks and disposed of daily to check the solid wastes entering the ponds, streams etc.
- Concrete will be placed within 30 minutes from the time of mixing and will be managed in such a way to prevent aggregate segregation and excessive moisture loss. Concrete container will be kept clean and free from hardened or partially hardened concrete.

Residual Impact Significance

- After implementation of mitigation measures, the significance of residual impacts for construction activities will be **Low.**

Table 5-5: Impact Significance on Water Resource and Quality

Impact		Impact on water resource and quality				
Impact nature		Negative				
Impact Type		Direct				
Impact Scale		Uncontrolled construction works and waste generating from construction site may contaminate drainage of the area.				
Impact Magnitude (Without Mitigation		Negative-Moderate				
Aspect	Scenario	Spread	Duration	Intensity	Likelihood	Overall
Impact on Water Resource	Without Mitigation	Local	Short	High	Moderate	Moderate
	With Mitigation	Local	Short	Low	Low	Minor

5.5.3 Ambient Air and Noise Quality

Impacts- Context and Receptors

Air: The air quality along the project stretch may get affected during the construction period. Particulate matter will be the predominant pollutant affecting the air quality during the construction phase as the construction activities are likely to generate dust. Operation of equipment and machineries for pipeline laying and civil works in pipeline ROW & other sites will generate dust that could impact the air quality. Mostly the additional automobile traffic and construction machineries involved during construction activities will generate pollutants like PM, SO_2 & NOx. Therefore, the receptor sensitivity is assessed as **"Moderate"**. However, this will not lead to any tangible effect, as the additional traffic volume related to construction activities will be low.

Noise: During construction phase, noise will be generated due to movement of vehicles, and operation of light and heavy construction machineries including pneumatic tools (hot mixer, dozer, tipper, loader, excavator, grader, scrapper, roller, concrete mixer, generator, pump, vibrator, crane, compressor, HDD etc.). Operation of construction machinery may lead to a rise in noise level in the range between 80-100 dB(A). The magnitude of impact from noise will depend upon types of equipment used, construction methods and on work scheduling. The main sources of noise during construction period are:

- Movement of vehicles during the construction period for procurement of construction material.
- During site preparation, surface preparation, pipeline laying etc.

Noise generated from the sources mentioned above will be mostly during daytime. Moreover, villages / settlements being near to the route, significant impact on local people is apprehended (as a few congested human habitations are along the site), as the noise generated will be a problem. However, the workers are likely to be exposed to high noise levels that may affect them.

Embedded/In-Built Control

- Suppression of fugitive dust emissions by spraying water, wetting of the stockpile.
- Pre-identified proper locations of material stockpiles, especially sand.
- Screening or providing wind breaks for stockpiles, covering of trucks with tarpaulin sheets during transportation of material.
- Normal working hours of the contractor will be defined (preferable 8 am to 6pm). If work needs to be undertaken outside these hours, it would be limited to activities which do not generate noise.
- Avoid unnecessary honking in traffic movement.
- Barricading of project premises to avoid dispersion of dust and noise outside the project premises.

Impact Magnitude

The major source of emissions in the construction phase is fugitive dust emissions & emissions from excavation and other construction activities. In addition, the operation of DG sets will also cause gaseous emissions. There will be some impact due to plying of vehicles on the access roads which run across settlement area.

The construction activities will occur for maximum 6-12 months whereas dust emitting activities such as site clearing, civil construction etc. will be of short/medium duration for 1-2 peak months. The impact magnitude has been categorized as small because the soil type is alluvial. Thus, dust emission would be restricted to construction phase only for shorter duration.

Impact Significance

As per the impact significant assessment matrix (**Table 5-2)** combination of low impact magnitude with medium receptor sensitivity results in impact significance as Moderate.

Mitigation Measures

- Proper and prior planning, appropriate sequencing and scheduling of all major construction activities will be done, and timely availability of infrastructure supports needed for construction will be ensured to shorten the construction period vis-à-vis reduce pollution.
- Construction materials will be stored in covered godowns or enclosed spaces to prevent the windblown fugitive emissions.
- Concrete will be mixed in a mechanical mixer to ensure thorough mixing of all materials to avoid dispersion of particulate matter into the ambient air. Reinforcements will be placed around the length of pipeline. Night Caps to be provided to both ends of line pipe before starting the work.
- Stringent construction material handling / overhauling procedures shall be followed.
- Adequate dust suppression measures such as regular water sprinkling on unpaved haul roads, at vulnerable areas of construction sites will be undertaken to control fugitive dust during material handling and hauling activities particularly near habitations especially in dry seasons.
- The construction material delivering vehicles will be covered to reduce spills.
- Low emission construction equipment, vehicles and generator sets to will be used.
- It will be ensured that all construction equipment and vehicles are in good working conditions, finely tuned and maintained to keep emission within the permissible limits and engines tuned off when not in use to reduce pollution.
- Vehicles and machineries will be regularly maintained so that emissions confirm to standards of Central Pollution Control Board (CPCB).
- Construction workers to be provided with appropriate PPEs during construction phase.
- Temporary labour sheds will be located away from the immediate vicinity of construction sites and major road traffic.
- Protective gears such as earplugs, etc. will be provided to construction personnel exposed to high noise levels as preventive measures.
- It will be ensured that all the construction equipment and vehicles used are in good working condition, properly lubricated and maintained to keep noise within the permissible limits and engines tuned off when not in use to reduce noise.
- Construction activities carried out near residential locations will be scheduled to the daytime (i.e. from 10.00 a.m. to 6.00 p.m.) only to have minimum disturbance to the residents.
- Whenever possible static noisy machinery will be placed on vibration isolators or temporary sheeting will be provided to check noise propagation.

- Noise level will be monitored at regular intervals during construction phase, which will help in taking appropriate action to maintain it within the prescribed limit

Residual Impact Significance

- The significance of residual impact will be **Low** after implementing mitigation measures.

Table 5-6: Impact Significance for Ambient Air & Noise Quality

Impact		Impact on Ambient Air & Noise Quality				
Impact nature		Negative				
Impact Type		Direct				
Impact Scale		Impact due to construction activity and operation of construction vehicles				
Impact Magnitude (Without Mitigation		Negative-Moderate				
Aspect	Scenario	Spread	Duration	Intensity	Likelihood	Overall
Ambient Air & Noise Quality	Without Mitigation	Medium	Short	Moderate	Moderate	Moderate
	With Mitigation	Local	Short	Low	Low	Insignificant

5.5.4 Land and Soil Environment

Impacts- Context and Receptors

Construction activities such as earth moving may lead to reduction in vegetation cover on ground thus leading to soil erosion. During the construction period the movement of heavy vehicles will result in compaction of soil by making it hard and impermeable. The erosion at construction stretches will result in increased sediment load in recipient streams. Any leakage of lubricants in equipment yard may cause soil contamination. Solid waste disposal along roadside also adds to impact on the land environment during the construction.

During construction activity for laying of pipeline cutting of existing land will be done and the dug material generated will be replaced back after laying of the pipes. Loosening of topsoil and loss of vegetative cover (land clearing) along the route and construction areas due to excavation and back filling which lead to enhance soil erosion.

Embedded/In-Built Control

- Erosion and sediment control measures should be adopted including using silt fences to manage runoff, applying erosion control mats on disturbed soil, hydroseeding for vegetation restoration, and setting up sediment basins to collect runoff.
- In order to do topsoil management, the topsoil should be striped and stockpiled separately before construction, and it should be replaced after construction to restore soil fertility.
- For vegetation and habitat protection land disturbance should be minimization by keeping the construction area narrow and by the usage of controlled clearing methods for vegetation removal.
- To achieve the soil compaction prevention usage of mats or gravel paths for heavy machinery

should be adopted.

- Water management and protection involves using trenchless technology for stream, canal and wetland crossings, designing proper drainage systems to prevent erosion, and managing de-watering to avoid soil erosion.
- In flood-prone areas like Amravati, water management should include elevated trenching techniques, flood-resistant trench covers, and diversion channels to prevent inundation of construction zones.
- In earthquake-prone zones, trench stabilization should include geotechnical reinforcement, use of flexible pipeline joints, and seismic-resistant bedding materials.
- Contaminant management includes setting up spill prevention and containment measures for fuel or oil spills and conducting soil testing to monitor contamination levels.
- Trench management focuses on stabilizing trenches during construction to prevent collapse and refilling trenches promptly to avoid long-term soil settlement.

Impact Magnitude

The overall magnitude of the land and soil impacts is expected to be can range from **moderate to high**, in sensitive zones such as Amravati due to the combined effects of excavation, soil compaction, removal of topsoil, trenching, and the added vulnerability to seismic and flood events.

Impact Significance

The significance can range from **moderate to high**, particularly in hazard-prone areas where soil stability and erosion risks are elevated.

Mitigation Measures

- During excavation, care will be taken to see that the topsoil and the subsoil are stored separately. Topsoil (50cm) of route pits will be conserved and restored after excavation is over and will be replaced back for filling of the pit areas. Whereas the topsoil (25cm) stripped from the area stacked separately as topsoil dump of not more than 1m in height and the same will be redistributed to the pit after laying of pipeline. During refilling, care will be taken to see that the topsoil is replaced back at the top while refilling after laying of pipeline.
- Back filling shall be carried out immediately after the pipeline has been laid in the trench. On no account shall the topsoil from ROW be used for this purpose. The backfill material shall not contain any extraneous material and/or hard lumps of the soil. After the initial backfill has been placed into the trench to a level slightly above the surrounding ground, the backfill material shall be compacted.
- When the trench has been dug through driveways or roads all backfills shall be executed with sand or a suitable material and shall be thoroughly compacted.
- Trench excavated in dykes which are the property of the railways, or which is part of main road shall be graded and backfilled in their original profile and condition.
- Also, necessary contour bunding, gully plugging, and staggered trenching shall be carried out wherever required in the pipeline corridor and in areas where excavated soil will be dumped to check soil erosion.

- Stone pitching will be provided at the slopes near the irrigation and natural drainage / rivers to prevent silting of soil into these water bodies.
- In flood-prone areas, temporary bunds and drainage diversion structures will be installed to prevent waterlogging and erosion during monsoon.
- In seismic zones, trench design will incorporate flexible joints and bedding materials that can absorb ground movement without compromising pipeline integrity.
- Concrete shall be tested in accorder with IS: specification and shall have a minimum compressive strength as per concrete grade design and the same will be utilized for construction purposes.
- Approved quality of cement confirming to IS code will be used only OPC 53 grades.
- Concrete coating will be reinforced by a Single layer of steel reinforcement.

Residual Impact Significance

- The significance of residual impact will be **Low to Moderate** depending upon the effectiveness of mitigation measures.

Table 5-7: Impact Significance for Land and Soil Environment

Impact		Impact on Land and Soil Environment				
Impact nature		Negative				
Impact Type		Direct				
Impact Scale		Erosion, sediment runoff, compaction, habitat loss, disruption of topsoil, Localized, with concentrated effects near water crossings, steep areas, and during trenching.				
Impact Magnitude (Without Mitigation)		Medium to High				
Aspect	**Scenario**	**Spread**	**Duration**	**Intensity**	**Likelihood**	**Overall**
Land and Soil Environment	Without Mitigation	Medium	Medium	Moderate	Moderate	Moderate
	With Mitigation	Local	Medium	Low	Low	Minor

5.5.5 Ecology and Biodiversity

Impacts- Context and Receptors

The construction works of the NG pipeline route involve clearance of land, including the removal of trees, for which necessary permissions have been obtained from the relevant authorities. While a significant portion of the pipeline route will still be laid along the Right of Way (RoW) of existing roads, certain segments will require the clearing of trees, shrubs, and herbs. This introduces a moderate ecological impact, particularly in areas with dense vegetation or sensitive habitats.

The removal of trees may lead to:

- Loss of local biodiversity and habitat for birds and small mammals,
- Temporary disruption of ecology of the region,
- Increased vulnerability to soil erosion and microclimatic changes.

Embedded/In-Built Control

- The design will incorporate buffer zones around ecologically sensitive areas to minimize habitat fragmentation.
- Soil erosion control measures such as silt fences, mulching, and temporary revegetation will be implemented.
- Construction activities will be scheduled to avoid breeding seasons of local fauna where applicable.

Impact Magnitude

The magnitude of the impact on ecology and biodiversity is expected to be moderate, due to the Forest patches and rivers passing through the route and its associated habitat loss. However, the impact is localized and temporary, with potential for recovery through mitigation and restoration efforts.

Impact Significance

Given the tree removal and associated ecological disturbance, the significance of ecological and biodiversity impacts is considered moderate without mitigation. With proper mitigation, the impact can be reduced to low.

Mitigation Measures

- Construction alignment will be optimized to avoid ecologically sensitive areas and minimize vegetation loss.
- Post-construction ecological restoration will be implemented, including soil stabilization and replanting of native vegetation.

Residual Impact Significance

- The significance of residual impact will be **low** after implementing mitigation and restoration measures.

Table 5-8: Impact Significance for Ecology and Biodiversity

Impact		Impact on Ecology and Biodiversity				
Impact nature		Negative				
Impact Type		Direct				
Impact Scale		Localized to Regional (depending on density of vegetation and ecological sensitivity)				
Impact Magnitude (Without Mitigation)		Medium				
Aspect	Scenario	Spread	Duration	Intensity	Likelihood	Overall
Impact on Ecology and Biodiversity	Without Mitigation	Medium	Medium	Moderate	Moderate	Moderate
	With Mitigation	Medium	Medium	Low	Low	Moderate

5.5.6 Socio-economic Environment

Impacts- Context and Receptors

The project will provide either direct or indirect job opportunities to the local population as far as possible. There will be some migration of skilled labour force from outside the project area during construction phase, which may put some pressure on the local settlements and resources. Local skilled employees will be preferred.

There will be a temporary rise in traffic on nearby roads during the construction phase, both inside and outside the project site, because the pipeline route crosses several major roadways. The transportation of building equipment and raw materials will be the primary cause of this rise. Due to the project's size and nature, there can be inconveniences for the public as well as possible safety hazards. Residents may be at risk for health and safety issues since the pipeline route travels through villages with dense human settlements along the right of way (ROW). This will have minimal affect considering the size and nature of the project.

Impact Significance

The significance of this impact is evaluated to **low**, which can be translated to positive beneficial impacts of the area.

Mitigation Measures

- Implement a traffic management plan to regulate the movement of vehicles and machinery.
- Schedule transportation of raw materials and heavy equipment during off-peak hours to minimize traffic congestion.
- Designate specific routes for construction vehicles to reduce disturbances in residential and high-traffic areas.
- Install appropriate road signage, speed limits, and warning signals to alert commuters and pedestrians.
- Deploy trained personnel for traffic control at critical junctions to ensure smooth vehicle movement and public safety.
- Conduct awareness programs for nearby residents on safety precautions related to pipeline construction.
- Implement strict safety protocols, including barricading construction areas and placing warning signs along the Right of Way (ROW).
- Establish emergency response plans and provide first aid facilities at construction sites.
- Regular monitoring of air and noise pollution levels in residential areas near the construction zone.
- Ensure compliance with occupational health and safety standards to protect both workers and the public.
- Adopt strict measures to prevent spills or leakages of hazardous substances into rivers and water bodies.
- Install silt traps and sedimentation barriers near river crossings to control soil erosion and prevent contamination.
- Conduct water quality monitoring before, during, and after construction to ensure no significant impact on aquatic life.

- Avoid construction activities near riverbanks during peak fishing seasons to minimize disruptions.
- Implement eco-friendly construction techniques to reduce the risk of river pollution and maintain biodiversity.
- Compensate affected individuals for any temporary disruptions to their livelihood due to construction activities.
- Promote local employment opportunities by prioritizing the hiring of skilled and unskilled workers from nearby villages.

Residual Impact Significance

- After the implementation of these mitigation measures, the residual impact significance is expected to be **Positive low to moderately beneficial.**

Table 5-9: Impact Significance for Socio-Economic Condition

Impact		Impact on Socio-economic condition of the study area				
Impact nature		Negative (with mitigation impact would be positive and beneficial)				
Impact Type		Direct				
Impact Scale		Construction activity may impact on public health in proximity of the project foot-print area. However, construction work may create jobs for local population/PAFs, which may convert the impact to beneficial.				
Impact Magnitude (Without Mitigation)		Minor				
Aspect	**Scenario**	**Spread**	**Duration**	**Intensity**	**Likelihood**	**Overall**
Socio-economic Impacts	Without Mitigation	Local	Short	Moderate	Moderate	Minor
	With Mitigation	Local	Short	High	High	Moderate-beneficial

5.5.7 Occupational Health and Safety

Impacts- Context and Receptors

The construction and installation activities for the 112 km natural gas pipeline involve several occupational health and safety risks. These include:

- Exposure to hazardous materials (e.g., gas, welding fumes, lubricants),
- Operation of heavy machinery and equipment,
- Working at heights or in confined spaces,
- Manual handling of pipes and trenching activities,
- Risk of fire, explosion, or gas leaks,
- Heat stress and fatigue during long working hours in open environments.

Workers, contractors, and site personnel are the primary receptors of these risks along with the local people residing/crossing the areas where the laying work will be carried out. The risks are adverse, direct, and likely to occur without proper controls

Embedded/In-Built Control

The project design and execution plan include several embedded safety controls:

- Compliance with national and international safety standards (e.g., OISD, PNGRB, IS codes).
- Mandatory use of PPE (helmets, gloves, safety shoes, flame-resistant clothing).
- Safety induction and training programs for all workers.
- Emergency response plans include fire extinguishers, first aid kits, and evacuation protocols.
- Regular safety audits and inspections.
- Signage and barricading around hazardous zones.
- Permit-to-work systems for high-risk activities (e.g., hot work, confined space entry).
- Health surveillance and medical check-ups for workers.

Impact Magnitude

The magnitude of occupational health and safety impacts is moderate, considering the nature of construction activities and the potential for injury or exposure. However, with embedded controls, the risks can be significantly reduced.

Impact Significance

Based on the appraisal criteria:

- **Spread**: Local (restricted to construction sites area),
- **Duration**: Medium (construction phase may last up to 2–3 years),
- **Intensity**: Moderate (risk of injury or exposure),
- **Likelihood**: Moderate (possible to occur without controls),

Hence, the **overall significance** is **moderate** without mitigation.

Mitigation Measures

To further reduce risks:

- Strict enforcement of HSE protocols and daily toolbox talks.
- Deployment of trained safety officers at all active sites.
- Installation of gas detection and fire suppression systems.
- Provision of rest areas, hydration stations, and shaded zones to prevent heat stress.
- Incident reporting and investigation mechanisms to prevent recurrence.
- Coordination with local emergency services for rapid response.

Residual Impact Significance

With effective implementation of mitigation measures, the residual impact on occupational health and safety is expected to be low.

Table 5-10: Impact Significance for Occupational Health and Safety

Impact		Impact on Occupational Health and Safety of the study area				
Impact nature		Adverse				
Impact Type		Direct				
Impact Scale		Local (confined to construction)				
Impact Magnitude (Without Mitigation)		Moderate				
Aspect	Scenario	Spread	Duration	Intensity	Likelihood	Overall
Occupational Health and Safety	Without Mitigation	Local	Medium	Moderate	Moderate	Moderate
	With Mitigation	Local	Medium	Low	Low	Minor

5.6 IMPACT DURING OPERATION STAGE

The impact during the operation phase will be continuous in nature. For a gas-based pipeline, the potential for imparting adverse impacts is not high. However, whatever impact on environment is present will be minimized through incorporation of efficient technologies for pollution control measures.

5.6.1 Air Environment

The pipeline will be 1.5 to 2 m below the ground and would be monitored via SCADA System. Some vehicular emissions during maintenance that will be short-term and temporary in nature. Therefore, there will be no impact on air environment due to operation of NG pipeline.

5.6.2 Noise Environment

The NG pipeline being underground in nature will not lead to noise pollution during its operation. However, noise could be generated during maintenance and repair works that will be temporary in nature.

5.6.3 Water Environment

IMPACTS

There will be no consumption of water during the operation phase of the NG Pipeline. However, there are chances of water contamination due to unprecedented leakage of pipelines within the water bodies located in ROW of the pipeline.

Embedded/In-Built Controls

Nil

Impact Magnitude

The **magnitude** of potential impacts is also expected to be **low** during the operational phase. The pipeline's construction did not disturb any major water bodies.

Impact Significance

During the operation of the natural gas pipeline project, the impact on the water environment is expected to be minimal.

MITIGATION MEASURES

- Leak Detection and Control System shall be in place.
- Mock Drills shall be conducted at regular intervals in line with the Emergency Response and Disaster Management Plan.
- Edges of the spilled area will be undercut so as to provide a key lock for the repair material. A stiff mixture of cement, water and aggregate will be throttled into & through the reinforcement and built-up until the surface is level with coating around the repair. The pipe will then be carefully laid with the repaired area at the top and will be moist cured for twenty-four (24) hours before further handling.

Table 5-11: Impact Significance for Water Environment

Impact		Impact for Water Environment				
Impact nature		Operation of the pipeline involves minimal disturbance to water bodies.				
Impact Type		Temporary impacts, such as minor risks of water contamination due to accidental leakage or malfunction.				
Impact Scale		Localized to the pipeline's specific route				
Impact Magnitude (Without Mitigation)		Low				
Aspect	Scenario	Spread	Duration	Intensity	Likelihood	Overall
Water Environment	Without Mitigation	Local	Long	Low	Moderate	Minor
	With Mitigation	Local	Long	Low	Low	Minor

5.6.4 Environment, Health, and Safety

There could be impacts on environment, health, and safety due to leakage from pipelines from likely external physical forces (Floods & Earthquake). Natural Gas being inflammable in nature could lead to fire hazards. Since the pipeline route passes through the several areas with the heavy settlements, canals, drains, railway crossing and heavy traffic areas. Ensuring the safety of workers during the construction phase, especially in highways and high-traffic areas along the pipeline route, requires the implementation of strict safety protocols and a comprehensive monitoring system. These precautions are essential to minimize risks related to natural gas leakage and to protect both workers and the surrounding community from potential hazards and accidents.

Embedded/In-Built Controls

- Project specific Health and Safety Management Plan will be put in place.

- Personal Protective Equipment (PPEs) including safety shoes, helmet, goggles, earmuffs, face shield, insulating (rubber) gloves with leather protectors, insulating sleeves, and flame-resistant (FR) clothing and face masks.
- Use of permit to work system
- Cranes and other lifting equipment are operated by trained and authorised persons.
- An up to date first aid box should be provided at all construction sites and a trained person should be appointed to manage it.

Impact Magnitude

As mentioned above, the O&M activities will be carried out by qualified team. With above embedded controls, the magnitude of impacts will be **Low**.

Impact Significance

As per the impact significant assessment matrix (**Table 5-2**) a combination of small impactmagnitude with medium receptor sensitivity results in impact significance as **Low**

MITIGATION MEASURES

- Leak Detection and Control System shall be in place.
- SCADA monitoring shall be carried out.
- Mock Drills shall be conducted at regular intervals in line with the Emergency Response and Disaster Management Plan.
- Continuous metering will be done to provide a comparison between input and output for leak detection.
- Periodic audits of pipeline and its control measures will be conducted regularly.
- Demarcation of Hazard Zones and pipeline chainage will be done.

Residual Impact Significance

- Residual significance of impacts during operation phase will be **Low to Insignificant.**

Table 5-12: Impact Significance for Environment, Health, and Safety

Impact		Impact for Environmental Health and Safety				
Impact nature		Negative				
Impact Type		Direct				
Impact Duration		Long-term				
Impact Extent		Local				
Impact Scale		Operational activity may impact occasionally on health & Safety of operational work force				
Impact Magnitude (Without Mitigation)		Negative-Low				
Aspect	**Scenario**	**Spread**	**Duration**	**Intensity**	**Likelihood**	**Overall**
Environmental Health and Safety	Without Mitigation	Local	Long	Low	Moderate	Moderate
	With Mitigation	Local	Long	Low	Low	Minor

5.7 SUMMARY OF PRE AND POST MITIGATION IMPACT SIGNIFICANCE

Table 5-13 below presents the summary outcome of the comprehensive assessment of identified impacts pre and post mitigation during various phases of the project. During impact assessment study, significant impacts have been considered, and mitigation plans have been developed in accordance to mitigate the impacts.

Table 5-13: Summary of Impacts

Category	Impact Significance (without mitigation measures)	Impact Significance (post-mitigation)
Planning Phase		
Impact due to Land Procurement	Moderate	Minor
Construction Phase		
Topography and Drainage	Moderate	Minor
Water resources and availability	Moderate	Minor
Ambient air and noise quality	Moderate	Insignificant
Land and Soil Environment	Moderate	Minor
Ecology and Biodiversity	Moderate	Moderate
Socio-economic Impacts	Low	Moderate-beneficial
Occupational Health and Safety	Moderate	Minor
Operational Phase		
Water Environment	Minor	Minor
Environmental Health & Safety	Moderate	Minor

6 ANALYSIS OF ALTERNATIVES

Route selection is a process of identifying constraints, avoiding undesirable areas and maintaining the economic feasibility of the pipeline. Diversion of pipeline around obstacles can be very costly. The ideal route, of course, would be a straight line from the origin to the terminal point. However, physiographic, environmental, design and construction constraints usually alter the route

The pipeline route should be optimized based on the following considerations:

- Safety of public lives and property and safety of the pipeline from engineering and other considerations.
- Shortest pipeline length.
- Easy and favorable terrain condition free of large water bodies, low lying marshy lands, obstacles like ravines, depressions and unstable grounds, meandering rivers, etc.
- Ground profile for pipeline hydraulics and avoidance of steep rising and falling ground, hills and valleys having sloping right of way.
- Availability of infrastructure and access to the pipeline route during construction and maintenance.
- Environmental impact and avoidance of environmentally sensitive lands, such as reserved forests, marine parks, built-up areas, places of worship, burial and public events.
- Minimum crossing of existing pipelines, transmission lines, parallel alignment, etc.
- Minimum road, rail, river and canal crossings.
- Avoidance of rugged and intricate grounds with hard strata, exposed rocks, boulders and quarries.
- Existing and future developments in the region, such as roads, rail lines, canal network, reservoirs, townships, industrial units, etc.
- Scope for future expansion of the pipeline.

Analysis of Alternatives: The initially proposed pipeline alignment traversed the Badnera Bus Depot area, as illustrated by the continuous navy-blue line in **Figure 1**. However, due to the presence of dense forest cover and heavily populated settlements along a 1.43 km stretch (highlighted within the red circle in Figure 1), a realignment was necessitated. The revised route, which circumvents these constraints, is depicted within the red circle in **Figure 2**.

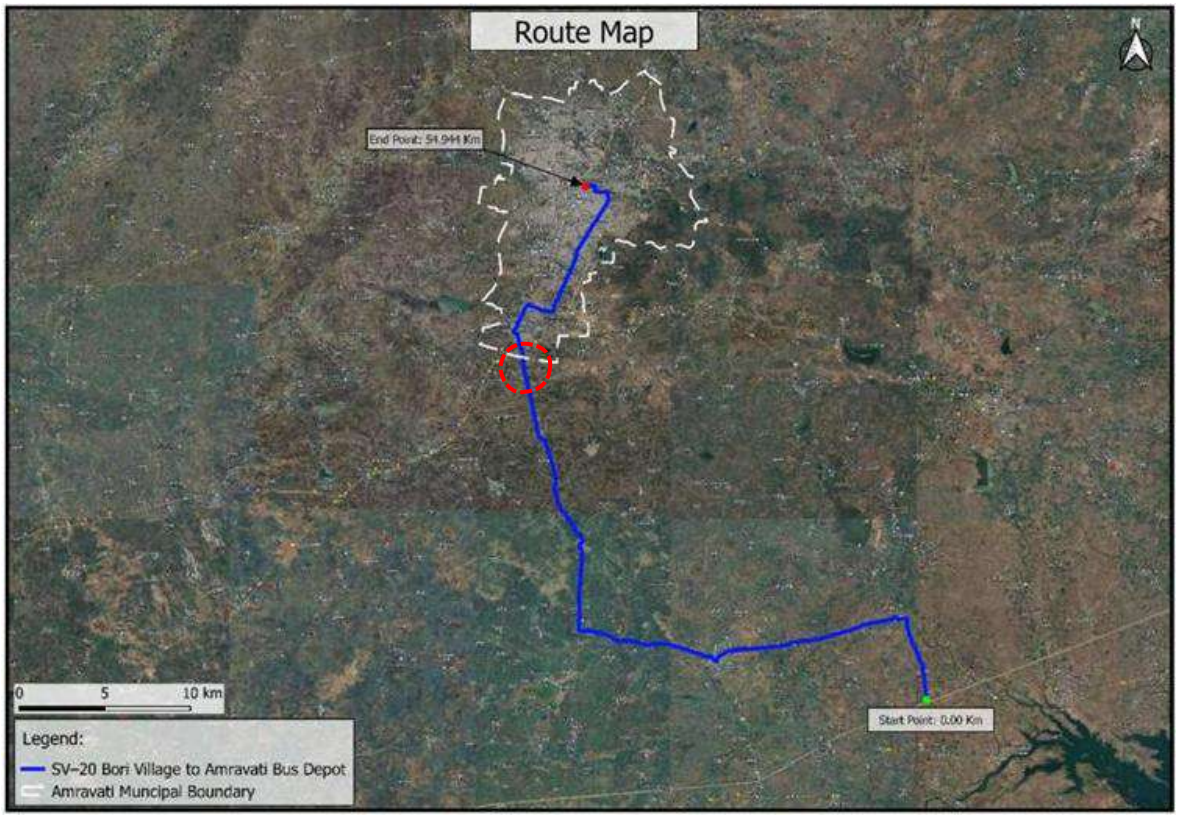


Figure 6-1: Initial Stretch Depicted in Red Circle

Figure 6-2: Final Diverted Stretch Depicted in Red Circle

Given that the project requirements were largely predefined, the scope for alternative route analysis was limited. The 1.43 km diversion was implemented to avoid environmentally and socially sensitive areas, including forested zones and densely inhabited regions. The revised alignment primarily follows the

existing Right of Way (RoW) of the road, which experiences significant vehicular traffic. The final route was selected based on a combination of technical viability and economic feasibility considerations.

7 ADDITIONAL STUDIES

7.1 Quantitative Risk Assessment

Quantitative Risk Assessment (QRA) study should be undertaken for the proposed 8" diameter underground pipeline for the transfer of natural gas. The aim of QRA study will be to identify potential hazards, assess the consequences and frequency of hazards and evaluate the risk to personnel, property and public. To assess the relative level of risk posed by the proposed project, a comparison will be made with risk criteria that are considered tolerable (ALARP) for similar operations.

The overall approach and methodology employed for the study will be based on the guidelines given in IS 15656: 2006, Indian Standard – Hazard Identification and Risk Analysis – Code of Practice, May 2006, using PHAST Software/Correlations.

The pipeline system will be provided with state-of-the-art safety systems like protection system, SCADA, leak detection system / pipeline application software, Fire and gas detection systems, etc. The proposed transfer of gas will be examined for inherent hazards or the potential to result in an unplanned event or sequence of events at different sections along the pipeline route. Several hazards that can cause failure of pipelines will be identified. This included loss of integrity/ damage due to interference from third parties, corrosion, accidents, human error, sabotage, etc., during normal operation. Analysis of past accidents are to be used to establish the credibility of accident scenarios.

7.2 Guidelines for Emergency Response Plan

An emergency response plan will be developed with the resources available within the company. The important stages of the response plan are declaration of an emergency, identification of resources & manpower, ending of an emergency and rehearsal of the plan. Declaration of an emergency would involve recognizing a leak and reporting to the Station in charge of the nearest compressor station.

Other features are summarized below:

Emergency Response Structure: An emergency response structure will be developed for effective response to the emergency. The structure defines the main functions of the decision makers and the individual roles as well.

Roles & Responsibilities of Team: Emergency response team (ERT) to respond to fire, accidents and technical emergencies will be constituted from operations personnel, who can be called upon 24 hours a day, supported by senior management field personnel as and when required. The ERT will receive specific training for their roles and exercised on a regular basis. The proposed functions of employees that are planned to be deployed will be finalized prior to commissioning.

Operations Control: The pipeline operation will be monitored and controlled through Local control system and POC in command which will have the provision for emergency shut down or isolation of Pipeline. Security: Surveillance of the entire pipeline will be held periodically through ground patrolling. Using operators with knowledge of the local area will be deployed for ground patrolling of the pipeline route.

Medical and First Aid: All arrangements will be made available at site offices and camps for medical and first aid. First–Aid facility will be provided at compressor stations, master pipeline operation center/ local control center, MLVs and M&Rs. Adequate first-aid training will be provided for employees at these locations.

Communication: Responsibility for external and internal communication will be assigned at each station. Dedicated fiber optic cable-based communication system will be provided for quick communication between the control stations, dispatch and delivery station(s) of the pipeline. The backup system will consist of an appropriate combination of fixed telephone lines/data-bandwidth of the local service provider, mobile phones, VHF sets etc.

Emergency control room: A safe location will be designated as an emergency control room (ECR) within the compressor stations.

Emergency Procedures: PP will evolve easy-to-follow procedures for responding to the identified situation. The plan will be rehearsed once in three months.

Ending of an emergency: After controlling an emergency, the site ERT Leader will declare as “All Clear”. The siren will be sounded for 2 minutes to indicate that the Emergency is over.

The basic elements for an effective plan have been included in the development. Prior to the commissioning of the project, copies of the plan are to be given to the authorities.

8 PROJECT BENEFITS

8.1 CONTRIBUTION TO NATIONAL ENERGY SECURITY

Energy is the key input for economic growth and Indian Energy sector play a vital role in country's Economy. Energy is a key input to the production processes that transform inputs into goods and services. India became the third largest energy consumer in the world after United States and China. Key drivers for increasing energy demand in India are population growth, industrialization, and urbanization. Energy security and sustainability are interdependent because emissions from energy consumption contribute to climate change in greater extent globally. Indian government is also committed to increase the share of natural gas in country's energy mix up to 15% by 2030 and Ministry of Petroleum and Natural Gas intervening with policy reforms in natural gas sector. India requires a sustained supply of energy to support its ambitious growth and welfare targets for the coming years. In a survey by NITI Aayog, it was noted that India's energy consumption will reach 2,300 million tons of oil equivalent by 2047 out of which natural gas will contribute 173 million tons of oil equivalent under the determined effect scenario.

According to the International Energy Agency (IEA), Indian gas market is considered one of the most growing energy markets in the world, the Agency expected that Indian gas demand will increase in the coming decades at 5.4% per annum over 2007-30 (IEA ,2009) reaching 132 BCM by 2030. With the growing need for oil and gas in India since the nineties of the last century, the Indian government has worked to develop the oil and gas sector through the development of mechanisms of action and the issuance of new regulatory laws, 1993, private investors have been allowed to import and market liquefied petroleum gas (LPG) and kerosene freely, private investment is also allowed in lubricants, which are not subject to price controls. In the 11th Five Year Plan, the Indian government has focused on the energy sector to self-reliance for energy resources, particularly oil and gas by encouraging of exploration and extraction operations and reduce dependence on overseas.

8.2 REDUCED RISKS AND COSTS

The natural gas pipeline has been regarded as the most cost effective and safest channel of gas transportation and has extraordinary strategic significance for the country. Pipeline is regarded as the most cost-effective and safest channel to transport the oil and gas from upstream oil field or port to downstream users or refineries. Gas is significantly replaced by oil in all sectors i.e. power generation, domestic and transportation due to price hike in oil prices globally and cheaper availability of natural gas. During the last five years the oil imports have reduced by 8 %. The other reason for that may be the availability of cheaper, safe, and durable modes of gas transportation system (main and distribution network of pipeline), which is continuously expanding.

The gas pipeline projects help in reducing the travel cost in comparison to other resources and it is also very safe and cheaper for domestic, commercial, and industrial uses. The proposed pipeline project would be very feasible and cost effective as it is totally underground and there will be continuous access to the gas for use.

8.3 SOCIO-ECONOMIC DEVELOPMENT

The proposed project will create socio-economic development across the pipeline route and in the near vicinity as well. The project will provide employment during construction and operation phase to the local labours. Natural gas pipelines provide a reliable mode for transportation, reducing dependence on less stable energy supplies. Access to natural gas will decrease heating and electricity costs for residents and businesses. Usage of gas in domestic households and other commercial activities will reduce consumption of fossil fuels that would lead to a reduction in pollution.

9 ENVIRONMENTAL, SOCIAL AND BIODIVERSITY MANAGEMENT & MONITORING PLAN

9.1 BACKGROUND

The Environmental Social and Biodiversity Management Plan (ESBMP) provides an essential link between predicted impacts and mitigation measures during implementation and operational activities. ESBMP outlines the mitigation, monitoring and institutional measures to be taken during project implementation and operation to avoid or mitigate adverse environmental impacts, and the actions needed to implement these measures. The likely impacts on various components of environment due to the project during developmental activities have been identified and measures for their mitigation are suggested. The ESBMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each attribute, or operation, which could otherwise give rise to impact, the following information is presented:

- A comprehensive listing of the mitigation measures
- Parameters that will be monitored to ensure effective implementation of the action.
- Timing for implementation of the action to ensure that the objectives of mitigation are fully met.

The ESBMP comprises a series of components covering direct mitigation and environmental monitoring, an outline waste management plan, and a project site restoration plan. Therefore, an environmental management plan has been prepared for each of the above developmental activities.

9.2 ENVIRONMENT, HEALTH & SAFETY POLICY

ATGL believes that Environment, Health, Safety and Quality (EHS&Q) is an integral part of their business. By embracing the best principles EHS&Q, the company sincerely attempts to have all overall positive impact on the environment and communities where they operate. **ATGL** is committed to continually improving their EHS&Q performance by including the points below: The EHS&Q Policy of **ATGL** emphasizes the following objectives:

- Implement high standards of Environment, Health, Safety & Quality in planning, construction, operations, and maintenance of projects throughout their lifecycle to provide a safe and conducive working environment to its employees.
- Identify, eliminate, or mitigate potential EHS&Q risks associated with our business by implementing robust due diligence and monitoring mechanism.
- Evaluate and comply with applicable regulations related to EHS&Q.
- Provide adequate training & resources for its employees to achieve its EHS&Q targets.
- Voluntarily adopt to an integrated Management Systems, compliant with international standards ISO 14001, ISO 45001, and ISO 9001 for EHS&Q respectively.

This EHS&Q policy is applicable for **ATGL** 's business and project related activities and its subsidiaries. All employees and contractors of **ATGL** are required to adhere to this policy.

The HSE policy further ensures adherence of health and safety norms by hired contractors. The specific provisions to be followed include the following:

- The contractor shall in its performance of the contract and carrying out of the work to ascertain and comply with all the relevant statutory laws and directives act as applicable.
- The contractor shall provide detail of EPF, ESIC, Labour License, medical fitness of workmen, valid photo id of workmen, undertaking letter mentioning workmen criminal record and other documents as applicable.
- All required safety items shall be supplied by contractor and any accident occurs during the contract period shall be to the contractor's account and **ATGL** will not be responsible for the minor/major accident/incident legally or financially.
- Workmen compensation policy must be obtained and kept in force.
- If contractor assigning the whole or partial work to third party should be intimated to **ATGL** in written with all required documents.
- Daily manpower and man-hour shall be reported by contractor.
- The contractor shall provide Attendance Register, Wages Register, EPF Remittance Challans, ESIC remittance challans every month or as on when required. This is also required for release of payment.

- The contractor shall make provisions for potable and domestic water for manpower, proper sanitary requirements with sufficient toilets and wastewater management for workmen which will be deployed for all ongoing work.
- Dedicated safety supervisor/officer should be available at site all the time during work execution.
- Mandatory PPE. (All PPE's Should be of IS standards)
    - ✓ Safety Helmet / Hard Hat.
    - ✓ Safety Shoes.
    - ✓ Safety Goggle.
    - ✓ Safety Jacket.
    - ✓ Safety Hand gloves.
- Job Specific PPE's

    a. Welding Work (Basic)

    - ✓ Safety Goggle / Welding Shield.
    - ✓ Leather Hand Gloves.
    - ✓ Leather apron.
    - ✓ Full Sleeved shirt
    - ✓ Pants that covers the top of shoe.

    b. Drilling Work (basic)

    - ✓ Safety Goggle
    - ✓ Nose mask.
    - ✓ Hand Gloves.
    - ✓ Ear Plug (as per requirement)

    c. Electrical

    - ✓ Insulating (rubber) gloves.
    - ✓ Insulated tools.
    - ✓ All electrical extension boards should have industrial plugs wherever required.
    - ✓ All electrical extension boards should have 30mA ELCB MCB.

    d. Civil Work

    - ✓ Gum Boot with steel toe.
    - ✓ Rubber Gloves.
    - ✓ Nose mask.

- ✓ Safety Goggles.
- ✓ Ear plug if working in high noise area.

- Any other specific PPE required that will be intimated time to time.
- All required safety training will be provided by **ATGL** time to time.

The contractor should adhere to all the **ATGL** & end customer safety norms. Failing to adhere may result in suspension of work or penalty will be applicable.

9.3 ORGANIZATION STRUCTURE

The overall management and coordination of the project will be managed through Chief Executive Officer (ATGL) who will be supported by the Plant Manager and Head (EHS&S). The Head- EHS&S /ESG will overview, monitor and control the activities of Site Manger and Safety officer. The contractors will be controlled by the site manager during construction phase. The construction contractor shall have a Health, Safety and Environment supervisor in their team who shall work in coordination with the EHS officer.

The primary responsibility of management of EHS&S functions within **ATGL** lies with the head quality control and EHS&S Officer. For management of land related issues, the responsibility rests directly with the land procurement personnel and HR related issues is managed by dedicated HR team. CSR is managed by a separate team and is responsible for overlooking all assets operated by **ATGL .**

9.3.1 Roles and Responsibilities

Head EHS

The Head of EHS should be the designated EHS&S head at **ATGL** . The key Roles and Responsibilities are as follows:

- The overall responsibility for implementation and communication of the EHS&S and associated policies and meeting ESMS performance objectives for the organization with respect to project.
- Ensuring adherence of EHS&S Policy and procedures and Safety compliance by Contractors.
- Ensuring compliance with existing and future operations with respect to the applicable national laws, rules and regulations, permits pertaining to Environmental, Safety, Health and Social as well as international best practices including reference frameworks such as IFC Performance Standards.
- Communication of EHS&S related issues and concerns with the CEOs office and project heads as well as guiding them on Go and No-Go decisions for projects with serious EHS&S risks and issues.
- Decision on internal risk categorization and rating lies with the ESHS head.
- Approvals for commissioning of ESIA studies, Resettlement Action Plans etc.
- Responsible for recommendation and appointment of EHS&S personals.
- Responsible for taking up monitoring reports and audit reports with the CEO's office.

- Changes in this ESMS manual must be sanctioned by the EHS&S head and formalized by the ESMS head.
- Responsible for decisions on higher level EHS&S non-compliance by external stakeholders such as contractors and vendors with respect to fines and associated penalties.

Corporate EHS&S Officer

The EHS&S Manager at the corporate level will be responsible for the following:

- Overseeing successful EHS&S screening, audit and impact assessment of assets either internally or through external agencies as the case maybe.
- Overseeing the implementation of the systems, protocols and checklists of the ESMS at the corporate level and where necessary, transferring information and expertise at the site level.
- Interaction with other teams such as project team, land, procurement, HR etc. for handling and resolution of EHS&S issues and risks.
- Ensuring implementation of training and capacity building exercises at the corporate levels and project levels.
- Documentation and control of ESMS related documents.
- Development of processes with respect to EHS&S. Also includes internal updates of existing systems pertaining to EHS&S wherever feasible and technically possible.

Functions of HR Department

The HR department is responsible only for the management of HR relations for internal employees within ATGL . Some of the primary roles and responsibilities undertaken by HR department are as follows:

- Responsible for implementation of the corporate HR Policy, manual and practices.
- Planning and recruitment of new employees as aligned with the business plan.
- Management of performance appraisal & review process.
- Implementation of desired employee engagement programs & practices.
- Management of any internal Human Resources Information System.
- Assessing and evaluation of competencies of existing employees.
- Carrying out of training programs and orientation of new employees.
- Liaise with law enforcement agencies whenever necessary.
- Manage harmonious industrial relations.
- Handling and management of employee grievances.

CSR Team

The CSR department established at the corporate level primarily has the following roles and responsibilities:

- Conducting need-based assessment studies (internal or external) for project relevant CSR programs and activities.
- Undertaking stakeholder identification, profiling, analysis, and influence impact matrix.
- Defining and developing strategies which underpin the company's CSR objectives in the aspects defined under the central CSR policy.
- Developing site specific CSR engagement plan.
- Liaison and maintaining good rapport with government, educational institutions & community-based organization & engaging them for CSR activities.
- Developing evaluation and monitoring indicators for implementation across locations & conducting review meetings at regular intervals.
- Establishing effective ways of measuring and articulating ATGL impact in social development through the various CSR programs.
- Disclosure of the impacts and other aspects of the project including emergency response plan for the community.
- Ensuring sharing of project benefits the local community.
- Visit project sites on a regular basis, monitor program progress and resolve implementation obstacles to ensure the programs are being implemented in accordance with plans and agreements.

Legal Team

Broadly the key functions of the legal team at the corporate office of ATGL are as follows:

- Managing compliance and statutory requirements and records applicable to ATGL businesses including necessary licenses and permits.
- Providing legal support to land, assets, contractual transactions.
- Ensuring legal compliance of contractors and vendors to established terms and conditions.
- Government sanction/approvals.
- Checking, proofing and validation of legal documentation.
- Addressing legal disputes and litigation.
- Maintenance of legal records.
- Review contractor/ supply chain engagement with compliance of all legal requirements related to EHS&S and HR provisions.

SITE LEVEL

Site Manager/ EHS&S Officer

The Project Manager/ EHS&S Officer are responsible for overall management of the project and ESMP implementation. The following tasks will fall within his/her responsibilities:

- Monitor site activities daily for compliance.
- Conduct internal audits of the construction site against the ESMP.
- Confine the construction site to the demarcated area.
- Reporting EHS&S related issues & incidents in respective areas.

Project Manager

- Responsible for the overall implementation of the EHS&S plan.
- He/ She shall establish an EHS&S organization for the effective implementation of this plan.
- He/ She shall provide all resources to effectively implement the EHS&S plan.
- He/ She shall initiate disciplinary actions for any violations of the EHS&S plan.
- He/ She shall ensure the project EHS&S plan is integrated with customer requirements and ensure its compliance.
- Communicate all kinds of events to customers and regulatory agencies as appropriate.
- He/ She Shall act as the highest authority in taking any decisions related to EHS&S violations.

EHS&S Officer

The EHS&S Officer will have the following responsibilities:

- Ensuring availability of resources and appropriate institutional arrangements for implementation of ESMP.
- Role may be combined with Project Security Manager's role.
- Ensuring this plan requirement is communicated to all sub-contractors and their contractors, employees, customers and visitors.
- Sub-Contractor shall take conduct periodic inspections to ensure compliance with the requirements of this plan.
- Provide support to implement the procedures of this plan for the respective project site.
- Ensuring that Identification Badges and Helmet Badges is not issued to his Employees, Visitors, Sub-Contractors and their contractors without undergoing the orientation training.
- Ensuring compliance with legislative, IFC's and other lender's requirements.
- Carrying out audits, and inspection of all the project activities at regular intervals and rectify non-compliances if any.
- Preparation of necessary documents and record keeping system.

- Reviewing and updating of ESMP for its effective implementation.
- Acting as a point of contact for residents and community members.
- The contractor should develop a code of conduct to guide the employees on how to behave with the community to avoid conflicts.
- Develop a Grievance Redressal Mechanism in line with informing the local community about the Grievance Redressal Mechanism and ensuring effective implementation; and
- Conducting periodic meetings with the local community to understand their grievances and outcomes of the CSR activities; and
- Address training needs of contractors and other employees for social and community issues.

Sub-Contractors/ Labour Contractors

- The sub-contractors / labour contractors working for ATGL is hereby responsible for complying with the guidelines of this plan.
- Sub-Contractor shall provide all resources to implement the requirements of this plan in their respective work area.
- Sub-Contractor is responsible to communicate the requirements of the plan to all their sub-contractors and their contractors, their employees and visitors.
- Sub-Contractor shall take disciplinary actions for any violations of this plan as required.
- Sub-Contractor shall not issue Identification Badges and Helmet Badges to his employees, his Sub-Contractors and their contractors without undergoing the orientation training on the plan.
- Sub-contractors shall ensure commitment and compliance for no child/forced labour involvement in the project.

Training and capacity building

Training is one common method of supplying individuals with additional skills and knowledge. To be successful in EHS&S management, training programs need to be thought out carefully and systematically. A robust social and environmental, health and safety training plan is important for effective implementation of ESMS.

The Corporate EHS&S head at ATGL along with recommendations from EHS&S officers will ensure that the job specific training and EHS&S induction training needs are identified based on the specific requirements of the ESMS and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Some of the specific trainings that will be carried out on a routine basis are as follows:

- ESMS Checklists and procedural guidance
- Occupational Health & Safety
- Fire Safety and Prevention

- Emergency Response Preparedness
- Operational Training
- HR Induction Training
- PPE Training
- Driver Safety
- Implementation of Environmental and Social Management/Action plans

The above listed training courses are the preliminary training courses which will be undertaken at the inception stage once the employee/worker joins the company and/or Project. Post that monthly refresher training will be undertaken, especially for the workers. Other training will be identified and implemented during the project lifecycle as per the need assessment, as part of mitigation measure and also capacity building of the staff.

An environmental and social management training program will be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training program will ensure that all concerned members of the team understand the following aspects:

- Purpose of action plan for the project activities.
- Requirements of specific Action Plans.
- Understanding of the sensitive environmental and social features within and surrounding the project areas.
- Aware of the potential risks from the project activities.

In case of contractors or turnkey contractors having sufficiently well-developed standards on EHS&S management, the training can be sub-let to the same for their respective employees and ATGL will monitor the completion and sufficiency status of these programs. In case of subcontractors, the training and capacity building will be done by the site level EHS&S's officers along with the contractor's EHS&S manager to ensure such trainings of the contracted staffs either directly or through trainers of **ATGL** . Subsequently the responsibility can be passed on to the sub-contractors for all future training programs.

It is further advised that **ATGL** shall consider engaging a third party EHS&S audit to monitor and evaluate the EHS compliance during the construction phase. The EHS&S officer shall be responsible for checking compliance of the contractor(s) with the requirements of this ESMP and any other relevant environmental legislation for all activities associated with the contract. The general duties of the EHS&S officer will be as follows:

- Third Party EHS&S Officer will be responsible for conducting an EHS&S audit during the construction phase of the project according to the provisions of the Environmental Management Plan.
- Conduct independent environmental audits.

- Submit audit reports to the EHS&S Specialist/ Head EHS&S and if required, relevant authority.

9.4 CONTRACTORS MANAGEMENT PLAN

The overall responsibility of the project will be of **ATGL** It shall thus ensure that the ESMP is implemented by its contracts through contractual arrangements. **ATGL** has developed a Vendor's Code of Conduct which requires that all service providers and their directors, employees, agents, suppliers, and subcontractors (collectively Service Providers' representatives) always conduct themselves with integrity and in full compliance with this Code of Conduct and applicable laws, rules and regulations that govern their business activities. All **ATGL** service providers will be required to educate and, when appropriate, train their representatives to ensure they understand and comply with this Code of Conduct. The code of conduct principles of **ATGL** are as follows:

- Corruption & Prohibited Business Practices
- Health and Safety
- Environment
- Labor Standards
- Acting in Concert
- Mirroring of Contractual Requirements towards sub-suppliers
- Human Rights

The EHS norms in the code of conduct cover the following elements:

- The service provider should ensure that its workers are provided with a healthy and safe working environment in accordance with recognized standards. The Service Provider shall do its utmost to control hazards and take necessary precautionary measures against accidents and occupational diseases. The Service Provider shall ensure compliance with the provisions of Building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1976. Whenever necessary the workers are to be provided with, and instructed to use, appropriate personal protective equipment, and are adequately & regularly trained to ensure that they are adequately educated on health and safety issues.
- Compliance with labour laws and legislations i.e. the Contract Labour (Regulation and Abolition) Act, 1970, Employees State Insurance Company Act, 1948, Employees' Provident Funds and (Misc. Provisions) Act 1952, Payment of Bonus Act 1965, Payment of Gratuity Act, 1972, Equal Remuneration Act, 1976, Maternity Benefit Act, 1961, Labour Welfare Fund Laws, Minimum Wages Act, 1948, Payment of Wages Act, 1936, Shops and Establishment Act and Inter-State migrant workmen (Regulation of Employment) and (Conditions of service) Act, 1979.
- Non-engagement of child labour and bonded labour.
- Non-discrimination based on caste, creed, religion, or sex.
- Ensuring that women employees of Service Provider are given full protection from sexual harassment as per guidelines laid down by the Supreme Court of India.

- Ensuring adherence of EHS policies and procedures by Contract Agreement in order to ensure that its own suppliers', sub-supplier's, business partners and other third parties directly or indirectly used by the Service Provider in the provisioning of services to accept and adhere to the EHS requirements.

General environmental awareness will be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. The same level of awareness and commitment will be imparted to the contractors and subcontractors prior to the commencement of the project through an EHS Management Plan prepared for Project and Contractors engaged for the project. It shall ensure compliance with **ATGL** 's Environmental Performance Guidelines for New Projects and Developments, minimizing the safety hazards through good engineering design through the implementation of the Group Integrity Management Standard, and achieving a record of 'zero' Lost Workday Case (LWDC) injuries and incidents on the Project. Itcomprises of the following aspects:

- Project Management Plan Deliverables Register
- Project Contractor Requirements
- Project Risk Management Plan
- Project Training Matrices
- Project Reward & Recognition Program
- Project Safe Work Practices
- Project Document Management Procedure
- Project Records Management Procedure
- Project Communications Table
- Project Audit Program
- Project Emergency Response Plan

ATGL shall ensure that the job specific training and EHS Induction Training needs are identified based on the specific requirements of ESMP and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Special emphasis will be placed on traffic management and operation of Cranes.

An environmental and social management training program will be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training program will ensure that all concerned members of the team understand the following aspects:

- Purpose of action plan for the project activities.
- Requirements of the specific action plans.
- Understanding of the sensitive environmental and social features within and surrounding the

project areas; and

- Aware of the potential risks from the project activities.

A basic occupational training program and specialty courses should be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments. Training shall be provided to management, supervisors, workers, and occasional visitors to areas of risks and hazards. Workers with rescue and first-aid duties shall receive dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their co-workers.

Through appropriate contract specifications and monitoring, the employer should ensure that service providers, as well as contracted and subcontracted labour, are trained adequately before assignments begin.

9.5 COMMUNITY/ STAKEHOLDERS ENGAGEMENT PLAN (SEP)

ATGL shall adhere to Stakeholder Engagement Plan (SEP) for engagement with community, government bodies during the lifecycle of the project and to assess the efficiency of the communication process in meeting the objectives of the SEP and ensuring the projects' 'social license to operate.

Table 9-1: Stakeholder Group Categorization

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	Sub-contractors, local labours	Local community, agricultural labour, vulnerable communities
Institutional Stakeholders	Gram Panchayat, Project Investors	Village Institutions, (schools, health centers etc.)
Government Bodies	Regulatory Authorities, District Administrations	-
Other Groups	-	Media, other industries, projects

9.5.1 Aims and Objectives of SEP

The engagement plan is to guide all the stakeholders' engagement during construction phase and operations phase. The objectives of the SEP are:

- Enable management to develop effective stakeholder management strategies for various projects to build long term relationship so as to ensure smooth functioning of the projects.
- To define and standardize the process that the project will use to communicate with respective stakeholders.
- To ensure regular and timely sharing of information with project team to spruce up their understanding and skills of engaging with the stakeholders.
- Ensuring coordination in approach and message to be shared with the community regarding the company and the projects.
- To assess the efficiency of the communication process in meeting the objectives of the SEP and ensuring the projects' 'social license to operate.'

The community engagement process is informally managed by the QHSE Head and is limited to liaison with local authorities and the panchayat. To ensure the implementation of the ESMP and engage all the

stakeholders identified, this process will need to be formalized through the social officer defined as above.

The two important elements of community engagement will be disclosure and consultation. This implies that as a first step, the findings of the ESIA, especially the ESMP will have to be disclosed to the community. The ESMP should be finalized through consultation with the community and an action plan shall be developed. Further, the community should be regularly updated about the implementation of the ESMP and all other relevant information pertaining to the construction phase, activities, health, and safety risks etc. The community shall also be made aware of the available job opportunities from time to time.

The project will engage with the affected people to understand the stakeholders on the common property resources (roads, grazing areas etc.) which would be impacted. It shall work closely with the Panchayat and local administration to identify and develop alternate areas for common resources (fodder,) if required.

To understand community expectations and manage any local concerns, **ATGL** will constitute a Grievance Redressal Mechanism to be managed by the Social Officer. This grievance mechanism will respond to the concerns and grievances of local communities, NGOs, Panchayats and any other aggrieved party or stakeholder. The project will share information about these mechanisms to the stakeholders through locally appropriate communication tools.

The Grievance Redressal Procedure will also outline the process and steps to be taken and the time limit within which the issue would need to be resolved to the satisfaction of the complainant. The project will endeavor to get all complaints recorded and addressed in a uniform and consistent manner. For disputes that cannot be internally resolved, the project will set up an independent mechanism with representation from community, Panchayats, and locally respected citizens of the area to sort these conflicts. If it has a legal implication the district administration will be approached.

9.6 ESMP REVIEW & AMENDMENT

ESMP is a social and environment management tool which shall be reviewed periodically (at least once in 2 years or earlier) to address changes in the project design, life cycle processes and activities, organization, and regulatory requirements.

9.6.1 Inspection, Monitoring & Audit

To implement the ESMP, the on-site team will develop a time-bound and action- oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments.

The monitoring process will cover all stakeholders including contractors, labourers, suppliers, and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring, the company will ensure that all the contractors comply with the requirements of conditions for all applicable

permits including suggested action plans. The inspections and audits will be done by **ATGL** 's trained team and external agencies/experts. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors in their respective areas.

9.6.2 Reporting and Review

ATGL will develop and implement a program of reporting through all stages of the project viz., construction and commissioning, operation, and decommissioning. Contractors will be required to fully comply with the reporting requirements in terms of timely report submission with acceptable level of details. Reporting will be done in form of environmental, health, safety and social check list, incident record register, environmental, health, safety, and social performance reports (weekly, monthly, quarterly, half yearly, yearly etc.).

9.6.3 External Reporting and Communication

All complaints and enquiries are to be appropriately dealt with, and records be maintained in a Complaint/Enquiry Register by QHSE Head or other delegated staff.

9.6.4 Internal Reporting and Communication

Inspection and audit observations along with their improvement program are to be regularly reported to the senior management for their consideration. The same are also to be communicated within the staff working on the project. To maintain open communication between the staff and management on EHS&S issues the following shall be used:

- Team Briefings,
- On-site work group meetings.
- Key Incidents/accidents and lessons learnt.
- Work Specific Instructions; and
- Meeting with stakeholders.

9.7 DOCUMENT & RECORD KEEPING

Documentation and record keeping system must be established to ensure updating and recording of requirements specified in ESMP. Responsibilities must be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained, and that document control is ensured through access by and distribution to identified personnel in form of the following:

- Documented Environment management system.
- Legal Register.
- Operation control procedures.
- Work instructions.
- Incident reports.
- Emergency preparedness and response procedures.

- Training records.
- Monitoring reports.
- Auditing reports; and
- Complaints register and issues attended/closed.

The following table provides a sample summary of engagements which are required in a typical project lifecycle. It indicates the methodology on how these stakeholder consultations are accomplished.

Table 9-2: Methods of Consultations and Engagement

Stakeholder	Stakeholder Category	Objective of Engagement	Stakeholder Influence	Methods of Consultation and Engagement	Frequency of Consultations and Engagement
Sub- contractors/ Labours/Employees	Primary Stakeholder	To appraise labour working conditions and EHS compliance	Medium	Periodic Meetings (for the purpose of information dissemination, including information regarding labour laws, safety measures and discussions of grievances) as per the working duration, Information dissemination regarding welfare provisions for Labourers Information dissemination regarding welfare provisions for Labourers, employment opportunities, grievances, EHS and CSR activities through notice board and display of key messages on billboard.	Meetings and periodic reporting in the operation phase
Gram Panchayats And Village institutions	Primary Stakeholder	For necessary information disclosure of SEP. As Part of GRM Ensured involvement in CSR activities and local procurement if required	High	Consultations, meetings (FGD and individual interview) and Discussions; Sharing of documents, if required, as part of the disclosure mechanism; Meetings as a part of the Grievance Redressal mechanism, if required; Attendance at Panchayat meetings and participation in CSR activities and agreements with communities documented in minutes of meetings	• As and when required; and • As per the regulatory requirements
Regulatory Authorities	Primary Stakeholder		High	Meetings and Discussions	• As per the regulatory requirements • As and when required
District Administration (Tehsildar, SDO, Patwari)	Primary Stakeholder	Regular engagement Participation in CSR Activities	High	Regular meetings and participation in CSR events	• Regular Meetings; or • Monthly or as & when required
Landowner	Primary Stakeholder	Discussion on land purchase modalities.	Very Low	Discussion during various festivals and other relevant occasions.	• As and when required.
Community	Primary Stakeholder	Managing and ensuring participation in CSR	Low	• Open Meetings,	• As and when required

Stakeholder	Stakeholder Category	Objective of Engagement	Stakeholder Influence	Methods of Consultation and Engagement	Frequency of Consultations and Engagement
		activities. As part of GRM.		• Interactions with community at Gram Panchayat, • Discussion on CSR programs	

9.8 GRIVANCE REDRESSAL MECHANISM (GRM)

ATGL has a well-defined Grievance Redressal Mechanism (GRM) procedure. This GRM serves as one of the components of **ATGL** 's Environmental and Social Management for managing the overall performance of its projects as well as providing more accountability to its stakeholders. The GRM, which caters to both internal and external grievances, is based on four (4) guiding principles of the company which include:

- Transparency
- Fairness
- Respect
- Accountability

9.8.1 *Internal Grievances*

Employee Grievance: These include the employees hired specifically for the site.

9.8.2 *External Grievances*

Contractor and labour related grievances (directly /indirectly controlled by **ATGL**). Community grievances including those on land and resettlement issues, project activities, CSR intervention, employee/worker-community conflicts, and other project related issues (Directly/Indirectly controlled by **ATGL**).

This grievance mechanism shall respond to the concerns and grievances of local communities, NGOs, Panchayats and any other aggrieved party or stakeholder. The project shall share information about these mechanisms to the stakeholders through locally appropriate communication tools.

In case the contractors have their own GRM, **ATGL** should ensure that it is functioning effectively and even review the grievance records. However, if the contractors lack GRM in the first place, **ATGL** should ensure that the workers are linked to their GRM process.

The project shall endeavor to get all complaints recorded and addressed in a uniform and consistent manner. For disputes that cannot be internally resolved, the project shall set up an independent mechanism with representation from the community, panchayats, and locally respected citizens of the area to sort out these conflicts. If it has a legal implication the district administration shall be approached.

ATGL has developed procedures for handling grievances, reviewing, and investigating grievances, grievance closure, monitoring, and review procedures.

A grievance body, led by designated Grievance officer is proposed for effective implementation of GRM and coordinating day to day functions. The grievance body would be reporting back to the appropriate authority including functional areas such as HR, Project, O&M, BD/Land, CSR, EHS etc. as per requirement. The mandate of this cell would be managed as part of the ESG forum. **ATGL** should ensure appropriate budget allocation in coordination with **ATGL** to deal with grievance tracking and handling with consent of appropriate authority. Awareness shall be provided in the company's policy and practices for both employee and appropriate stakeholder grievance mechanisms, relevant to their exposure and responsibilities

9.9 CORPORATE SOCIAL RESPONSIBILITY (CSR) POLICY

ATGL will focus on the following areas for CSR projects from amongst the activities specified under Schedule VII of the Companies Act, 2013 and the Rules made thereunder including but not limited to Education, Empowerment, Environment and Health:

- Promoting gender equality & empowering women
- Employment enhancing vocational skills and livelihood enhancement programs
- Rural Infrastructure Development Projects

CSR committee may recommend to the Board of Directors additional CSR initiatives, based on specific merit, provided that these projects fall under the scope of schedule VII of the Companies Act, 2013, as may be amended from time to time.

As part of its devising and planning for CSR activities and programs, prior to the commencement of projects, ATGL carried out impact assessment studies or need based assessment studies within the proposed project footprint area in order to understand the basic needs, problems and requirements where interventions/intervention activities can be implemented in.

The study encompasses various parameters such as-health indicators, access to infrastructure, vulnerability, literacy levels, workforce participation, employment opportunities, sustainable livelihood options, and demographic profile including population data –below the poverty line and above the poverty line, state of infrastructure. From the data generated, project specific CSR plans are developed for implementation. CSR programs and activities can also be reactive in nature where the need and requirement for the same may arise even outside the purview of the impact assessment or the need-based assessment or may be entirely disassociated with any project implementation. Proper budgeting and scheduling are carried out for the programs.

ATGL will seek to identify suitable projects/programs for implementation in line with the CSR policy of the Company.

By and large, it may be endeavored to execute most of the CSR programs/ activities forming part of defined scope in and around the areas adjoining projects.

The medium of implementation of CSR programs would be directly by the CSR department or company's own foundation or collaboration/ tie-ups with Trust/ Society/ Section 8 Company/ NGOs as per the decision taken by the CSR committee.

Monitoring And Reporting

The CSR department will be responsible for regular monitoring & reporting of the CSR programs and provide regular progress reports to the CSR Committee of the Board. This report would indicate:

- Achievement of the year-to-date in terms of coverage compared to the target, reason for variance, plans to overcome shortfalls if any and support required from the CSR Committee/Board to overcome the shortfalls.
- Actual year-to-date spending compared to the budget and reasons for variance.

- In respect of activities undertaken through outside Trust/Society/NGO's/Government recognized funds, etc. there will be a mechanism of reporting of progress on each such activities and the amount incurred thereon at the subsequent CSR Committee Meeting.
- The Board shall seek a progress report from the CSR Committee at least twice a year.

9.10 LABOUR MANAGEMENT PLAN

The construction of the project has not yet started, and locals have proposed to be hired for the project during construction phase. However, in case of hiring migrant labour, **ATGL** needs to adhere to implementation of *Labour Camp Management Plan Guidelines* as provided under "*Worker's Accommodation Processes and Standards: A Guidance Note by IFC and EBRD*[4]" and ensure that the worker's accommodation should be at clean, safe place and, at the minimum, should meet the basic requirements of workers. In particular, the provision of accommodation should meet national legislation and good international practices in relations, but not restrict to the following:

- Practice for charging accommodation.
- Provision of minimum amounts of space for each worker.
- Provision of sanitary, laundry and cooking facilities and potable water.
- Location of accommodation in relation to the workplace.
- Any health, fire safety or other hazards or disturbances and local facilities.
- Provision of first aid and medical facilities; and heating and ventilation.
- Workers' freedom of movement to and from employer-provided accommodation should not be unduly restricted.

9.10.1 Drinking Water Resources and Monitoring Water Quality

- Access to an adequate & convenient supply of free potable water should be always available to workers.
- Depending on climate, weather conditions and accommodation standards, 80 to 180 liters per person per day are available.
- Drinking water should meet national/local or WHO drinking water standards.
- All tanks used for the storage of drinking water should be constructed and covered as to prevent water stored therein from becoming polluted or contaminated.
- Drinking water quality should be regularly monitored.

[4] https://www.ifc.org/wps/wcm/connect/60593977-91c6-4140-84d3-737d0e203475/workers_accomodation.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-60593977-91c6-4140-84d3-737d0e203475-jqetNIh

9.10.2 *Wastewater and Solid Waste*

- Arrangements for discharge of wastewater, sewage, and disposal of food, kitchen waste and any other waste materials should be made without causing any impact on the biophysical environment or surrounding communities.
- Specific containers for rubbish collection should be provided and emptied on a regular basis.
- Adequate number of rubbish containers provide leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents needs to be provided.
- The garbage/rubbish containers should be 30 meters from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odors associated with decaying organic materials.
- Pest extermination, vector control and disinfection should be carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be conducted on a regular basis.

9.10.3 *Labour Camp Room/ Dormitory Facilities*

- Rooms/dormitories should be kept in good condition.
- Rooms/dormitories should be aired and cleaned at regular intervals.
- Rooms/dormitories are built with easily cleanable flooring material.
- Sanitary facilities should be located within the same buildings and provided separately for men and women. Usual standards range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface).
- A minimum ceiling height of 2.10 meters is provided.
- In collective rooms, which are minimized, to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers.
- All doors and windows should be locked and provided with mosquito screens where conditions warrant.
- There should be mobile partitions or curtains to ensure privacy.
- Every resident should be provided with adequate furniture such as a table, a chair, a mirror, and a bedside light.
- Separate sleeping areas should be provided for men and women, except in family accommodation.

9.10.4 Bed Arrangements and Storage Facilities

- A separate bed for each worker should be provided. The practice of “hot bedding” should be avoided.

- There should be a minimum space between beds of 1 meter.
- Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimized. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from 0.7 to 1.10 meters.
- Each worker should be provided with a comfortable mattress, pillow, cover, and clean bedding.
- Bed linen should be washed frequently and applied with repellents and disinfectantswhere conditions warrant (malaria).
- Facilities for the storage of personal belongings for workers should be provided.
- Separate storage for work boots and other personal protection equipment needs to be provided.

9.10.5 Sanitary and Toilet Facilities

- Sanitary and toilet facilities should be constructed of materials that are easily cleanable.
- Sanitary and toilet facilities should be cleaned frequently and kept in working condition.
- Sanitary and toilet facilities should be designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.
- Sanitary and toilet facilities should not be shared between men and women, except in family accommodation.
- An adequate number of toilets should be provided for workers. Standards range from 1 unit to 15 people to 1 unit per 6 people. For urinals, the usual standards are 1 unit to 15 persons.
- Toilet facilities should be conveniently located and easily accessible. Standards range from 30 to 60 meters from rooms/dormitories. Toilet rooms shall be located to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well lit, have good ventilation or external windows, have sufficient hand wash basins, and be conveniently located.

9.10.6 Showers/Bathrooms and Other Sanitary Facilities

- Shower/bathroom flooring should be made of anti-slip hard washable materials.
- An adequate number of handwash facilities should be provided for workers. Standards range from 1 unit for each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap, and hygienic means of drying hands.
- An adequate number of shower/bathroom facilities need to be provided for workers. Standards range from 1 unit to 15 people to 1 unit per 6 people.
- Showers/bathrooms should be conveniently located.
- Shower/bathroom facilities should be provided with an adequate supply of cold and hot running water.

9.10.7 Cooking Facilities

- Places for food preparation should permit good food hygiene practices, including protection against contamination between and during food preparation.
- Kitchens should be provided with facilities to maintain adequate personal hygiene including sufficient washbasins designated for cleaning hands with clean, running water and materials for hygienic drying.
- Wall surfaces adjacent to cooking areas should be made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Further, to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.
- All kitchen floors, ceiling and wall surfaces adjacent to, or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.
- Wall surfaces adjacent to cooking areas should be made of fire-resistant materials. Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Further, to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable, and washable surface.
- Adequate facilities for cleaning, disinfecting and storage cooking utensils and equipment should be provided.
- Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.

9.10.8 Medical Facilities

- A number of first aid kits adequate to the number of residents should be available.
- First aid kits should be adequately stocked.
- An adequate number of staff/workers (1 first aider for every 50 persons) should be trained to provide first aid.
- Where possible and depending on the medical infrastructure existing in the community, other medical facilities should be provided (nurse rooms, dental care, minor surgery).

9.10.9 Leisure, And Social Facilities

- Basic collective social/rest spaces should be provided for workers. Standards range from providing workers multipurpose halls to providing designated areas for radio, TV, cinema.
- Recreational facilities should be provided for the workers.

9.10.10 Security of Workers' Accommodation

- A security plan including clear measures to protect workers against theft and attack should be implemented.
- Security staff should be checked to ensure that they have not been implicated in any previous crimes or abuse. Where appropriate, security staff from both genders should be recruited.
- Security staff should have a clear mandate and have received clear instruction abouttheir duties and responsibilities, in particular their duties not to harass, intimidate, discipline, or discriminate against workers.
- Security staff should have received adequate training in dealing with domestic violence and the use of force.
- Security staff should have a good understanding of the importance of respecting workers' rights and the rights of the communities.
- Workers and the locals residing in nearby areas in villages should have specific means to raise concerns about security arrangement and staff.
- **ATGL** should also adhere to Standard Operating Procedure for Work Resumption after Lockdown prepared by **ATGL** and ensure compliance with respect to the following measures:
- Maintaining Social Distancing in Labour Accommodation (2 meters)
- Soap solutions / hand sanitizers to be placed in all quarters / washroom's places wherever required and replenished periodically.
- Ensuring that all doors / windows/fittings are sanitized frequently.
- Special attention to be given for the washrooms / toilets by periodical cleaning, Swabbing, disinfecting, and maintaining dry.
- Emergency Facilities to be available for 24 X 7 and displayed emergency key contacts.
- Soap solutions / hand sanitizers to be placed in all quarters / washroom's places wherever required and replenished periodically.
- To ensure that all the workers who are coming to work are healthy and not having any symptoms of COVID-19 (Fever, Dry cough, breathing problem).
- Arrangements to be made to supply all essential items like rice, wheat, groceries, water, etc. to colony itself so as to restrict movements of Labourers.
- Appropriate masks to be distributed to all Labourers.
- All labour engaged at site shall be advised to wear masks while at colony, movement outside and during duty timings.
- Always ensuring availability of the following

    1. Sanitizer

2. Face mask
3. Hand gloves
4. Hand Wash
5. Dettol
6. Soap
7. Thermometer
8. BP checking machine
9. First Aid Box

- The nearest Hospital/COVID-19 Rescue Team shall be made for getting medical examination of all people for any Covid-19 symptoms.
- Quarantine hall or room shall be established in labour colony for the said purpose.
- Contractors shall display precautions measures - dos and don'ts at colony premises in all languages spoken by the workers.
- Vehicles shall be kept ready or tip up for vehicles shall be made for emergency purpose.
- Minimum social distancing shall be ensured in keeping occupants in a single room.
- Disinfecting spray is done at all the areas of colony after workers are left for work daily.
- A team comprising **ATGL** Admin, **ATGL** HSE and Contractor site in charge shall visit labour colony daily to ensure availability of essential things and regarding no off occupants, cleanliness, sanitization status, etc. and submit a report to the Construction Manager and Project Manager.
- Feedback in written form or through personal interaction regarding labour colony requirements shall be obtained from contract labours on weekly basis.

9.11 WASTE MANAGEMENT PLAN

The proposed project should handle all incoming waste materials, all waste generated on site and both the disposal, and potential recycling of such materials. The exact quantities need to be detailed once agreed packaging and quantities of incoming material is identified. The project waste is primarily related to civil works, and packaging of incoming materials. The following principles are put in place to reduce the amount of waste generated:

- Packaging will be optimized to reduce non-recyclable content.
- Orders of cables and other consumables will be kept to a minimum.
- The amount of earth works is kept to a minimum, including optimized road works to reduce required import of material to site.

Registered vendors are appointed by **ATGL** for collection of waste generated from their natural gas pipeline projects.

9.12 DISASTER MANAGEMENT PLAN

The district of Amravati is prone to several natural and man-made hazards, necessitating the preparation of a comprehensive Disaster Management Plan. The study area falls within Seismic Zone II, indicating a

high risk of earthquakes, as per the Earthquake Hazard Map of India and the Vulnerability Atlas of India, 3rd Edition, 2019, published by BMTPC.

In addition to seismic risks, flood hazards in Amravati District are classified as low. The region has become increasingly vulnerable to flooding due to heavy monsoon rains and rising water levels in the Sutlej River and its tributaries.

During the construction phase, the site will at times consist of loose and/or un-compacted soil and removed or destroyed vegetative cover, increasing susceptibility to erosion and waterlogging. To mitigate these risks, a temporary drainage system will be installed. This system will include landforms such as trenches and deep pits to collect and dissipate stormwater. Where feasible, these temporary structures will be converted into permanent masonry drainage systems or decommissioned upon completion of the planned infrastructure.

A detailed Disaster Management Plan needs to be developed to address these vulnerabilities, incorporating risk assessment, emergency response protocols, infrastructure resilience measures, and community awareness initiatives.

9.13 TRAFFIC MANAGEMENT PLAN

9.13.1 Introduction

The Traffic Management Plan (TMP) is designed to ensure the safe and efficient movement of vehicle and pedestrian traffic through and around construction zones. It also aims to safeguard workers and minimize disruptions to the public. This plan outlines the procedures, safety measures, and control devices to be implemented during road construction activities.

This TMP has been developed based on the preliminary site survey conducted during the Environmental and Social Impact Assessment (ESIA) phase. As such, it reflects the anticipated traffic conditions and construction impacts identified at that stage. However, recognizing that actual site conditions may vary during implementation, the TMP will be reviewed and updated by the contractor during the construction phase to ensure it remains responsive to real-time requirements and evolving site-specific challenges.

9.13.2 Objectives

The primary objectives of the TMP are:

- To ensure the safety of road users and construction workers.
- To maintain efficient traffic flow during construction.
- To provide clear and timely information to road users.
- To minimize environmental and social impacts due to traffic disruptions.

9.13.3 Key Principles

- **Warning Sign**: Inform road users well in advance of any changes or hazards.
- **Safe Guidance**: Provide clearly marked and safe lanes for traffic.
- **Work Zone Protection**: Establish buffer zones and barriers to protect workers.

- **Driver Behavior Control**: Use signage and devices to influence safe driving behavior.

9.13.4 Planning Considerations

Traffic control plans will be tailored to specific site conditions, considering:

- **Traffic Volume**: Peak and non-peak hour densities.
- **Lane Requirements**: Width and number of lanes needed for construction.
- **Junction Complexity**: Number and type of intersections.
- **Pedestrian Infrastructure**: Availability and condition of footpaths.
- **Speed Limits**: Regulatory and advisory limits in the area.
- **Lane Geometry**: Changes in lane width or alignment.

9.13.5 Construction Zone Layout

Construction Zone is an integral part of any road construction system. The safety practices in construction will, therefore, be oriented towards reducing conditions, which lead to such hazards and consequent stress whereby the risk of accident increases.

Safety measures will be aimed at avoiding hazardous conditions, especially in work sub-zones where major construction activities are going on.

The construction zone is divided into four sub-zones:

i. Advance Warning Sub-zone

- **Purpose:** Alert drivers to upcoming construction. The warning system should educate the driver well in advance by providing information regarding distance, extent and type of hazard ahead so that he can gradually reduce the speed of his vehicle.
- **Features:** Warning signs placed ~60m before the work zone.
- **Devices:** Retro-reflective signage, flashing beacons.

ii. Transition Sub-zone

- **Purpose**: Guide traffic into the diversion path. This is the most crucial sub-zone from safety point of view since most of the movements are turning movements.
- **Features:** Begins ~30m before the work zone.
- **Devices:** Barricades, channelizers, directional signs.

iii. Work Sub-zone

- **Purpose:** Area of active construction, and therefore the safety of the Project workers / pedestrians / members of the road are the major concern at site from the plying traffic.
- **Features:** The path of the traffic must be clearly delineated to prevent vehicle intrusion.
- **Devices:** Cones, barriers, safety signage, flagmen.

iv. Terminal Sub-zone

- **Purpose:** Indicate the end of the construction zone.
- **Features:** “End of Work Zone” signage.
- **Devices:** Informational signs, speed normalization signs.

Other Aspects: Following sections are from guidelines for Safety Construction, Indian Road Congress, IRC: SP: 55: 2001.

The pictorial representation of the sub-zones is depicted in **Figure 9-1** and the recommended length of traffic control zones are shown in the **Table 9-3**.

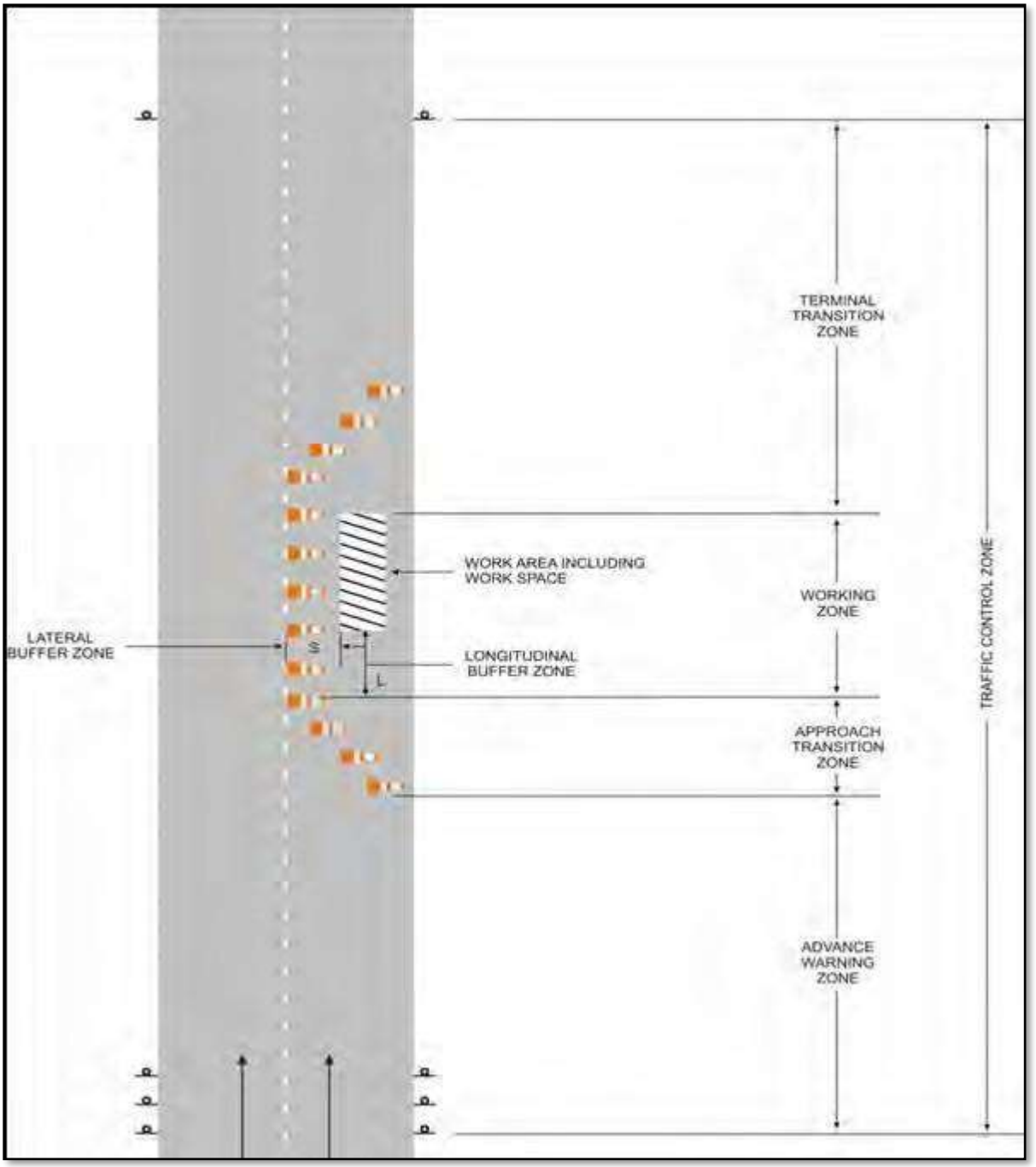


Figure 9-1: Recommended length for Construction Zones as per IRC: SP:55-2001

Table 9-3: Recommended Lengths of Traffic Control Zones

Average Approach Speed (Km/h)	Length of advance warning Zone (M)	Length Approach Transition Zone(M)	Length of working Zone(M)
50 or less	100	50	Varies
51-80	100-300	50-100	
81-100	300-500	100-200	
Over 100	1000	200-300	

9.13.6 Traffic Control Devices

Traffic control devices are essential components of a safe and effective traffic management system within construction zones. These devices serve the critical functions of warning, informing, guiding, and protecting both road users and construction personnel. Their proper deployment ensures smooth vehicular movement, minimizes confusion, and significantly reduces the risk of accidents.

This section is prepared in accordance with the Indian Roads Congress (IRC) Guidelines for Safety in Construction Zones (IRC: SP: 55-2001) and other relevant standards.

9.13.6.1 Purpose and Function

Traffic control devices are strategically installed across all sub-zones of the construction area to:

- Alert drivers to upcoming changes in road conditions.
- Provide clear guidance on lane usage and diversions.
- Protect workers and pedestrians from vehicular intrusion.
- Ensure safe passage for vehicles through or around the work zone.

These devices must be:

- Easily understandable and unambiguous.
- Clearly visible during both day and night.
- Stable under adverse weather conditions.
- Easy to install, maintain, and remove.

As per Specification 112.4, the use of barricades, signs, markings, flags, lights, and flagmen is mandatory for the safety and information of traffic approaching or passing through construction or maintenance zones.

9.13.6.2 Types of Traffic Control Devices

1. Regulatory Signs

These signs impose legal restrictions and must be installed in consultation with local traffic authorities. Common regulatory signs used in construction zones include:

- Do Not Enter
- Road Closed
- Give Way to Pedestrians
- Speed Limit

2. Warning Signs

Warning signs alert drivers to potential hazards ahead. Typical examples include:

- Lane Closed
- Diversion to Other Carriageway
- Divided Carriageway Starts/Ends
- Two-Way Traffic

These signs may be supplemented with rectangular definition plates placed 0.15 m below the warning triangle for added clarity.

3. Directional (Guide) Signs

Guide signs provide navigational information and differ in appearance from standard informatory signs. As per IRC: 67-1977, construction zone guide signs should have: Black text and arrows on a Traffic Yellow (IS: 5-1978) background.

Common examples include:

- Diversion
- Road Ahead Closed
- Sharp Deviation of Route

4. Delineators and Channelizing Devices

Delineators help guide traffic safely through the construction zone. As per IRC: 79-1981, these include:

Traffic Cones: Typically, 0.5–0.75 m high and 0.3–0.4 m in diameter, made of plastic or rubber with red and white retro-reflective bands. Cones should be anchored securely and spaced 3–9 m apart, depending on speed and visibility requirements.

Traffic Cylinders and Tapes: Used for lane separation and guidance.

Drums: Metal or plastic drums (0.8–1 m high, 0.3 m diameter) painted with alternating black and white circumferential stripes. Metal drums offer high visibility and psychological deterrence, while plastic drums are lightweight and easier to handle.

5. Barricades

In urban construction zones, barricades are used to restrict unauthorized access and protect traffic from hazards such as excavated areas. These are typically constructed using MS frames and reinforced with

horizontal bamboo or wooden posts to maintain continuity. Openings are provided only at designated access points such as shop entrances or residential driveways.

6. Flagmen

Flagmen play a vital role in ensuring on-site safety. Their responsibilities include:

- Controlling vehicle speed and movement near active work areas.
- Providing visual signals to drivers.
- Assisting in the safe movement of construction equipment such as cranes and excavators.

Flagmen must be properly trained, clearly visible to drivers, and equipped with appropriate signalling tools.

7. Vehicle Parking

A designated parking area will be developed to accommodate all work-related vehicles. This area will be:

- Firm and leveled to prevent vehicle instability.
- Free from obstructions to allow safe maneuvering.
- Clearly marked and labeled for easy identification.
- Located away from pedestrian pathways to avoid conflicts.
- Equipped with safety protocols requiring all raised parts of equipment (e.g., booms, backhoe buckets) to be fully lowered to the ground when parked.

Safe Parking Protocols

To ensure safety during vehicle parking, the following measures will be strictly enforced:

- The vehicle engine must be turned off.
- Keys must be removed from the ignition.
- Hand brakes must be applied.
- Wheel chocks must be used when parking on slopes.

8. Material Transportation

All construction materials will be transported to the site using suitable trucks or other appropriate vehicles. The following precautions will be taken:

- Materials will be securely fastened to prevent shifting or falling during transit.
- Wooden blocks or padding will be used between the load and vehicle body to ensure stability and minimize damage.
- Unloading and storage of materials will be done in a manner that does not obstruct traffic or cause congestion.

9. Speed Control

To maintain safety within the construction site:

- The maximum vehicle speed limit will be restricted to 20 km/h, except for emergency vehicles during critical situations.
- Speed limit signs will be prominently displayed at strategic locations across the site.
- In areas with high pedestrian activity, reduced speed limits will be enforced and clearly indicated.

Speed Limit Violations

Violations of the prescribed speed limits will be treated with strict disciplinary action, including:

- Temporary suspension of the vehicle operator.
- Permanent removal from the site in cases of repeated or severe violations.

10. Personnel Safety

To ensure the safety of all personnel working near or on the roadway:

- All workers will always wear high-visibility reflective jackets.
- Additional personal protective equipment (PPE) such as helmets, safety shoes, and protective goggles will be mandatory based on the nature of the task.
- Site engineers and supervisors will be responsible for monitoring compliance and enforcing the use of PPE.

11. Signage and Visual Aids

The following standard traffic signs will be used throughout the construction site to guide and inform both workers and road users:

- Regulatory Signs: Stop, Entry Prohibited, Parking Prohibited, Speed Limit, Heavy Vehicle Prohibition.
- Warning Signs: Go Slow, Men at Work, Pedestrian Prohibited.
- Informational Signs: Parking Area, Pedestrian Only, Diversion.

All signs will be:

- Retro-reflective for night visibility.
- Mounted at appropriate heights and locations.
- Maintained regularly to ensure legibility and effectiveness.

For Sensitive Receptors no honking board should be provided with the minimal construction activity during the daytime.

		
Stop Sign	Entry Prohibited	Parking Prohibited
		
Pedestrian Prohibited	Speed Limit	Heavy Vehicle Prohibition
		
Go Slow	Parking Area	Pedestrian Only
		
Diversion	Diversion	Men at Work

Figure 9-2: Traffic Regulatory Signs

9.13.7 Traffic Diversion Planning

During the construction phase, traffic diversions will be implemented based on actual site conditions to ensure minimal disruption and maximum safety for road users and workers. The diversion routes will be designed in accordance with the Indian Roads Congress (IRC) guidelines and will be finalized in coordination with local traffic authorities.

A detailed Traffic Diversion Plan will be prepared for each affected road segment, considering factors such as pipe diameter, road width, junction complexity, and availability of alternative routes. The plan will be updated dynamically as construction progresses as depicted in the **Table 9-4.**

In addition, visual diagrams as shown in the

Note: This table should be prepared during the construction phase by the client, depending upon the construction plan for all the five stretches and its proposed diversions

Figure 9-3**, Figure 9-4** and **Figure 9-5)** to illustrate :

- Traffic management during survey activities.
- Traffic control during active work zone operations.
- Diversion plans during full or partial road closures.

Table 9-4: Sample Table for the Details of Traffic Diversion Plan

S. No.	Road/Location	Dia of Pipe	Chainage	Total Length	Road Blockage	Alternative Route	Available Road Width	Type of Road
1.								
2.								
3.								
4.								
5.								
6.								

Note: This table should be prepared during the construction phase by the client, depending upon the construction plan for all the five stretches and its proposed diversions

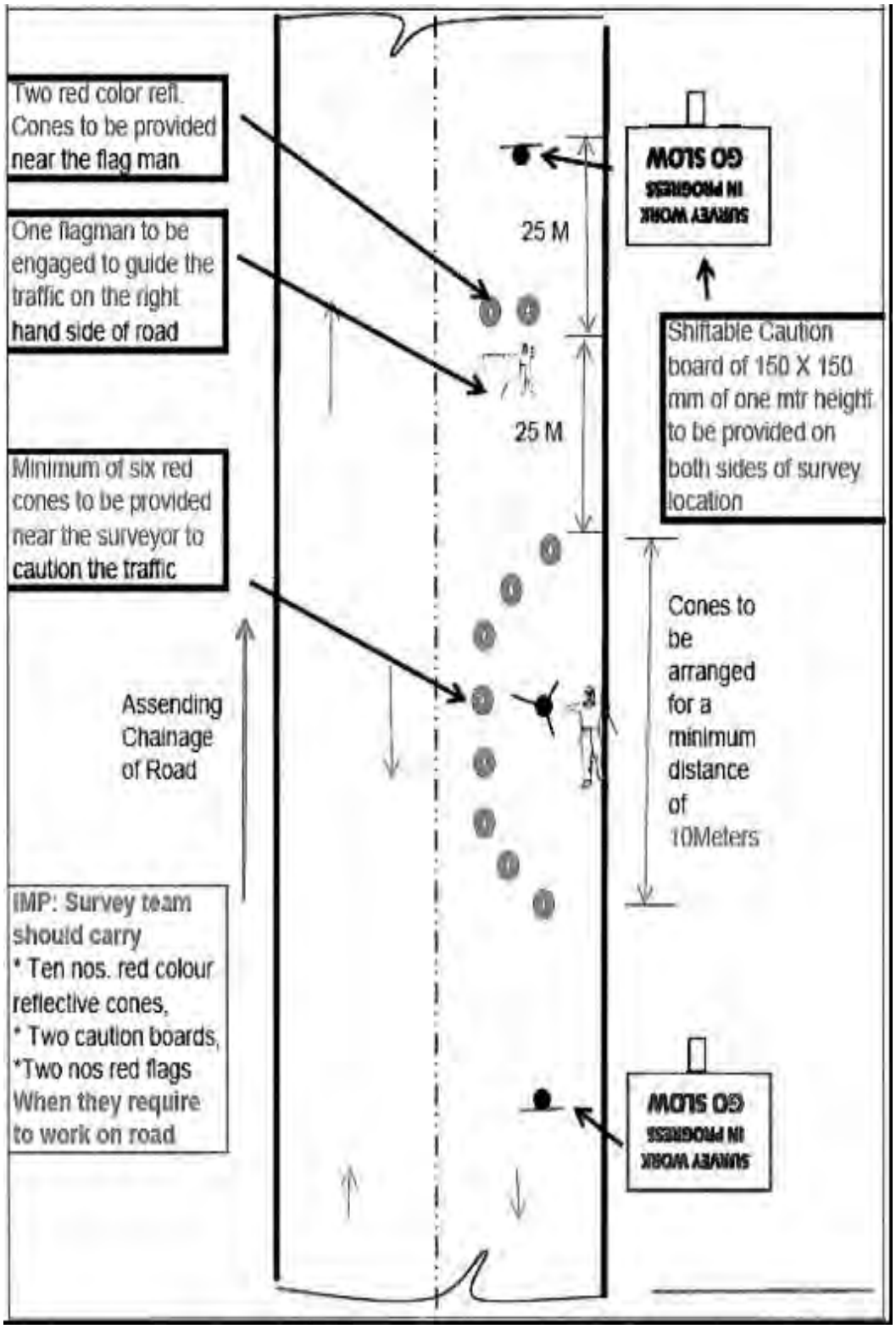


Figure 9-3: Traffic Management Plan for doing Survey

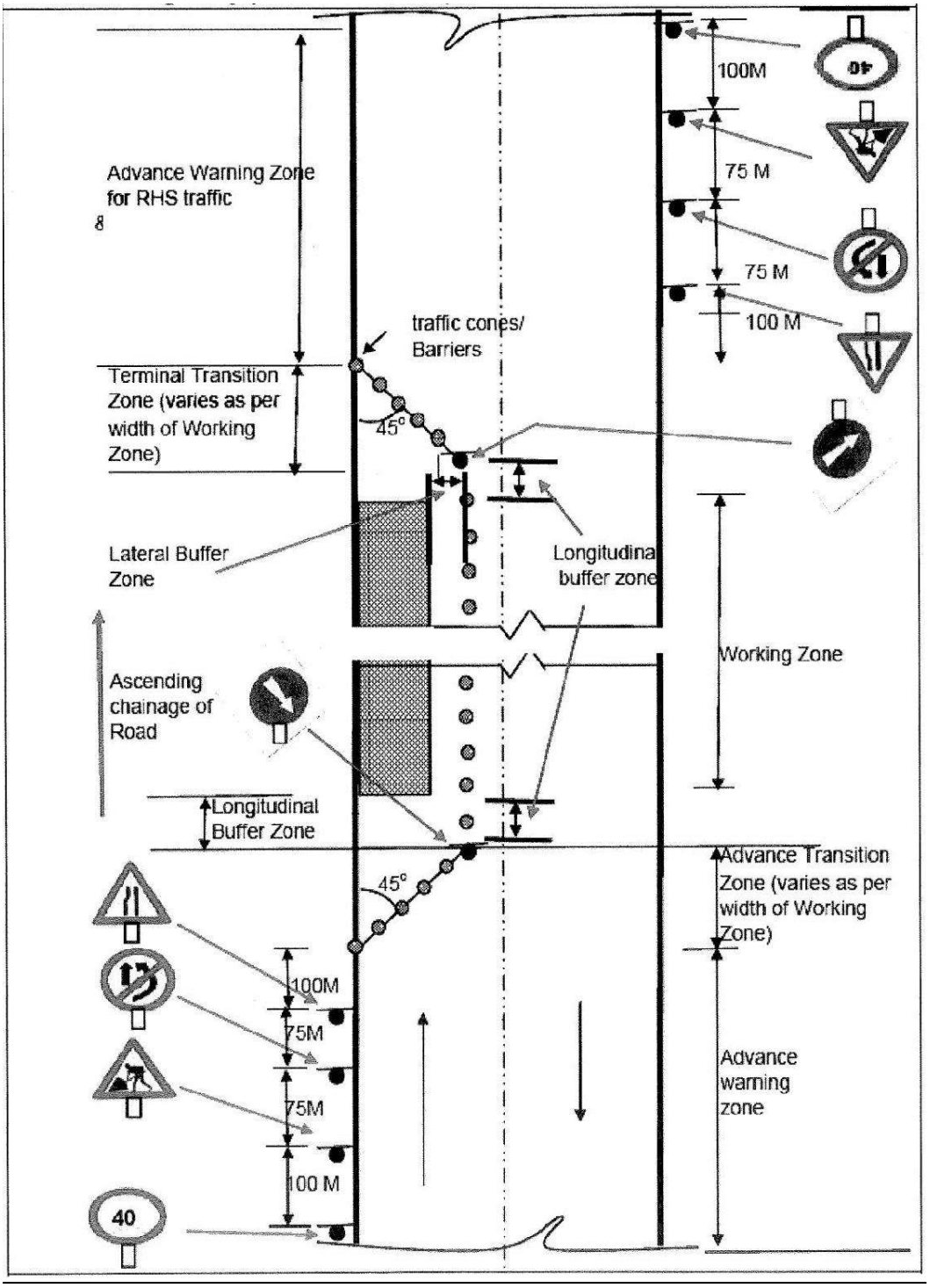


Figure 9-4: Traffic Management Plan for Working Zone

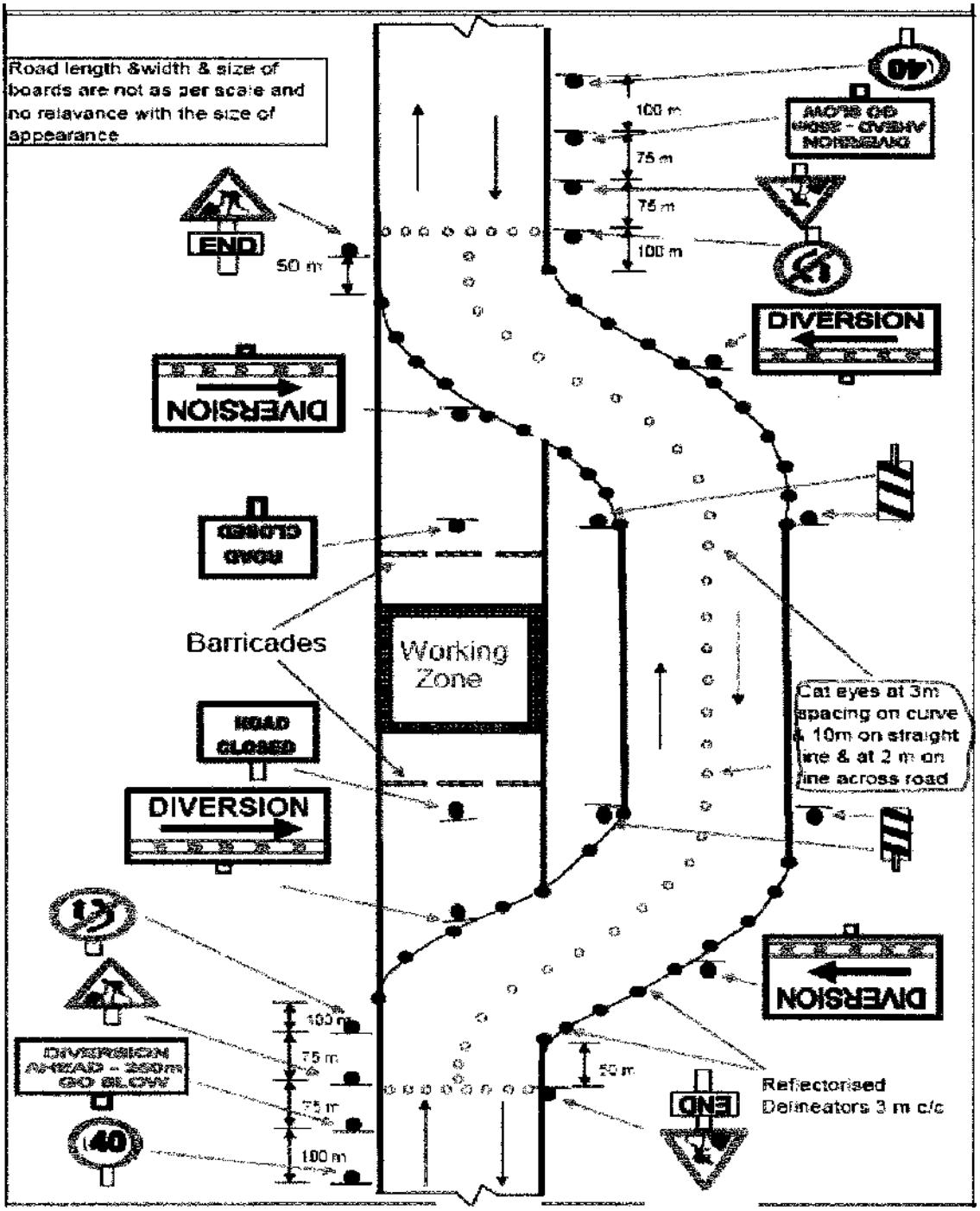


Figure 9-5: Traffic Management Plan for Diverting the Traffic

9.13.8 Traffic Management Practices

The implementation of traffic management during construction will be guided by the following operational principles:

- **Optimal Use of Existing Lanes**: Existing carriageways will be utilized to the maximum extent possible to minimize the need for diversions.
- **Intersection Management**: At major intersections, turning movements will be maintained wherever feasible to reduce congestion.
- **Lane Bifurcation**: In constrained areas, two-way traffic may be temporarily accommodated on a single carriageway with appropriate signage and barriers.
- **Speed Control**: Vehicle speeds through construction zones will be reduced using speed breakers, warning signs, and visual cues.
- **Standardized Signage**: All advance warning and information signs will comply with IRC standards for visibility, placement, and content.
- **Equipment Placement**: Construction materials, machinery, and equipment will be stored away from berms and pedestrian paths, within the available road land.
- **Safe Machinery Parking**: All parked machinery will be clearly marked with red flags and red lights. Only the minimum quantity of material required for immediate operations will be stored at the work site.
- **Wildlife Safety**: In areas with dense vegetation, precautions will be taken to prevent snake encounters. This includes clearing bushes, applying carbolic acid, and mandating the use of gumboots.
- **Heat Stress Prevention**: During summer months, workers will be provided with adequate rest intervals to prevent heat-related illnesses such as sunstroke.

9.14 PROPOSED ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

An Environment and Social Management Plan has been developed following the delineation of impacts and mitigation measures. These measures will be adopted by the project proponent and imposed as conditions of contract of the sub-contractor employed for respective phases of the power project. The mitigation measures suggested during operation will be made part of the regular maintenance and monitoring schedule.

The ESMP includes the following:

- Investigations suggested adverse environmental and social impacts and associated risks.
- Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations.
- Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations.

- Monitoring arrangements for effective implementation of suggested mitigations for the proposed project; and
- Reporting requirement to the regulatory agencies and funding institutes.

Table 9-5: Environment and Social Management Plan

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
Construction Phase				
Soil Characteristics				
Erosion and compaction	Loose soil to be protected from wind and runoff by covering / watering / other means of covering. Existing roads to be used for transport of material to extent possible. All construction materials should be kept within the project footprint area. Re-fueling of machinery at site should be undertaken over paved surface. In case of any accidental spill, soil should be cut and stored securely for disposal with waste.	Project representative to make observations on storage and handling of construction material. Drivers should be instructed about use of dedicated tracks within the site workers to be trained on handling and storage of waste by contractor. Workers handling activity to be briefed about the need to prevent contamination. Inspection/Monitoring to conduct construction activities within the site boundary only. Soil monitoring for physical properties to be at least once during construction phase.	EPC contractor/Site supervisor/ Project Director to make observations and convey it to the contractors. EHS Personnel/ Project Director should monitor implementation of ESMP.	Throughout project cycle
Waste Disposal				
Accumulation of construction waste Unhygienic conditions for labours. Hazardous waste from machinery, generators etc.	Construction debris should be utilised for levelling of land and unused debris shall be disposed-off to C&D Disposal Site. Proper sanitation and sewage facility in terms of septic tank with soak pit should be provided. Nearby municipality should also be contacted for regular disposal of the labour camp waste. Other wastes like packaging material, metal, jute, etc. to be sold to scrap dealers/ buyers.	**ATGL** representative should brief specific needs as per country's requirement for further execution, as and when required. Workers should be instructed to maintain neat, clean & hygiene at facilities.	Contractors will be abided with Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2023. Site Engineer to make observations and convey it to the contractors.	Should be incorporated as part of project budget, no additional cost is envisaged. During Construction Phase

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
Soil and land contamination due to accidental leakage. Run off into rainwater channels.	Random stocking of raw material, storage of debris, piling of loose soil etc. should be strictly controlled. Portable toilets/ suitable arrangements with septic tank-soak pit arrangement should be provided for workers.	Contractors should be briefed about need for proper storage and disposal of construction waste.	Monthly report of EHS Officer to include the compliance and observations if any.	
Water Resource and Quality				
Run off into rainwater channels and drains passing through the site and ultimately into nearby surface water body. Wastage of water and sewage discharge from labour camp	Water for construction and consumption to be arranged by suitable local contractors through authorized tanker water suppliers. Arrangement for storm water management in construction area should be made to avoid sediment run off. Storm water flow during monsoon should be directed to existing drains. Natural flow and topography of the drains as flowing inside the project boundary should be maintained. Septic tank with soak pits should be provided at site to facilitate the sewage generated from labour area.	Daily consumption of water should be recorded. Storm water arrangements should be monitored. Performance parameters are EC, TSS, TDS, Oil & Grease, Total Coliforms, BOD, etc. Workers should be instructed about optimal use of water	Conditions should be the part of contract with the EPC contractor. Project Director or EHS personnel should make observations and convey it to the contractors. Report of Project Director/ Site EHS Officer should be sent to EHS head.	Construction Phase
Ecology				
Clearance of vegetation	Tree cutting or shrub clearance should be limited to the road side. Workforce should be instructed to avoid any other activity likely to affect the local flora & fauna. Movement of construction & transport vehicles should follow dedicated paths to avoid any injury/mortality to the wildlife.	Visual damage loss inspection should be undertaken by Site Engineer Construction contractor should instruct and inform workers to refrain from activities that may adversely affect the ecology in near vicinity of the project.	Project Director/EPC Contractor	Construction Phase

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
Traffic and Transport				
Break-down and Improper halt of vehicles. Discomfort due to air and noise pollution due to raw materials transportation. Damage to road and related structure from heavy vehicles.	Vehicle movement and parking within the project premises should be managed properly to avoid accidents. Routes for use by construction traffic should be planned to minimize impact on adjoining activities. Dedicated path within the site for exclusive entry and exit of construction vehicles should be provided. Only PUC certified vehicle should be deployed. Construction material should be transported in covered trucks. Transportation should be undertaken along pre-identified paths only. High noise generating activities should be restricted to daytime with proper mitigation measures.	Necessary training to the driver of construction vehicles for speed restrictions. Drivers should be assessed for their knowledge on traffic rules before engagement. During the construction phase, number of vehicles as well as any incidents and accidents need to be reported, and their outcomes should be monitored.	Project Director/ site EHS person should provide the training. Should be mentioned in the contract with the construction contractor.	Regular maintenance of vehicle and upkeep of roads should be included in O&M budget. For all construction related activities during construction and operation phases.
Air Quality				
Fugitive dust Emissions from diesel engines/ vehicles	Regular water sprinkling while undertaking dust generation activities. Construction activities should be avoided during high wind speed time. Construction material should be covered to prevent any fugitive dust from these areas. Regular maintenance of construction machineries. Deployment of only PUC certified vehicles. Flyable Construction material should be transported in covered trucks only.	Awareness should be developed among the site workers for fugitive dust management. Air Quality monitoring specifically for particulate matter in nearby settlement areas once during construction for compliance to NAAQ Standards.	Project Director should regularly coordinate and supervise work. Monitoring agency should take out the monitoring work. Should be incorporated in the contract with contractor	Water sprinkling will be done throughout construction phase.

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
	Vehicle speed should be restricted to 30km/hour at site to minimize potential for dust emission in the surroundings.			
Noise and Vibration				
Disturbance to habitations Occupational Hazard	Only well-maintained equipment should be operated on site. DG sets should only be used for emergency power/ backup. Scheduling of the construction activities should be done. Loud, sudden noise emissions to be avoided wherever possible.	Arrangements/facilities for noise reduction should be monitored as and when required. Personal protective devices for site workers working near high noise equipment. Schedule of activities should be discussed and finalized between site manager and the contractor. Noise monitoring in nearby settlement areas once during construction period to ensure compliance with Noise Rules	Project Director should take care of the compliance of ESMP. External training on use of PPE should be the responsibility of EPC Contractor	Throughout construction phase
Cultural				
Cultural differences amongst workers	To the extent possible sourcing of construction labour should be done from local region by contractor for unskilled activities.	Workers should be briefed about need for cooperation and harmony with the community.	EPC Contractor	Normal Practice
Health and Safety				
Operation of heavy machinery Accidents leading to injuries fatalities. Occupational health hazards	Operation of loading–unloading equipment should be undertaken under the guidance / supervision of trained professional. Sufficiently competent person should be engaged in driving or operating construction machineries. Should ensure personal protective equipment for all personnel present at site are made available during Construction period.	Proper training of the workers regarding health and safety procedures. Workers should be trained through sub-contractors regarding use of Personal protection equipment and its importance.	Project Director should ensure compliance of safety guidelines. Safety Officer of contractor should be responsible for implementation of safety guidelines.	Training of workers shall mostly be given by internal resources during Construction phase

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
	Arrangement for fire control measures Display of Emergency phone numbers at site.	Operation of Cranes shall normally be limited for transmission line as per requirement. Crane (If required) should be operated as per contractor's Crane Safety Plan only.	To form part of the contractor's contract	
Social				
Expectations for infrastructure development benefits	Project officials should communicate and discuss with the community in a transparent manner on a regular basis and demonstrate their concerns. Consultation with women 's groups should also be held during construction and operation phases to listen to their issues and concerns regarding labour, health, and safety etc. as well as to solicit their ideas on various community initiatives.	Project officials should hold regular consultations with appropriate stakeholders. All concerns must be addressed through systematic process.	Project Director	Normal Practice
Local Employment	Assess the exact number of workers should be required at each stage through contractor/ own resource in the construction period. Should ensure priority is given to local people for short term/long term employment opportunities, based on required skill and education level.	Explore possibilities of training and capacity building to enable the community to be able to secure the available jobs and contracts, as per the applicability and requirement of the business.	EPC contractor in discussion with project director should assess potential for engagement of local community and for women.	Normal Practice
Demands for materials	Should ensure local contracting and vendor opportunities aligned with the scope and demand as far as possible.	-	Project proponent/Contractor	Normal Practice

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
Livelihood of roadside vendor might be impacted during to construction period at daytime.	Construction time should be selected in such a manner that minimum livelihood loss occurs due to construction and other project related activities. Compensation paid to roadside vendor if inconvenience caused due to construction of pipeline project.	Fair Compensation Policy	Land Team	Normal Practice
Excess load on existing resources	Local labour should be preferred for unskilled work. Awareness camp for communicable disease understanding. Medical camp as part of CSR activities	Awareness training for applicable regulatory regulations.	Project Director through EPC Contractor	During Construction Phase
Operation Phase				
Waste Generation				
Construction waste	Should earmark designated areas for storage of waste separately. Waste should be given to approved recyclers.	Training and briefing of the staff involved in waste management.	Project Director	Normal Process
Ecological Impact				
Impacts on existing flora and fauna	A monitoring of bird and bat species within the project study area should be undertaken that may help understand the presence of threatened species inside the project area and their movement. This will further help in assessing the site-specific impacts and updating the mitigation measures. Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors.	Training and briefing of the staff involved for record keeping for any electrocution or carcass incident.	Plant EHS or Safety Officer	On regular basis

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
	General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers.			
Water Resources				
surface water body located across pipeline route.	Natural slope of the site shall be maintained laying of pipeline structures require very less topographical correction. Used oil and Waste should be stored in separate designated areas to avoid any contamination due to run-off. Avoidance of water wastage to the maximum extent Proper storm water facility	Regular check on water use quantity Awareness campaign for effective use of water	Plant EHS or Safety Officer	-
Soil Quality Degradation				
Soil quality might be impacted due to construction work	Topsoil Preservation: Strip and store topsoil separately before excavation to facilitate land restoration after construction. Soil Stabilization: Use geotextiles, mulch, or temporary vegetation cover to prevent soil erosion. Controlled Excavation: Minimize the area of disturbance by restricting excavation to designated work zones.	Regular record management of waste materials.	Plant EHS or Safety Officer	-
Health and Safety				
Accidents leading to Injury / fatality. Fire Risk	Schedule high-risk work (such as excavation and pipe laying) during non-peak traffic hours to minimize risks. install warning signs, barricades, and reflective cones well in advance of the worksite. Fire extinguisher in accident prone areas.	Health and safety awareness training on regular interval Safety incidents should be recorded and monitored with an aim that numbers are never significant, and gradually reduce.	Plant EHS or Safety Officer	-

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
	High-visibility safety jackets, hard hats, safety boots, gloves, Protective Eye Wear.			
Social Aspects				
Local Economy Upgradation of infrastructure	Should boost the local economy though local contracting to the extent possible. Infrastructure upgradation as part of CSR	-	CSR Team	Continuous improvement
Decommissioning Phase				
Impacts due to disposal of material after construction work, Contamination of soil	Segregate waste into recyclable (metal scraps, plastic, wood) and non-recyclable (hazardous, non-biodegradable) materials. Reuse excavated soil for backfilling and land restoration. Recycle metal pipes, concrete debris, and plastic materials wherever possible.	-	Plant EHS or Safety Officer	-

9.14.1 On-Site Emergency Management Plan

The probability of inevitable residual risk arising out of operations, capable of causing emergencies cannot be ruled out no matter how well a process is being controlled or safeguarded by instruments and process safety procedures. Such emergencies could be the result of malfunction, ignorance, non-observance of operating instructions or be the consequence of acts outside the control of people.

Hence, they need to prepare an **ON-SITE EMERGENCY PLAN (OSEP)** for dealing with accidents and natural calamities which may still occur and are likely to affect health, safety, life, property, and environment both at site and in the immediate neighborhood. An OSEP mitigates the effects of a major accident/emergency when these effects are contained within the boundary of the site.

This plan is guideline for employees, workers, contractors, sub-contractors, visitors etc., informing about prompt rescue operations, medical treatment, coordination, and communication among various internal & external members. The plan should be proactive to avoid any confusion/panic and should direct to handle the emergency with clear instructions.

Purpose

ATGL has prepared an Emergency Management Plan for implementation at the project site in the event of an emergency so that the loss of life and damage to the properties and natural resources are minimized.

Objective

The overall objective of a good emergency preparedness plan is for what to do and what not during an emergency. The following aspects shall be included in emergency preparedness plan: -

- To assess what dangers could arise to people on and offsite as a result of these foreseeable emergencies and what the effects could it pose on the environment.
- To contain and control incidents.
- To assess the risk involved, and to mitigate the same by pre-planned remedial and rescue measures using, when necessary, the combined resources of the organization concerned and the public emergency services.
- To safeguard residents, employees and any one nearby who might be affected and to minimize the damage to property or the environment.
- The training of the individual personnel with duties under the plans will be familiarizing on site personnel with their roles, their equipment, and the details of the plans.
- The onsite emergency plan should be based on the specific needs of each particular site for dealing with those emergencies which it is for seen may arise.
- For an emergency plan to be successful, it should be tested, when first devised and thereafter to be rehearsed at suitable intervals.

9.14.2 Environmental Monitoring Plan

Environmental monitoring is an effective tool in making necessary recommendations and adopt suitable control strategies so that menace of rising environmental pollution could be minimized, and a relief be

extended to the people including labours in case of any damage caused under occupational health hazards. The monitoring is necessary for the following reasons:

- To verify the results of the impact assessment study.
- To assess what impacts have occurred.
- To evaluate the performance of mitigation measures proposed in the ESMP.
- To ensure that the conditions of necessary consent and approvals are adhered.
- To suggest improvements in management plan, if required.
- To ensure that any additional parameters, other than those identified in the impact, do not become critical after the commissioning of proposed project.
- Considering the short duration of construction phase (around 6-12 months), environmental monitoring can be considered on yearly basis during operation phase only. However, other mitigation measures suggested for construction phase shall be maintained for env. protection.

The proposed environmental monitoring program during both construction and operation phases of the project are given in **Table 9-6** below:

Table 9-6: Environment Monitoring Program- Construction & Operation Phase

Sl. No.	Component	Location	Parameters	Frequency
Construction Phase				
1	Stack emission characteristics	Stacks attached to emission sources (e.g. DG set)	Stack monitoring for PM, SOx, NOx and HC	Once a month
2	Ambient air quality	Nearest Residential Areas, and busy commercial locations	Ambient air quality parameters as per NAAQS viz. PM10, PM2.5, SOx, NOx, CO	Once a month
3	Ground water quality (used as source of domestic water)	Point used for drinking water	Parameters listed in ISO:10500	Once a month
4	Effluent quality	Discharge header of hydrotested pipeline/ tank	According to general discharge standards	As per requirement
5	Waste (including hazardous)	Construction sites and camps	Quantity/ volume generated and disposed	Once in a day
6	Equipment noise levels	1 m from DG set	dB(A)	Once a month
7	Ambient noise levels	Nearest residential areas/ Silent zones etc.	Ambient noise levels (Leq Day & Leq Night)	Once a month
Operation Phase				
8	Greenbelt development	Along the ROW of pipeline	Plant density, health, growth, and survival rate	Once in 6 months

Sl. No.	Component	Location	Parameters	Frequency
9	Waste (including hazardous)	Along the ROW of pipeline	Quantity/ volume generated and disposed of.	Once in a month
10	Effluent quality	Along the ROW of pipeline	According to general discharge standards	Once in 6 months

9.14.3 Performance Indicators of Monitoring

The physical, biological, and social components, which are significant in affecting the environment at critical locations, have been suggested as Performance Indicators. The following specific environmental parameters can be quantitatively measured and compared over a period of time and therefore selected as Performance Indicators for monitoring due to their regulatory importance and the availability of standardized procedures and relevant expertise.

- Ambient Air Quality
- Water Quality

9.14.4 Ambient Air Quality (AAQ) Monitoring

The baseline air quality in these project sections do not show any significant source of pollution as the project area is void of any industrial activities nearby. However, during the construction, vehicular movement is expected. The major increase of pollution in the region during the construction phase would be dust as the existing roads are earthen in nature. Hence constant monitoring of PM10 and PM2.5 may be required. However, considering the short duration of construction phase (around 12-18 months), environmental monitoring can be considered on yearly basis during operation phase only. However, other mitigation measures suggested (especially daily twice-a-time water sprinkling in major construction and movement area) for construction phase shall be maintained for env. protection. There are chances of increase in other pollutants like SO2, NOx and CO but are estimated to be negligible and will be intermittent in nature during the construction stage.

However, during the operation stage monitoring is required for all the parameters like PM10 and PM2.5, Sulphur Dioxide (SO2), Oxides of Nitrogen (NOx) and Carbon Monoxide (CO). These parameters need to be monitored periodically in the operation stage to establish a data bank to ensure that the project has not made any significant impact to the nearby settlements and vegetation. The monitored results are to be checked with the standards of Central Pollution Control Board (CPCB).

9.14.5 Ground Water Quality

Ground Water Quality and depth of water table will be monitored at study area of project site. Analysis of the sample shall be carried out as per established standard methods and procedures prescribed by CPCB, IS 3025, and IS 10500 and APHA 22nd edition, 2012.

9.15 ENVIRONMENTAL MONITORING COST

The environmental monitoring and management costs for the project will be covered under CAPEX (Capital Expenditure) as per project requirements. This allocation includes several key components:

1. Environmental Monitoring: Regular monitoring of ambient air quality, ambient noise quality,

water quality, soil quality, and medical check-ups for workers during construction and operation phase.

2. Pollution Control Measures: Implementing measures to control environmental pollution during the operation phase. These measures include the establishment and maintenance of storage areas for hazardous materials, installation of risk and safety signs, and development of a green belt to function as a buffer and enhance the local environment.

The inclusion of these costs in the project's CAPEX ensures that both initial implementation and ongoing monitoring activities are funded and managed effectively, promoting sustainable practices and regulatory compliance throughout the project's lifecycle.

A separate budgetary provision has been made for implementation of Environmental Monitoring Plan in construction phase. The environmental monitoring cost is estimated based upon the environmental monitoring program being considered in **Table 9-7.** A budgetary provision of **INR 3.25 Lakhs** has been kept for Construction Phase Environmental Management Plan (EMP).

Table 9-7: Environmental Management Plan (EMP) Budget for Construction Phase

S. No.	Environmental & Social Budget (Construction Phase)		Unit Description	No. of Units	Unit cost (INR)	Total Cost (INR)
A	**CONSTRUCTION STAGE - MONITORING COSTS**					
A1	Air	Cost covered under Baseline Monitoring in ESIA	No. of Samples	4		
A2	Noise Quality	Cost covered under Baseline Monitoring in ESIA	No. of Samples	4		
A3	Water Quality (Ground Water + Surface Water)	Cost covered under Baseline Monitoring in ESIA	No. of Samples	2 + 2		
A4	Soil	Cost covered under Baseline Monitoring in ESIA	No of samples	2		
Total Cost						
B	**EHS COSTS**					
B1	Medical check-up to be done for EPC staff	As per worker management practices	Construction Workers	1	25000	25000
B2	E&S Sign Board for E&S promotion to displayed identified locations	E&S signage costs during pre-commissioning and commissioning	Full project area	1	50000	50000
B3	EHS equipment and items cost	Safety equipment and item costs required for construction phase	For construction phase	1	100000	100000
B4	EHS training & audit	EHS training & audit costs during construction phase	Construction Workers	1	50000	50000
B5	Plantation and Greenbelt Development	Lumpsum	Suitable Sites	1	100000	100000
Total Cost						**325,000**
					TOTAL COST (A+B)	**325,000**

10 SUMMARY AND CONCLUSION

10.1 SUMMARY OF IMPACTS

The environmental impacts of the proposed 68.2 km Natural Gas Pipeline Project in Amravati GA has been assessed across its construction and operational phases. Given the temporary nature of construction activities, most impacts are expected to be short-term, localized, and reversible. The project has been designed with a strong emphasis on minimizing ecological disruption and ensuring compliance with environmental regulations.

10.2 IMPACTS DUE TO THE CONSTRUCTION OF PIPELINE

- The area identified for the proposed pipeline project is located within Amravati District, Maharashtra, consisting of city gas distribution of natural gas pipeline project covering a total length of 68.2 km. The pipeline alignment is divided into five distinct stretches. Stretch-1 covers a 15 km segment from Bori Village to Nandgaon Khandeshwar. Stretch-2 spans another 15 km from Shree Khandeshwar Shiva Temple to Shiv Shakti Gaushevashram. Stretch-3 extends for 10 km between DODO Sambhu Raje and the Gajanan Maharaj Temple. Stretch-4 continues for 15 km, reaching up to the Amravati Bus Depot, which marks the endpoint. An additional segment, Stretch-5, spans 9.8 km, starting near the Surat-Kolkata Highway crossing at Badnera Bus depot (and an additional 1.42 km that has been considered a part of stretch 05) and extending to BPCL RP Bhagwat Petroleum at Bopnemtabad. The pipeline traverses a mix of urban, peri-urban, and rural landscapes, including protected forests, rivers, national highways, state Highways, PWD roads, Amravati Municipal corporation roads, railway lines, and drains. The details of major environmental and infrastructural crossings are such that:

    i. **Greenbelt Obstruction/Protected Forests:** The pipeline passes through the Protected Forest area at Stretch 02 near BPCL Jain Petroleum, Nandgaon Khandeshwar and near Maholi Chor Village and then at 3 locations in Stretch 04. The permission is pending from the Amravati Forest Division.

    ii. **Rivers:** The pipeline passes through two rivers, Jallu and Nal Nadi, thrice throughout its stretches. A total of 77.35 m of the stretch passes through rivers. Permissions from the Water Resources Department have been secured.

    iii. **Roads and Highways:** Crossings include NH-53, SH-294, and SH-242A. Some of the permissions from NHAI, PWD, and local authorities have been received by ATGL whereas some are currently under process.

    iv. **Railways:** Stretch-04 passes through railway crossing twice, most of the permissions are obtained from Central Railways.

v. **Drains and Nala**: The pipeline passes through 39 Nala, major and minor drains at multiple locations of Stretches 01 to 04 and at 5 locations in Stretch 05.

vi. **Sensitive Receptors:** The pipeline passes near schools, colleges, hospitals, banks, temples, markets, Spiritual centres and industrial zones. These areas will require special attention during construction to minimize disruption.

- Earthwork excavation, transportation of materials, handling, laying, and jointing of pipelines will result in a temporary increase in dust and suspended particulate matter in the ambient air. These impacts will be localized and short-term and will be mitigated through dust suppression measures and proper handling of materials. For major crossings such as canals the pipeline should be buried at least 4m below the canal bed.
- Movement of vehicles for transportation of construction material could lead to PM and other air emissions. However, the impact shall be short-term & temporary in nature.
- There will be no abstraction of ground water from the project as freshwater for domestic purposes will be supplied by private tankers. Domestic sewage will be disposed of to the septic tanks with soak pits.
- Water consumption during hydro-testing of pipeline - Efficient use of water will be made to reuse test water in different test sections. Water will be tapped from different sources along the pipeline route, without unduly disturbing its normal users.
- In the project around 80% laying will be done via Horizontal Directional Drilling (HDD) method so there will be no disturbance to the natural water flow or cause any pollution to the water body. Hence there will not be any obstruction/damage to fishing, recreational and navigation activities.
- The pipeline will be buried all along its length hence impact on land use pattern will be marginal and reversible. Appropriate reinforcements will be made to avoid contamination.
- Some quantity of earth excavated for pipeline laying will become surplus after installation of the pipeline and may be required for disposal. However, as this excess of earth will be taken to low lying area for filling purpose, the aesthetics of the pipeline and soil quality will not be affected.
- Noise Generation - The major human settlements are along the pipeline route where the noise levels due to construction activities are estimated to be around 70-90 dB(A). Such one-time exposure is not expected to last for more than a few weeks and shall not exceed the stipulated standards. The pipeline laying work would be done at night only as there is lots of traffic in the daytime and it creates disturbance to the locals.

10.3 IMPACTS DURING OPERATION OF PIPELINE

- No impact on any ecological sensitive area is envisaged during operation.

- No air emissions will be generated during the operation phase except during maintenance that could be temporary in nature.
- There will be no significant impact on the ecological environment during the operational phase of the project.
- The probability of leakage will be significantly reduced by adoption of appropriate safety measures and SCADA system.
- The probability of leaking from a pipeline is remote. The pipeline will be buried at a minimum of 1.5 m at major crossings.

10.4 MITIGATION AND ENVIRONMENTAL MANAGEMENT PLAN

10.4.1 General

The mitigation measures to reduce environmental impacts, described in this ESIA, can be divided into the following categories:

- Project decisions taken by **ATGL** with environmental protection in mind.
- Such measures are designed to avoid, eliminate, or reduce potential impacts that may occur to the environment during the proposed activities.
- Mock Drills shall be conducted at regular intervals in line with the Emergency Response and Disaster Management Plan since Amravati falls under flood and earthquake hazard zone.

10.4.2 Post-Monitoring Program

The implementation of mitigation measures during construction and operation phases will be monitored. The monitoring plan would provide for periodic revision, if necessary, considering the baseline status to indicate progress in project implementation and changing environmental conditions to provide a basis for evaluation of project impacts. The post monitoring program would include the following:

- Approved means of leak detection would be employed as per the provisions of Schedule I -E of PNGRB Regulations, 2008 and as per ASME B 31.8, Appendix - M.
- Regular and adequate patrolling of pipelines particularly at crossing locations and settlements.
- Monitoring of pressure, coating conditions and cathodic protection

10.5 CONCLUSION

The Amravati Natural Gas Pipeline Project is poised to deliver substantial benefits, including enhanced energy access, industrial growth, and employment generation. With comprehensive mitigation strategies and a robust Environmental and Social Management Plan (ESMP), the project's environmental impact will be minimal and well-managed. The project also aligns

sustainable development goals and will contribute positively to the regional and national economy.

LIST OF ANNEXURES

Annexure 1: Permission from Central Railways

रघुपती वि. वैद्य
पदोन्नत विक्रेता, ला.क.१/१८

18 OCT 2024

MEMORANDUM OF AGREEMENT
RBCS ON-LINE ID No:- CR-BSL-2024-WL-54

MEMORANDUM OF AGREEMENT FOR GRANTING WAY LEAVE FACILITY RIGHTS FOR CROSSING RAILWAY LAND

(Authority: Board's Letter No. 2022/LML-I/25/5-(Pt-2) dated 06.12.2022)

Agreement No. DRM (W) BSL/2024/84 Dated: 06/11/2024

This Memorandum of Agreement(MOA) is made and entered into on this 6th day of NOVE, 2024 at BHUSAWAL(Place) by and between the President of India acting, through the **Senior Divisional Engineer [East], BHUSAWAL Division, Central Railway**, (hereinafter called the **'Grantor' or 'Railway Administration'** which expression shall, unless the context does not so admit includes his successors and assigns) of the one part and **Sr. Manager**

वरिष्ठ मंडल इंजीनियर (पूर्व) भुसावल
Senior Divisional Engineer (East) Bhusawal

(Projects), (hereinafter called the **'Grantee')** **R/o_Sr. Manager (Projects), Crest 4-5, Inspire Business Park, Shantigram, Nr. Vaishnodevi Circle,S. G. Highway, Ahmadabad, Gujarat** which expression shall, unless the context does not so admit, includes his successors and assigns) of the other part.

Whereas the Grantee is desirous of providing/laying **of 300mm Dia GAS PIPELINE in Casing of 450 mm Dia MS Pipeline under Track at Km. 664/18 - 664/20 between Badnera(BD)-Timtala(TMT) Stations on BSL-BD Section** by HDD Method as per **RBCS ON-LINE ID No:CR-BSL-2024-WL-54** [name of work] across/ through the Railway land belonging to [**BSL] Division of [CENTRAL] Railway** and has approached Railway Administration for permission to cross Railway land upon the terms and condition hereinafter contained.
Now this Memorandum of Agreement of terms witnessed as follows:

1. That the Grantee at his own risks and expenses, **300mm Dia GAS PIPELINE in Casing of 450 mm Dia MS Pipeline under Track at Km. 664/18 - 664/20 between Badnera(BD)-Timtala(TMT) Stations on BSL-BD Section** by HDD Method as per **RBCS ON-LINE ID No:CR-BSL-2024-WL-54** [Name of work] vide Railway Plan No **Drg No. Applicant ID: RBCS ON-LINE ID No: CR-BSL-2024-WL-54** (to be suitably modified if the work is done by railway).
2. That the permission for crossing Railway land at the aforesaid railway land is granted for a period of **35 years** from the date of signing this agreement to the Grantee on the terms and conditions contained herein which have also been distinctly and clearly understood by the Grantee before entering into this agreement.
3. That subject to otherwise provided in this agreement for way leave facility, any action including giving notices will be taken by Grantor (Railway Administration) on behalf of President of India.
4. That no work shall commence or proceed without previous sanction in writing and supervision of the concerned railway officer not below the rank of Divisional Engineer or any officer so deputed by him. The Grantee shall be bound all the times, at his own costs /expenses, to observe and carry out all rules and regulations etc. which are already in force or which may thereafter be prescribed from time to time in future by the Govt./ Grantor.
5. The Grantee shall always obey all such directions or orders or restrictions as may, from time to time, be given by Grantor or his deputies duly authorized by him in relation to the construction, shifting, stoppage, abandonment, alteration, repair, removal or with regard to the time and manner of the work for which permission for crossing Railway land has been obtained and also other things and matters related thereto.
6. That Grantee distinctly and clearly understood that all the relevant codes, manuals and instructions etc. are strictly followed for the purpose of durability, safety and soundness of structures thereof.

वरिष्ठ मंडल इंजीनियर (पूर्व) भुसावल
Senior Divisional Engineer (East) Bhusawal

ADANI TOTAL GAS LIMITED AMRAVATI

7. That it is distinctly and clearly understood by the Grantee that the Grantor shall retain the full legal title, ownership, right of access, pass through and inspection, without any notice to Grantee, and have full control over the use and disposal of Railway land for which a permission is given to the

Grantee only for the occasional/ limited purpose of laying **300mm Dia GAS PIPELINE in Casing of 450 mm Dia MS Pipeline under Track at Km. 664/18 - 664/20 between Badnera(BD)-Timtala(TMT) Stations on BSL-BD Section** by HDD Method as per **RBCS ON-LINE ID No:CR-BSL-2024-WL-54** [name of work] across/ through the Railway land belonging to [**BSL] Division of [CENTRAL] Railway** without conferring upon the party any right of possession or occupation of the land and without, in any way, affecting the railway's right, title, interest, possession, control, use of the land, any right to enter upon etc.. The Grantee has clearly understood that all air/space rights shall remain with the Grantor.

8. That the Railway Administration shall prepare an estimate before commencement of work and Grantee shall pay all codal charges as per railway rules including the expenditure incurred within Railway premises/Railway land.
9. That the Grantee shall pay, in advance, One- time fee or annual charges or entire payable amount for full way leave term on present value basis with discounting of future cash flows at rate of 7% (seven percent) per annum, as applicable, for way leave facility for crossing Railway land before the permission is granted by the Grantor. As such, the Grantee has to deposit an amount of **Rs. 5,91,582.0/- amount in words and figures (Five Lakh ninety one thousand five hundred eighty two Only)** as per Final Detailed Estimate & Demand Note No: **RBCS ON-LINE ID No:-CR-BSL-2024-WL-54 & Payment made by Party Rs.1000/- as Registration Fees Paid on 11.06.2024 & Rs.8,317/- paid on 11.09.2024 & Rs.1900/- paid on 04.10.2024 for Way plan & Survey charges.) Payment made On-line on RBCS Portal.** In case of annual payment option, a security deposit (refundable after tenure) of two-year annual payment shall be deposited by the party. Also, the annual charges shall be deposited in advance on or before 10th April of every year (next working day in case of holiday on 10th April). No monthly payment shall be accepted. In case of delay, an interest @12% per annum shall be payable on the outstanding dues for the delayed period. In case of delay for more than 24 months, the security deposit shall be forfeited and further necessary action shall be taken in terms of this agreement. The annual charges shall increase every year by 6 %.
10. On expiry of way leave agreement, further renewal can be done based on mutual agreement between Grantor and Grantee. Market value of the railway land prevalent at the time of renewal shall be considered for deciding the way leave charges. New agreement shall be signed between Grantor and Grantee.

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11. That the Grantee shall pay all the costs and expenses on account of stamp duty charges, documentation, registration of agreements, GST, property taxes etc. The Grantee shall ensure registration of agreement in terms of applicable laws.
12. That the Grantee shall not erect/raise any additional construction, other than approved plan, whether permanent or temporary on the Railway land. If any such construction comes up subsequently, the same shall be removed immediately as soon as noticed at the costs of the Grantee and the permission for way leave shall be discontinued with immediate effect.
13. That, if any time, the way leave facilities for crossing Railway land becomes, in the opinion of Railway Administration, a menace to the safety of the Railway operation or Railway property, the Grantee shall, at once take steps to remedy such dangerous defects to the satisfaction of the Railway Administration failing which the Railway Administration shall have the rights to take all necessary remedial steps at the costs of the Grantee, necessary for the protection of the Railway's interests, without being held responsible for any loss, suffered by the Grantee, due to such action of the Railways Administration. In case of any loss to the Railway due to such action, in case of menace, the Grantee shall be held liable to compensate the Railway in all cases, what so ever it may be.
14. That the Railway shall not in any case be responsible for any damage/loss to the work of the Grantee, caused by the running/operation of the trains, derailments or accidents to the train or by any other cause, whatsoever it may be.
15. That the Grantee shall keep, all the times, Railway Administration indemnified against and reimburse the Railway administration for all claims, suites, demands, compensation, losses, damages, costs, expenses, penalty, etc., whatsoever, which the Railway Administration may sustain or incur by any reason or in consequence of any injury to any person or loss of life or to Railway property resulting directly or indirectly or incidentally from any act or omission on the part of the Grantee or his employees or servants or any other person, agent etc. other than Railway servants on any account related to said permission, on duty in carrying out the purpose of the Grantee.
16. That any notice hereunder shall be deemed duly served on the Grantee if delivered or sent by post/mail to his above mentioned address.
17. In case shifting of alignment of way leave facility is required on party/ Railway account, the entire cost of shifting of way leave facility shall be borne by the Grantee.
18. In the event of the way leave facility being discontinued with by the Grantee or Grantor, the Grantor/Railway Administration shall not be liable to pay any compensation or reimburse any amount to the Grantee, nor to provide any alternative arrangement for access, etc. In such a case, any installations like underground pipelines, etc. put up by the party are liable to be removed/ shifted by the Grantee at its own cost.

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19. Grantee will be responsible for maintenance of assets crossing Railway land including, periodic cleaning of jungle/ vegetation grounds, periodical de-silting of all open drain/ storm water carrying drains, which do not carry any sludge, as applicable.
20. Grantee shall not transfer or sublet the way leave facility/ right granted by the Grantor further to any party.
21. Grantee agrees that provisions of Railway Act./Manuals/Codes, instruction and terms & condition of contract with Railways will supersede any conflicting provision of Petroleum act or provisions of Ministry of petroleum & Natural Gas or any other act.
22. (Retain if applicable) In case of inflammable substances pipe line crossings, shutoff valves should be provided on either side beyond 500 m from Railway Boundary but not beyond 1500 m. The inter-se distance between two shut off valves should not exceed 2000m. Vent pipe should be provided on either side beyond 500m from Railway boundary but not beyond 750m. Or

    In case of optical fibre cable, grantee have got requisite license from Department of Telecommunication, Government of India for laying of optical fibre cable in the area.

    Or

    In case of construction of ROB/RUB across Railway track through NREGA, MPLADS, PMGSY, MMGSY etc, way leave charges have been waived off in terms of Railway Board letter no, 2006/ CE-IV/BRO/82/MPLADS (Policy) dated 16.07.2012.

23. Dispute Resolution: In case of any dispute or difference arising out in any way touching or concerning the Agreement whatsoever, a standing committee of three JAS/SG officers of Engineering, Finance and user department of concerned railway division shall examine all the issues and submit recommendations to the DRM whose decision shall be final and binding on all the parties.
24. Termination of Agreement: In the event of any serious irregularity, grave breach of the terms & conditions of the agreement, any default, violation of the Railway Act, 1989, commission of any unlawful act which is not in line with good industry practices, railway administration may terminate the agreement with the Grantee without being held responsible to pay any compensation and/or reimburse any amount to the Grantee and not liable to provide any alternative arrangement for access, etc.. On receipt of such notice, the Grantee shall immediately remove its structures at its own cost and expenses and also made good for any damage, thereby occasioned to the surface or underground of Railway land.

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25. That the agreement shall be effective w.e.f. 06-11-2024

26. **RBCS ON-LINE ID No:CR-BSL-2024-WL-54**

In witness whereof, the parties to this agreement have set their respective hands and seals of their offices to these presents on the date, month & year mentioned against each.

For and on behalf of

PRESIDENT OF INDIA (Grantor)

SIGNED, SEALED AND DELIVERED by
Name:- Gautam Musale
Designation: Sr.DEN (East)
Address: Divisional Office, Central Railway
BHUSAWAL
(Authorized Signatory)

वरिष्ठ मंडल इंजीनियर (पूर्व) भुसावल
Senior Divisional Engineer (East) Bhusawal

For and on behalf of

Sr. Manager (Projects),
SIGNED, SEALED AND DELIVERED by
Name/Designation **Sr. Manager (Projects), Crest 4-5, Inspire Business Park, Shantigram, Nr. Vaishnodevi Circle,S. G. Highway, Ahmadabad, Gujarat**

In the presence of Witnesses:

1. Signature _____
Name: RANJEET KUMAR
Designation : SR.CLERK (WAB) Section
Office Address: DRM (W)'s Office, Engg. Deptt.
Central Railway, Bhusawal.

2. Signature _____
Name: Amit Tukaram Kamble
Designation : Surveyor
Address At. Post Paisy Ta Hadgaon Dist-
Nanded Pin 431712

Annexure 2: Permission from PWD

GOVERNMENT OF MAHARASHTRA
OFFICE OF THE EXECUTIVE ENGINEER
PW(SP) Division, Amravati
Public Works Department

Permission for laying utility

To,

ADANI TOTAL GAS LIMITED,
CREST 4-5, INSPIRE BUSINESS PARK, SHANTIGRAM, NR. VAISHNODEVI CIRCLE,S. G. HIGHWAY, AHEMDABAD, AHMEDABAD, 382421

Subject :-	**Permission for laying GAS Pipeline on 1. MDR - 31 From Km. 20/800 to 27/000, 2. MDR - 50 From Km. 18/250 to 19/000 & 3. SH - 294 From Km. 10/000 to 10/500**
Reference :-	Your Online Application No 57556, Dated 2024-06-12 14:49:00

With reference to your application for obtaining permission for laying **GAS Pipeline**, this office has received online amount for Rs **2,623,719 (Transaction No.:113387182188 dated 30-08-2024)** as restoration charges for **1. MDR - 31 From Km. 20/800 to 27/000, 2. MDR - 50 From Km. 18/250 to 19/000 & 3. SH - 294 From Km. 10/000 to 10/500**.

Based on the above,you are hereby granted permission with following terms and conditions, attached herewith.

Click here for printing Terms and Conditions document separately.

DSEXRHZG67ZJUYSDVK8O

Executive Engineer
Special Project Division
Amravati
Executive Engineer

No.S.P.(P.W.)Dn.Amravati/DB/GPL/ 3687 **/2024**

Date- 03 SEP 2024

Copy to :- Deputy Engineer, P.W. Sub-Division **Chandur Rly.** for information and proceedings.

2/- When the actual work is started, the applicant must take care of the work according to the prescribed conditions, attached herewith. In this regard submit report to divisional office.

Enclose:- Terms & Conditions.

Copy to :- SAC Division office for information and proceedings.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
कार्यकारी अभियंता, विशेष प्रकल्प (सा.बां.) विभाग, अमरावती

दुरध्वनी क्रमांक :-०७२१-२६६८००३ E-mail : spdamravati.ee@mahapwd.gov.in

जावक क्र./रेशा/आरे/Online Approve/ सन-२०२४	दिनांक- 02/07/2024

ई-परवानगी

विषय :- अंजनगाव बारी-मांजरी म्हसला सातरगाव राजुरा बोरी किरजवळा सुलतानपुर रस्ता प्र.जि.मा.३१ कि.मी.२०/८०० ते २५/७८०(उजवी बाजू), चांदुररेल्वे सोनगाव कळमगाव बग्गी राजुरा प्र.जि.मा.५० कि.मी.१८/२५० ते १९००(डावी बाजू) व नांदगाव खं. चांदुर रेल्वे कुऱ्हा आर्वी रस्ता रा.मा.२९४ कि.मी.१०/०० ते १०/३४४ (डावी बाजू) कि.मी. १०/३४४ ते १०/३९९ (उजवी बाजू) मध्ये रस्त्याच्या बाजूने व रस्ता क्रॉस करुन भूमिगत गॅस पाईपलाईन टाकणेस परवानगी मिळणेबाबत.

संदर्भ :-
१. अदानी टोटल गॅस लि. यांचा ऑनलाईन अर्ज-५७५५६.
२. शासन निर्णय क्र. संकीर्ण-२०१७/प्र.क्र.२४६/रस्ते-७ दिनांक-३०.०५.२०१७.
३. शासन परिपत्रक क्र. संकीर्ण-२०१७/प्र.क्र.२४६/रस्ते-७ दि.-३०.०५.२०१७.
४. उप अभियंता, सा.बां. उपविभाग, चांदुर रेल्वे यांचे पत्र क्र.७९८/२०२४ दि-२७.६.२०२४.
५. अदानी टोटल गॅस लि. यांचा दिनांक-२८.०६.२०२४ रोजीचा सविस्तर ऑनलाईन अर्ज.

उपरोक्त विषान्वये अदानी टोटल गॅस लि. या कंपनीस अंजनगाव बारी-मांजरी म्हसला सातरगाव राजुरा बोरी किरजवळा सुलतानपुर रस्ता प्र.जि.मा.३१ कि.मी.२०/८०० ते २५/७८०(उजवी बाजू), चांदुररेल्वे सोनगाव कळमगाव बग्गी राजुरा प्र.जि.मा.५० कि.मी.१८/२५० ते १९००(डावी बाजू) व नांदगाव खं. चांदुर रेल्वे कुऱ्हा आर्वी रस्ता रा.मा.२९४ कि.मी.१०/०० ते १०/३४४ (डावी बाजू) कि.मी. १०/३४४ ते १०/३९९ (उजवी बाजू) मध्ये रस्त्याचे बाजूने व रा.मा.२९४ कि.मी.१०/३४४ व प्र.जि.मा.३१ कि.मी.२५/७८० मध्ये रस्ता क्रॉस करुन भूमिगत गॅस पाईपलाईन टाकणेसाठी उपविभागीय अधिकारी, रो.ह.यो. (सा.बां.) उपविभाग, बडनेरा यांचे पाहणी अहवालानुसार व शासन निर्णय क्र.ओएफसी-२०२३/प्र.क्र.१६५/रस्ते-७ दि.१५.०९.२०२३ अन्वये प्राप्त अधीकारानुसार खालील अटींच्या अधीन राहून मंजूरी देण्यात येत आहे.

अटी व शर्ती:-

१. विषयांकित प्रस्तावित भूमिगत गॅस पाईपलाईन राज्यमार्ग रस्त्याच्या कडेने (Along) रस्त्याच्या मध्यरेषेपासून **१५.०० मी.** अंतरावर व प्र.जि.मा. रस्त्याच्या कडेने (Along) रस्त्याच्या मध्यरेषेपासून **१२.०० मी.** रस्त्याचे हद्दीत किंवा जेथे प्रत्यक्ष रस्त्याची शासकीय हद्द कमी अस्तित्वात आहे त्या ठिकाणी रस्त्याचे हद्दीतं रस्ता हद्दीला खेटून जास्तीत जास्त अंतरावर, त्या ठिकाणी रस्त्याच्या पृष्ठभागापासून (Ground Level) १.२० मी. पेक्षा जास्त खोलीवर टाकणेत यावी. प्रस्तावित गॅस पाईपलाईन ही अस्तित्वातील रस्त्यावरील मोऱ्या, लहान पूल व मोठे पूल यांचेवरुन किंवा त्यांचे लगत टाकू नये. तसेच आवश्यक त्या ठिकाणी याकरीता पूर्व परवानगी घेणे बंधनकारक आहे.

२. गॅस पाईपलाईन खोदाई चे काम टप्याटप्याने पुर्ण करण्यात यावे. ५०० मीटर अंतरापर्यंत खोदाई पुर्ण झाल्यावर गॅस पाईपलाईन टाकून व खोदाई बुजवून त्यावर दबाई करून रस्ता पुर्ववत करावा. सदरील काम करताना वाहतूक सुरक्षीततेच्या दृष्टीने खोदाई सुरू करण्यापुर्वी पुर्ण ५०० मीटर लांबीत बॅरिकेड्स व सुचना फलक उभारण्यात यावेत व या लांबीतील काम पूर्ण झाल्यानंतर ते उचलून पुढील लांबीत उभारून मग पुढील लांबीतील काम सुरू करण्यात यावे

३. प्रस्तावित काम सुरु करणेपूर्वी संबंधीत **उप अभियंता** यांना लेखी कळविणेत यावे तसेच त्यांचे मार्गदर्शनाखाली, देखरेखीखाली व सुचनांनुसार विषयाधीन प्रस्तावित गॅस पाईपलाईन टाकण्यात यावी. कंपनीस परस्पर रस्ता खोदाई सुरू करता येणार नाही.

४. खोदकाम करतांना जमिनीवरील तसेच भूमीगत अस्तित्वात असलेल्या इलेक्ट्रीक केबल्स / टेलीफोन केबल्स / ओएफसी, पाण्याच्या पाईप लाईन्स, ड्रेनेज लाईन्स इत्यादी सुविधांना कोणत्याही प्रकारची इजा / हानी होऊ नये याची दक्षता घेणेत यावी. तसे झाल्यास त्याची सर्व जबाबदारी अनुज्ञप्ती धारक कंपनीवर राहिल.

५. खोदकाम चालु असतांना शासकीय मालमत्ता, रस्त्याची गटर्स व वृक्षांचे कोणत्याही प्रकारचे नुकसान होऊ नये. तसेच अपघात होऊ नयेत याची दक्षता घेणेत यावी. तसे घडल्यास त्यांची सर्व जबाबदारी अनुज्ञप्तीधारक कंपनीची राहील. शासेकीय मालमत्तेचे नुकसान झाल्यास त्याची नुकसानभरपाई प्रस्तावधारक कंपनीने शासनास देणे बंधनकारक राहील.

६. विषयाधीन भूमिगत गॅस पाईपलाईन पुर्णपणे सुरक्षित असावी, जेणेकरुन भविष्य काळात जीवीत व वित्तहानी होऊ नये. त्याची संपुर्ण जबाबदारी अनुज्ञप्तीधारक कंपनी वर राहिल. विषयाधीन भूमिगत गॅस पाईपलाईन मुळे अपघात झाल्यास त्याची जबाबदारी प्रस्तावधारक कंपनीवर राहील. तसेच भूमीगत गॅस पाईपलाईनची देखभाल व दुरूस्तीची जबाबदारी अनुज्ञप्तीधारक कंपनीची राहिल तसेच सदर नियमित देखभाल व दुरुस्ती त्यांनी स्वखर्चाने करणे बंधनकारक आहे.

७. रस्ता रुंदीकरणाच्या वेळी रुंदीकरणाच्या वाढीव हद्दीपलिकडे सा. बां. विभागाने / भारतीय राष्ट्रीय महामार्ग प्राधिकरण (NHAI) किंवा इतर कोणताही शासकीय विभाग अथवा संस्था कि जी संबंधीत रस्त्याचे रूंदीकरणाशी संबंधीत आहे यांनी दिलेल्या सूचनांप्रमाणे कंपनीस गॅस पाईपलाईन स्वखर्चाने हलवावी लागेल. या करिता सार्वजनिक बांधकाम विभाग / भारतीय राष्ट्रीय महामार्ग प्राधिकरण (NHAI)/ राष्ट्रीय महामार्ग विभाग / रस्ते विकास महामंडळ, महाराष्ट्र किंवा इतर कोणताही शासकीय विभाग अथवा संस्था कि जी संबंधीत रस्त्याचे रूंदीकरणामध्ये अंतर्भुत आहे यांचेकडून आगाऊ तीस दिवसांची नोटीस दिली जाईल. नोटीस दिल्यानंतर तीस दिवसांच्या आत ही गॅस पाईपलाईन काढून न टाकल्यास सार्वजनिक बांधकाम विभाग / भारतीय राष्ट्रीय महामार्ग प्राधिकरण (NHAI)/ राष्ट्रीय महामार्ग विभाग / रस्ते विकास महामंडळ, महाराष्ट्र किंवा इतर कोणताही शासकीय विभाग अथवा संस्था कि जी संबंधीत रस्त्याचे रूंदीकरणामध्ये अंतर्भुत आहे यांचेकडून गॅस पाईपलाईन काढून टाकण्यात येईल. अथवा रस्ता रुंदीकरणाचे काम सुरु करण्यात येईल. अनुज्ञप्ती धारक कंपनीस नविन पाईपलाईन रस्त्याच्या वाढीव हद्दीपलिकडे सार्वजनिक बांधकाम विभाग / भारतीय राष्ट्रीय महामार्ग प्राधिकरण (NHAI)/ राष्ट्रीय महामार्ग विभाग / रस्ते विकास महामंडळ, महाराष्ट्र किंवा इतर कोणताही शासकीय विभाग अथवा संस्था कि जी संबंधीत रस्त्याचे रूंदीकरणामध्ये अंतर्भुत आहे यांचे पूर्व परवानगीने स्वखर्चाने टाकावी लागेल. याबाबत कोणतीही नुकसान भरपाई वरिलपैकी कोणत्याही अभिकरणाकडून मागता येणार नाही अथवा सदर बाबत कोणत्याही प्रकारचा दावा न्यायालयात दाखल करता येणार नाही.

८. उपरोक्त अट क्र.७ मध्ये नमुद एक महिन्याच्या नोटीसीचा कालावधी संपताच अर्जदारांनी पाईप लाईन न काढल्यास कार्यकारी अभियंता, सा.बां. विभाग यांना सदरची प्रस्तावित भुमीगत गॅस पाईपलाईन काढुन टाकण्याचा अधिकार राहिल आणि त्या कामाकरीता येणारा खर्च, सबंधीत प्रस्तावधारक कंपनीने सार्वजनिक बांधकाम खात्यास दयावा लागेल.

९. गॅस पाईप लाईन रस्ता ओलांडून टाकताना (Road Crossing) रस्त्याच्या मध्यापासून कमीत कमी ११.०० मीटर अंतरापासून रस्त्याच्या डांबरी पृष्ठभागाखालून कमीत कमी १.५० मीटर खोलीवर बोअर घेऊन (HDD पध्दतीने) २०० मि.मी. व्यासाच्या गॅस पाईप लाईनसाठी ६०० मि.मी. व्यासाचा केसिंग पाईप टाकून त्यातून गॅस पाईपलाईन नेण्यात यावी. केसिंग पाईपचा Top रस्त्याच्या पृष्ठभागापासून (R.T.L) कमीत कमी १.५० मीटर खोलीवर येईल या प्रमाणे खोदाई करावी. परंतू ज्या ठिकाणी Horizontal Drilling शक्य नाही अशा ठिकाणी खोदाई करून प्रथम केसिंग पाईप टाकून त्यामधुन गॅस पाईपलाईन टाकण्यात यावी.

१०. खोदकाम चालु असताना रस्त्याच्या कडेची झाडे तोडणे अनिवार्य असल्यास अनुज्ञप्ती धारक कंपनीने संबंधित सक्षम प्राधिकरण (वन परिक्षेत्र अधिकारी, वन अधिकारी, स्थानिक प्राधिकरण) यांची पूर्व परवानगी मिळवावी. तसेच संबंधीत वन अधिकारी व वन्यपरिक्षेत्र अधिकारी यांचेकडून तोडल्या जाणा-या झाडांचे मूल्यांकन करून झाडांचे मूल्य शासनाकडे जमा करावे, व संबंधीत प्राधिकरणाच्या सुचनेनुसार पर्यावरणाचा समातोल राखण्यासाठी

तोडाव्या लागणा-या झाडांच्या संख्येनुसार नवीन वृक्षांची लागवड व संगोपन करावे. तसेच वन जमिनीतून रस्ता जात असल्यास गॅस पाईपलाईन खोदाईसाठी वन विभागाची परवानगी घेतल्याशिवाय खोदाईस सुरूवात करू नये.

११. महाराष्ट्र सरकार व केंद्रीय जल भुतल परिवहन मंत्रालयाने नविन नियम, अटी व शर्ती प्रस्तुत केल्यास त्या अभिकर्ता कंपनीस बंधनकारक राहतील.

१२. रस्त्याखालून गॅस पाईपलाईन टाकण्याचे कामास सुरूवात करणेपूर्वी कामाच्या ठिकाणापासून दोन्ही दिशेला १०० मीटर अंतरावर सावधानतेच्या इशा-याचे फलक रिफलेक्टीव स्ट्रीपचा वापर करून लावण्यात यावेत. तसेच रात्रीच्या वेळी काम सुरू अथवा अपूर्ण राहिल्यास माहितगार तंत्रज्ञांसह रात्रभर तेवत राहणारा लाल प्रकाश झोताचा दिवा लावण्याची वा तत्सम व्यवस्था कंपनीने करावी.

१३. रस्त्याचा पृष्ठभाग गॅस पाईपलाईन टाकणेसाठी खोदला असता मोकळा होवून पोकळी निर्माण झालेल्या ठिकाणी गॅस पाईपलाईन व्यतिरिक्त इतर सर्व भागामध्ये संबंधित कंपनीने स्वखर्चाने सिमेंट क्राँक्रीट अथवा तत्सम समांतर पातळीने बांधकाम साहित्याने भराव करून रस्त्याच्या पृष्ठभागाची Rigidity कायम ठेवायची आहे. तसेच गॅस पाईपलाईन टाकणेचे काम पुर्ण झाल्यानंतर कामाच्या ठिकाणी सा.बां.खात्याच्या मालकीच्या जागेत संबंधित कंपनीच्या मालकीचे किंवा त्यांच्या संबंधित ठेकेदारांच्या मालकीचे कोणतेही अतिरीक्त साहित्य, मशिनरी, राडारोडा अथवा शेड राहणार नाही याची दक्षता सदर कंपनीने घ्यावी. या बाबत कार्यकारी अभियंता किंवा त्यांचे प्रतिनिधी यांचे संपूर्णत: समाधान होईल अशाप्रकारे पुर्ववत दुरूस्ती करून रस्ता पूर्ववत करून द्यावा लागेल.

१४. प्रस्तावात नमूद केलेल्या लांबीव्यतिरिक्त इतर काही वाढीव काम करावयाचे झाल्यास सा.बां. खात्याची पुर्व परवानगी घेणे कंपनीस बंधनकारक आहे. प्रस्तावासोबतचे नकाशात दाखविलेले मार्गा नुसारच काम करावे.

१५. सदर काम चालू करण्यापूर्वी संबंधित कंपनीने रस्त्याचा काटछेद नकाशा रस्त्याचा पृष्ठभाग खोदण्यासाठी वापरात येणारी मशिनरी व तिची पध्दत तसेच खोदाईच्या कामासाठी व प्रत्यक्ष काम पूर्ण होण्यासाठी लागणारा कालावधी इत्यादीबाबतचा सविस्तर आराखडा सा.बां.खात्याच्या सक्षम अधिकारी यांना द्यावा.

१६. कंपनीच्या मालमत्तेचे हानीपासून संरक्षण करण्याची हमी शासन देत नाही.

१७. करारातील कोणत्याही शर्तीचे संबंधित कंपनीने पालन न केल्यास तीन महिने आगाऊ दिलेल्या नोटीसची मुदत संपल्यावर जमीनीखालील गॅस पाईपलाईन काढून टाकण्याची कार्यकारी अभियंता यांना मोकळीक असेल, आणि कार्यकारी अभियंता यांचेव्दारे करण्यांत आलेल्या खर्चास संबंधित कंपनी जबाबदार असेल. तो खर्च प्रस्तावधारक/ कंपनीने शासनास देणे बंधनकारक राहील.

१८. सदर रस्त्याच्या लांबीमध्ये शेतकरी, संस्था व इतरखाजगी कंपनी अथवा इतर खात्याची अथवा इतर कोणाच्या हक्कांची जमीन येत असल्यास गॅस पाईपलाईन टाकण्याकरिता त्यांची स्वतंत्र परवानगी घेणे आवश्यक आहे व त्याच्या सहमतीने गॅस पाईपलाईन टाकण्याचे काम करण्यात यावे. अन्यथा काही तक्रारी उदंभवलेस सा.बा.खाते जबाबदार राहणार नाही.

१९. सदर गॅस पाईपलाईन प्रकरणीचे प्रस्तावांतर्गत संबंधितांनी पुरविलेले कागदपत्रे खोटे अगर दिशाभूल करणारी आढळून आल्यास देण्यात येणारी परवानगी तात्काळ रद्द करण्यात येईल. तसेच प्रस्ताव धारक कार्यवाहीस पात्र राहील.

२०. पाण्याची पाईप लाईन टाकणेकामी खोदाईचे काम करताना रस्त्याचे नुकसान झाल्यास त्याचा दुरूस्तीचा अतिरिक्त खर्च हा सा.बां.विभागाने दावा केले प्रमाणे कोणतीही हरकत न घेता तातडीने देणे परवानाधारक यांचेवर बंधणकारक राहील व सदर रस्त्याच्या नुकसानाची आर्थिक भरपाई विहित कालावधीत देण्यास परवानाधारक यांना बंधनकारक असेल.

२१. गॅस पाईप लाईन टाकणेसाठी खोदकाम करतांना उपयुक्त असे मुरुम, खडी, दगड यासारखे गौण खनिज सापडल्यास, त्यावर सा. बां. विभागाची मालकी असेल. असे गौण खनिज योग्य प्रकारे साठवून ते संबंधित उप अभियंता यांचेकडे सुपुर्द करण्यात यावे.

२२. सदर परवानगी ही प्रस्तावित असलेल्या फक्त एकच पाईपलाईन टाकणेकरीता मर्यादीत आहे.

२३. जि.प.चे अधिपत्याखाली इतर जिल्हा मार्ग व ग्रामीण मार्ग बाबत गॅस पाईपलाईन खोदाईसाठी जि.प विभागाकडून परवानगी घ्यावी.

२४. सदरहू गॅस पाईप लाईन ही ज्वालाग्राही असल्यामुळे वाहतुकीच्या सुरक्षेतेच्या दृष्टीने योग्य ती खबरदारी घेणे परवानाधारक कंपनीवर बंधनकारक राहील. त्यासाठी कंपनीने इतर संबंधित खात्याच्या आवश्यक त्या परवानग्या घेणे बंधनकारक राहील. अन्यथा भविष्यात गॅस पाईप लाईनमुळे कोणतीही दुर्घटना घडल्यास त्यामध्ये होणाऱ्या जिवीत व वित्तीय हानीस पूर्णपणे परवानाधाकर कंपनी जबाबदार राहील, याची नोंद घ्यावी.

२५. परवानाधारक कंपनी व सबंधित उप अभियंता यांचे मध्ये कामाचे सबंधित कोणताही वाद निर्माण झाल्यास वा तक्रार असल्यास त्याचे निवारण करण्यात कार्यकारी अभियंता हे सक्षम असतील व त्यांचा निर्णय अंतिम असेल.

२६. विषयांकित कामाचे ठिकाणी खोदकाम करताना अर्जदार यांनी खाली नमूद केलेली माहिती असलेला ४५० mm X ६०० mm या आकाराचा सुचना फलक लावणे बंधनकारक राहील.

अ) सार्वजनिक बांधकाम विभाग-

ब) सार्वजनिक बांधकाम उपविभाग-

क)अर्जदार/ प्राधिकरण / अभिकरण-

ड)सबंधित कंत्राटदाराचा मोबाईल क्र.

इ)कामाचे नाव-(रस्ता, साखळी क्रमांक, लांबी, कामाचा संक्षिप्त वाव)

ई)कामाचा कालावधी-

प्रत्यक्ष काम सुरु करण्यापूर्वी वरील अटी व शर्ती मान्य वा कबूल असल्याबाबतचे हमीपत्र रु. ५००/- किंमतीच्या मुद्रांक शुल्कावर तयार करुन अर्जदार यांनी कार्यकारी अभियंता, विशेष प्रकल्प (सा.बां.) विभाग, अमरावती या कार्यालयात जमा करावयाचे आहे.

(राजेश सोनवाल)
कार्यकारी अभियंता
विशेष प्रकल्प (सा.बां.) विभाग
अमरावती

प्रत :-उपविभागीय अभियंता, सा. बां. उपविभाग, चांदुर रेल्वे यांना माहिती व कार्यवाहीसाठी.

प्रत :-अदानी टोटल गॅस लि. यांना वरीलप्रमाणे माहिती व कार्यवाहीसाठी.

Annexure 3: Permission Letter from Water Resources Department for pipelines passing through River and Nalla

जलसंपदा विभाग

Government of Maharashtra
Water Resources Department,
Amravati Irrigation Division,
Amravati

$Upper Wardha Coloney, Shivajinagar $ 444603–
Telephone No - 721 2662337 Email- *eeaidamravati@gmail.com*

No.2512 /AID/ TS.-2 / Adani Gas /2024 Dt. / 09 / 2024

13 SEP 2024

To,

Senior Manager,
Adani Total Gas Limited,
Amravati

Subject :- Amravati Connectivity (GAIL SV -20 Bori Village to Amravati Bus Depot.) Granting permission to authority for 12" dia pipe line laying across to various Nalla / Drain / River along the pipe line route in Amravati District.

Ref :-
1) ATGL / Amravati GA / Nala / Per / 2024 Dt.10/06/2024
2) SDE /AID Sub. Dn./Letter No. 358/Gas pipe line /TS/2024 Dt.01/07/2024
3) This office letter No.1806 / AID / TS-2 / Adani Gas / 2024 Dt.03/07/2024
4) ATGL / Amravati GA / Loni / Nala /Drain/River / Pay – Sub / 2024 Dt.06/09/2024

----000----

M/s Adani Total Gas Limited vide Letter under reference 1 has submitted the proposal for laying of 12" dia steel pipeline to steup a Gas Distribution Network in Amravati City and surrounding area in Dist.Amravati Pipeline across to various River/ Nala along the pipeline route in Amravati district.

In the view of above,a joint site visit was conducted on 29/06/2024 with Representative of Adani Total Gas Limited and Sub Divisional Officer,Amravati Irrigation Sub.Dn.No.4 Kurha Dhamangaon Railway at the location of crossing mentioned below.

Sr.No..	Description	ATGL Pipe line Ch. In Km	Location of Crossing
1	Across to Nalla	1/940.59	Near Bori Village
2	Across to Nalla	3/508.81	Near Rajura Village
3	Across to Nalla	4/488.38	Near Rajura Village
4	Across to Nalla	6/924.87	Near Togalabad Village
5	Across to Nalla	7/308.06	Near Togalabad Village
6	Across to Nalla	12/760.03	Near Yenas Village
7	Across to Nalla	12/855.36	Near Yenas Village
8	Across to Nalla	13/431.94	Near Nandgaon Village
9	Across to Nalla	16/866.43	Near Nandgaon Village
10	Across to Nalla	18/447.85	Near Nandgaon Village
11	Across to Nalla	20/431.86	Near Shirpur Village
12	Across to Jallu River	21/611.95	Near Sawanga Village

13	Across to Nalla	23/494.17	Near Dhanora Gurav Village
14	Across to Nalla	26/964.09	Near Maholi Chor Village
15	Across to Nalla	27/667.98	Near Maholi Chor Village
16	Across to Nalla	27/983.76	Near Maholi Chor Village
17	Across to Jallu River	29/333.12	Near Maholi Chor Village
18	Across to Nalla	29/892.68	Near Maholi Chor Village
19	Across to Nalla	30/817.10	Near Maholi Chor Village
20	Across to Kondeshwar Nalla	31/500.27	Near Jasapur Village
21	Across to Nalla	34/077.22	Near Januna Village
22	Across to Nalla	35/422.32	Near Januna Village
23	Across to Nalla	35/893.04	Near Januna Village
24	Across to Nalla	37/650.50	Near Jalu Village
25	Across to Nalla	39/916.50	Near Dabha Gaon Village
26	Across to Nalla	40/277.95	Near Dabha Village
27	Across to Nalla	41/360.28	Near Nai Basti ,Badnera
28	Across to Minor Drain	41/682.52	Near Krupa Colony,Badnera
29	Across to Major Drain	42/200.50	Near Nai Basti ,Badnera
30	Across to Nalla	46/336.48	Near Almas Gate , Badnera
31	Across to Nalla	50/393.55	Near Balaji Mangal Karyalaya Amravati
32	Across to Bhuteshwar Nalla	51/444.90	Near Kaloti Nagar ,Amravati
33	Across to Nalla	51/467.02	Near Kaloti Nagar ,Amravati
34	Across to Nalla	53/044.94	Near Shyam Nagar ,Amravati
35	Across to Nalla	55/083.29	Near Indian Army Garden ,Amravati

As per above information mentioned in letter under reference no.2 & 3,this office have no objection to above subject work subjected to this following terms and conditons.

Trems and conditions :-

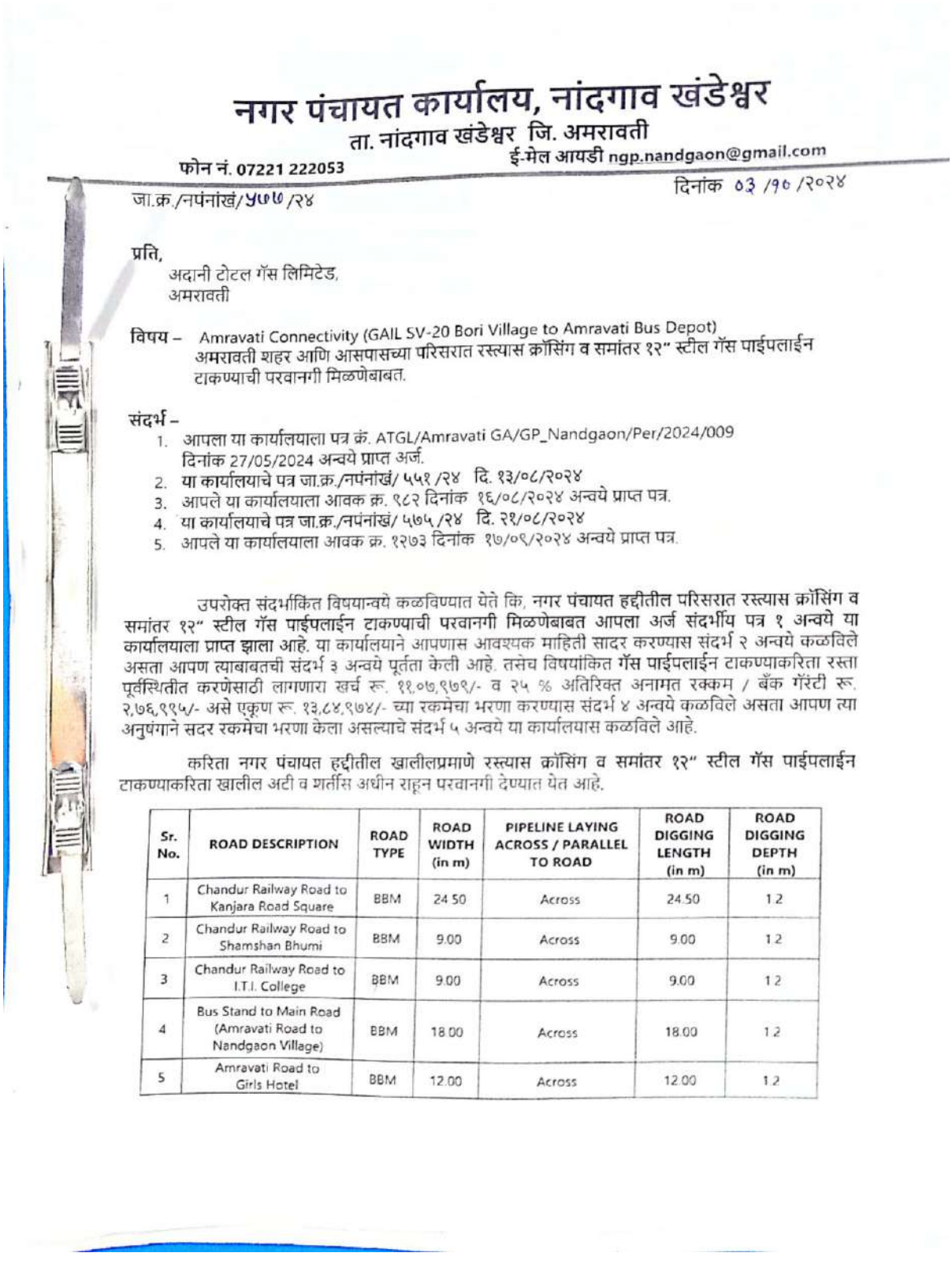
1) Above work should be carried out under the supervision of related engineer in chargeof this department.
2) The pipeline should be laid atleast 1.5 m below the scoured bed level /existing bed level whichever is more of the above said Rivers.
3) During /after completion of work natural flow/functioning of river and canal should not be obstructed ,canal cross section should be restored as per design
4) The Water Resources Department will not be held responsible for any loss of life and property if any accident occurs due to laying of gas pipeline
5) In case of any complaint or court matter,this office will not be held responsible.

Executive Engineer,
Amravati Irrigation Division,
Amravati.

Copy,

Sub Divisional Engineer, Amravati Irrigation Sub Division No.4 Kurha (HQ- Dhamangaon old) for information and keep watch during execution.

Annexure 4: Permission Letter /NOC issued by the Nagar Panchayat Office, Nandgaon Khandeshwar, granting approval for road crossings



नगर पंचायत कार्यालय, नांदगाव खंडेश्वर

ता. नांदगाव खंडेश्वर जि. अमरावती

फोन नं. 07221 222053 ई-मेल आयडी ngp.nandgaon@gmail.com

जा.क्र./नपंनांखं/५७७/२४ दिनांक ०३/१०/२०२४

प्रति,
अदानी टोटल गॅस लिमिटेड,
अमरावती

विषय – Amravati Connectivity (GAIL SV-20 Bori Village to Amravati Bus Depot)
अमरावती शहर आणि आसपासच्या परिसरात रस्त्यास क्रॉसिंग व समांतर १२" स्टील गॅस पाईपलाईन टाकण्याची परवानगी मिळणेबाबत.

संदर्भ –
1. आपला या कार्यालयाला पत्र क्रं. ATGL/Amravati GA/GP_Nandgaon/Per/2024/009 दिनांक 27/05/2024 अन्वये प्राप्त अर्ज.
2. या कार्यालयाचे पत्र जा.क्र./नपंनांखं/ ५५१ /२४ दि. १३/०८/२०२४
3. आपले या कार्यालयाला आवक क्र. ९८२ दिनांक १६/०८/२०२४ अन्वये प्राप्त पत्र.
4. या कार्यालयाचे पत्र जा.क्र./नपंनांखं/ ५७५ /२४ दि. २१/०८/२०२४
5. आपले या कार्यालयाला आवक क्र. १२७३ दिनांक १७/०९/२०२४ अन्वये प्राप्त पत्र.

उपरोक्त संदर्भांकित विषयान्वये कळविण्यात येते कि, नगर पंचायत हद्दीतील परिसरात रस्त्यास क्रॉसिंग व समांतर १२" स्टील गॅस पाईपलाईन टाकण्याची परवानगी मिळणेबाबत आपला अर्ज संदर्भीय पत्र १ अन्वये या कार्यालयाला प्राप्त झाला आहे. या कार्यालयाने आपणास आवश्यक माहिती सादर करण्यास संदर्भ २ अन्वये कळविले असता आपण त्याबाबतची संदर्भ ३ अन्वये पूर्तता केली आहे. तसेच विषयांकित गॅस पाईपलाईन टाकण्याकरिता रस्ता पूर्वस्थितीत करणेसाठी लागणारा खर्च रू. ११,०७,९७९/- व २५ % अतिरिक्त अनामत रक्कम / बँक गॅरंटी रू. २,७६,९९५/- असे एकूण रू. १३,८४,९७४/- च्या रकमेचा भरणा करण्यास संदर्भ ४ अन्वये कळविले असता आपण त्या अनुषंगाने सदर रकमेचा भरणा केला असल्याचे संदर्भ ५ अन्वये या कार्यालयास कळविले आहे.

करिता नगर पंचायत हद्दीतील खालीलप्रमाणे रस्त्यास क्रॉसिंग व समांतर १२" स्टील गॅस पाईपलाईन टाकण्याकरिता खालील अटी व शर्तीस अधीन राहून परवानगी देण्यात येत आहे.

Sr. No.	ROAD DESCRIPTION	ROAD TYPE	ROAD WIDTH (in m)	PIPELINE LAYING ACROSS / PARALLEL TO ROAD	ROAD DIGGING LENGTH (in m)	ROAD DIGGING DEPTH (in m)
1	Chandur Railway Road to Kanjara Road Square	BBM	24.50	Across	24.50	1.2
2	Chandur Railway Road to Shamshan Bhumi	BBM	9.00	Across	9.00	1.2
3	Chandur Railway Road to I.T.I. College	BBM	9.00	Across	9.00	1.2
4	Bus Stand to Main Road (Amravati Road to Nandgaon Village)	BBM	18.00	Across	18.00	1.2
5	Amravati Road to Girls Hotel	BBM	12.00	Across	12.00	1.2

6	Chandur Railway Road (Karim Kacchi) to Chandpura	CC	6.50	Across	6.50	1.2
		WBM	2.50		2.50	1.2
7	Chandur Railway Road (Urdu School) to Jawed Godown	CC	8.50	Across	8.50	1.2
		WBM	1.50		1.50	1.2
8	Chandur Railway Road (opposite of Lakhani Collection) to Nandgaon	CC	20.50	Across	20.50	1.2
9	Bus Stand to CBI Bank (Amravati Road to Nandgaon Village)	CC	9.00	Across	9.00	1.2
10	Amravati Road to Gawaripura	CC	9.00	Across	9.00	1.2
11	Amravati Road to Matangpura	CC	9.00	Across	9.00	1.2

-: अटी व शर्ती :-

१. गॅस पाईपलाईन टाकण्यापूर्वी या कार्यालयाचे नगर अभियंता व पाणी पुरवठा व विदयुत विभागातील संबंधित अधिकाऱ्यासोबत स्थळ निरीक्षण करून त्यांचे सुचनेनुसार काम करावे. व त्यांचे देखरेखीखाली संपूर्ण काम करण्यात यावे.

२. गॅस पाईपलाईन टाकतांना कोणत्याही पाण्याच्या पाईपलाईन व इलेक्ट्रिक केबलचे व टेलिफोन केबलचे व अन्य कोणत्याही प्रकारचे नुकसान झाल्यास त्याची सर्वस्वी जबाबदारी नुकसान भरपाईसह आपली राहील.

३. गॅस पाईपलाईन टाकतेवेळी कोणत्याही प्रकारची वित्तहानी व जीवितहानी झाल्यास त्यास आपण सर्वस्वी जबाबदार राहाल त्यास ही नगर पालिका जबाबदार राहणार नाही याची नोंद घ्यावी.

४. गॅस पाईपलाईन टाकण्याकरिता शासनाने निर्गमित केलेले सर्व शासन परिपत्रकान्वये अटी व शर्ती लागू असणार आहे व त्यापूर्ण न केल्यास सदर नाहरकत / परवाना रद्द समजण्यात येईल.

५. गॅस पाईपलाईन टाकतांना नागरिकांच्या तक्रारीमुळे किंवा इतर कुठल्याही कारणामुळे न्यायालयात अथवा कोणत्याही प्राधिकरणात काही वाद उद्भवल्यास त्या मधील संबंधित न्यायालयाच्या / प्राधिकरणाच्या निर्णयास अनुसरून कार्यवाही करण्याची संपूर्ण जबाबदारी अर्जदाराची राहील. त्यास ही नगर पालिका जबाबदार राहणार नाही याची नोंद घ्यावी.

६. गॅस पाईपलाईन टाकतांना वाहतुकीस कोणत्याही प्रकारचा अडथळा होणार नाही याची दक्षता घ्यावी.

७. गॅस पाईपलाईन टाकतांना रोड व नाली बांधकामाचे नुकसान झाल्यास ते आपणास पूर्वीप्रमाणे करून द्यावे लागेल.

८. कोणत्याही परिस्थितीत सदरची परवानगी रद्द करण्याचे अधिकार मा. मुख्याधिकारी, नगर परिषद, धामणगाव रेल्वे यांना राहील.

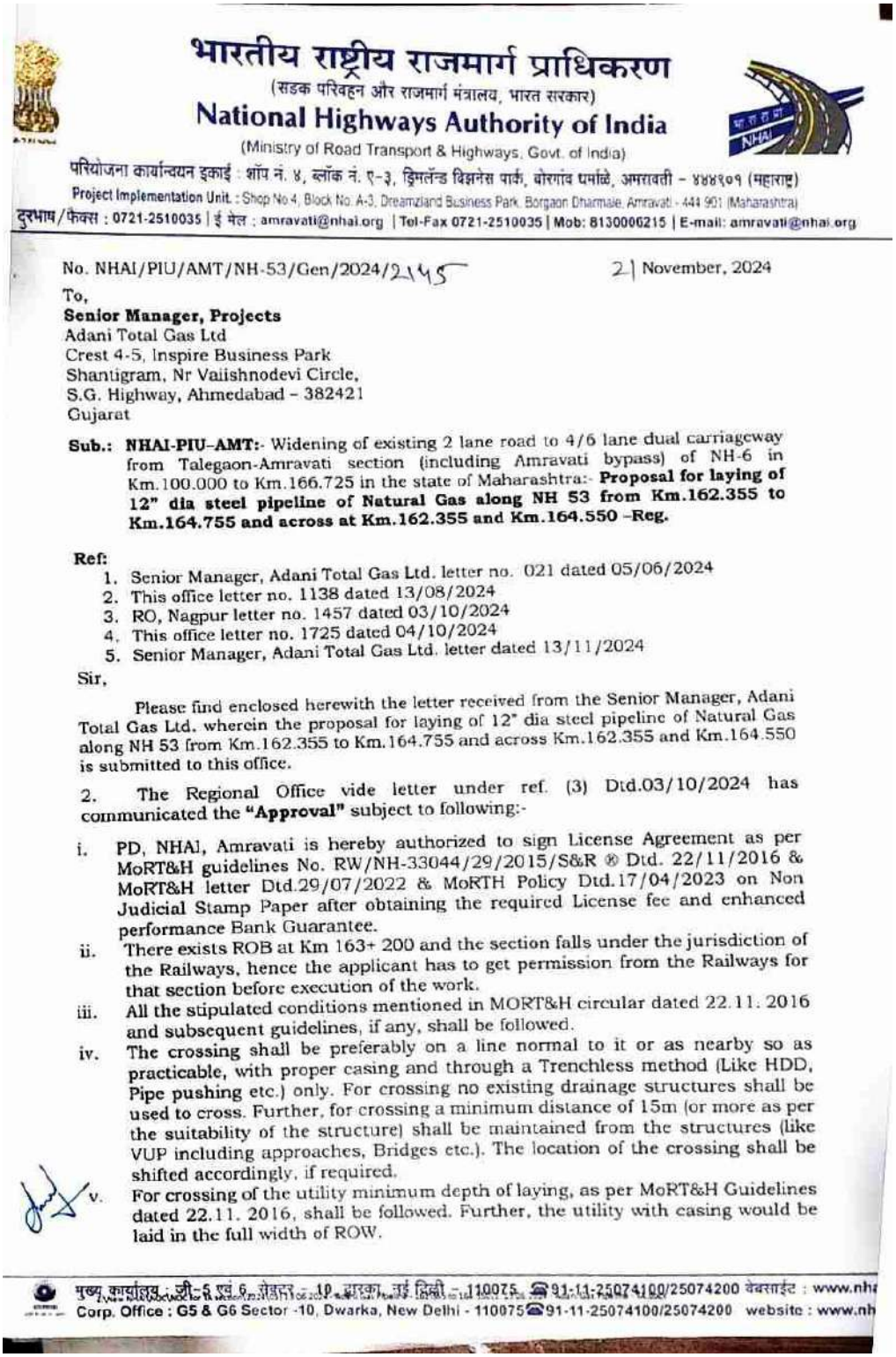
९. गॅस पाईपलाईन टाकण्याचे काम ही परवानगी आपणास प्राप्त झाल्यापासून ०६ महिन्याचे आत पूर्ण करून द्यावे लागेल. परंतु काही कारणास्तव सदरचे काम ६ महिन्याचे आत पूर्ण न झाल्यास नुतनीकरण परवानगी घेणे आपणावर बंधनकारक राहील. तसे न झाल्यास व नागरिकांची असुविधा होत असल्यास रु. ३०००/- प्रति दिवस दंड आकारण्यात येईल.

१०. गॅस पाईपलाईन टाकण्याचे काम पूर्ण झाल्यानंतर या कार्यालयास कळवावे

नगर पंचायत नांदगाव खंडेश्वर

मुख्याधिकारी
नगर पंचायत नादगाव खंडेश्वर

Annexure 5: Permission from NHAI for NH-53 for the laying of a 12" diameter steel natural gas pipeline by Adani Total Gas Ltd.



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)
National Highways Authority of India
(Ministry of Road Transport & Highways, Govt. of India)
परियोजना कार्यान्वयन इकाई : शॉप नं. ४, ब्लॉक नं. ए-३, ड्रिमलॅन्ड बिझनेस पार्क, बोरगांव धर्माळे, अमरावती - ४४४९०१ (महाराष्ट्र)
Project Implementation Unit : Shop No 4, Block No. A-3, Dreamzland Business Park, Borgaon Dharmale, Amravati - 444 901 (Maharashtra)
दुरभाष/फैक्स : 0721-2510035 | ई मेल : amravati@nhai.org | Tel-Fax 0721-2510035 | Mob: 8130006215 | E-mail: amravati@nhai.org

No. NHAI/PIU/AMT/NH-53/Gen/2024/2145 — 21 November, 2024

To,
Senior Manager, Projects
Adani Total Gas Ltd
Crest 4-5, Inspire Business Park
Shantigram, Nr Vaishnodevi Circle,
S.G. Highway, Ahmedabad – 382421
Gujarat

Sub.: NHAI-PIU-AMT:- Widening of existing 2 lane road to 4/6 lane dual carriageway from Talegaon-Amravati section (including Amravati bypass) of NH-6 in Km.100.000 to Km.166.725 in the state of Maharashtra:- **Proposal for laying of 12" dia steel pipeline of Natural Gas along NH 53 from Km.162.355 to Km.164.755 and across at Km.162.355 and Km.164.550 –Reg.**

Ref:
1. Senior Manager, Adani Total Gas Ltd. letter no. 021 dated 05/06/2024
2. This office letter no. 1138 dated 13/08/2024
3. RO, Nagpur letter no. 1457 dated 03/10/2024
4. This office letter no. 1725 dated 04/10/2024
5. Senior Manager, Adani Total Gas Ltd. letter dated 13/11/2024

Sir,

Please find enclosed herewith the letter received from the Senior Manager, Adani Total Gas Ltd. wherein the proposal for laying of 12" dia steel pipeline of Natural Gas along NH 53 from Km.162.355 to Km.164.755 and across Km.162.355 and Km.164.550 is submitted to this office.

2. The Regional Office vide letter under ref. (3) Dtd.03/10/2024 has communicated the **"Approval"** subject to following:-

i. PD, NHAI, Amravati is hereby authorized to sign License Agreement as per MoRT&H guidelines No. RW/NH-33044/29/2015/S&R ® Dtd. 22/11/2016 & MoRT&H letter Dtd.29/07/2022 & MoRTH Policy Dtd.17/04/2023 on Non Judicial Stamp Paper after obtaining the required License fee and enhanced performance Bank Guarantee.

ii. There exists ROB at Km 163+ 200 and the section falls under the jurisdiction of the Railways, hence the applicant has to get permission from the Railways for that section before execution of the work.

iii. All the stipulated conditions mentioned in MORT&H circular dated 22.11. 2016 and subsequent guidelines, if any, shall be followed.

iv. The crossing shall be preferably on a line normal to it or as nearby so as practicable, with proper casing and through a Trenchless method (Like HDD, Pipe pushing etc.) only. For crossing no existing drainage structures shall be used to cross. Further, for crossing a minimum distance of 15m (or more as per the suitability of the structure) shall be maintained from the structures (like VUP including approaches, Bridges etc.). The location of the crossing shall be shifted accordingly, if required.

v. For crossing of the utility minimum depth of laying, as per MoRT&H Guidelines dated 22.11. 2016, shall be followed. Further, the utility with casing would be laid in the full width of ROW.

मुख्य कार्यालय : जी-5 एवं 6, सेक्टर - 10, द्वारका, नई दिल्ली - 110075, ☎91-11-25074100/25074200 वेबसाईट : www.nha
Corp. Office : G5 & G6 Sector -10, Dwarka, New Delhi - 110075 ☎91-11-25074100/25074200 website : www.nh

vi. For along laying the laying of the Utility Shall be done at the extreme edge of the ROW and within Utility Corridor only.

vii. All the conditions mentioned in IE letter no. 352, dated 01.08.2024 shall be followed.

viii. This initial permission would be valid for a period of 5 years, which can thereafter be considered for renewal. On payment of additional fee at the time of renewal, the permission shall automatically be renewed, unless defaults exist. In case of renewal, rate prevailing at the time of renewal shall be charged. Delay in deposition of fee shall attract interest @ 15% per annum compounded annually.

ix. The safety of NH users shall be ensured during the execution of work shall be responsibility of the licensee.

x. Permission is granted on the condition that the applicant shall ensure safety of any other utility services of any authority

xi. All other statutory permission, if any, form other agencies shall be obtained by the applicant before execution of the aforesaid work.

xii. The utility agency shall ensure not to damage any assets of NHAI including avenue and median plantation. In case of damage, it should be restored by the License.

xiii. The utility agency shall inform the NHAI/Concessionaire/Consultant of stretch prior commencement of the said work.

xiv. Licensee will be informed that he will not make any legal contractual or other financial claim to NHAI for whatsoever loss/damage of the underground cable or company.

xv. The restoration work, if any, must be executed by concerned agency and the cost for same shall be borne by utility owning agency/Licensee, the undertaking for which has been given.

xvi. Utility Services shall be made operational by the Licensee only after completion certification is issued by Highway Administration.

xvii. The terms and conditions as per License Agreement and Undertakings shall also be applicable.

Thanking you,

Yours sincerely,

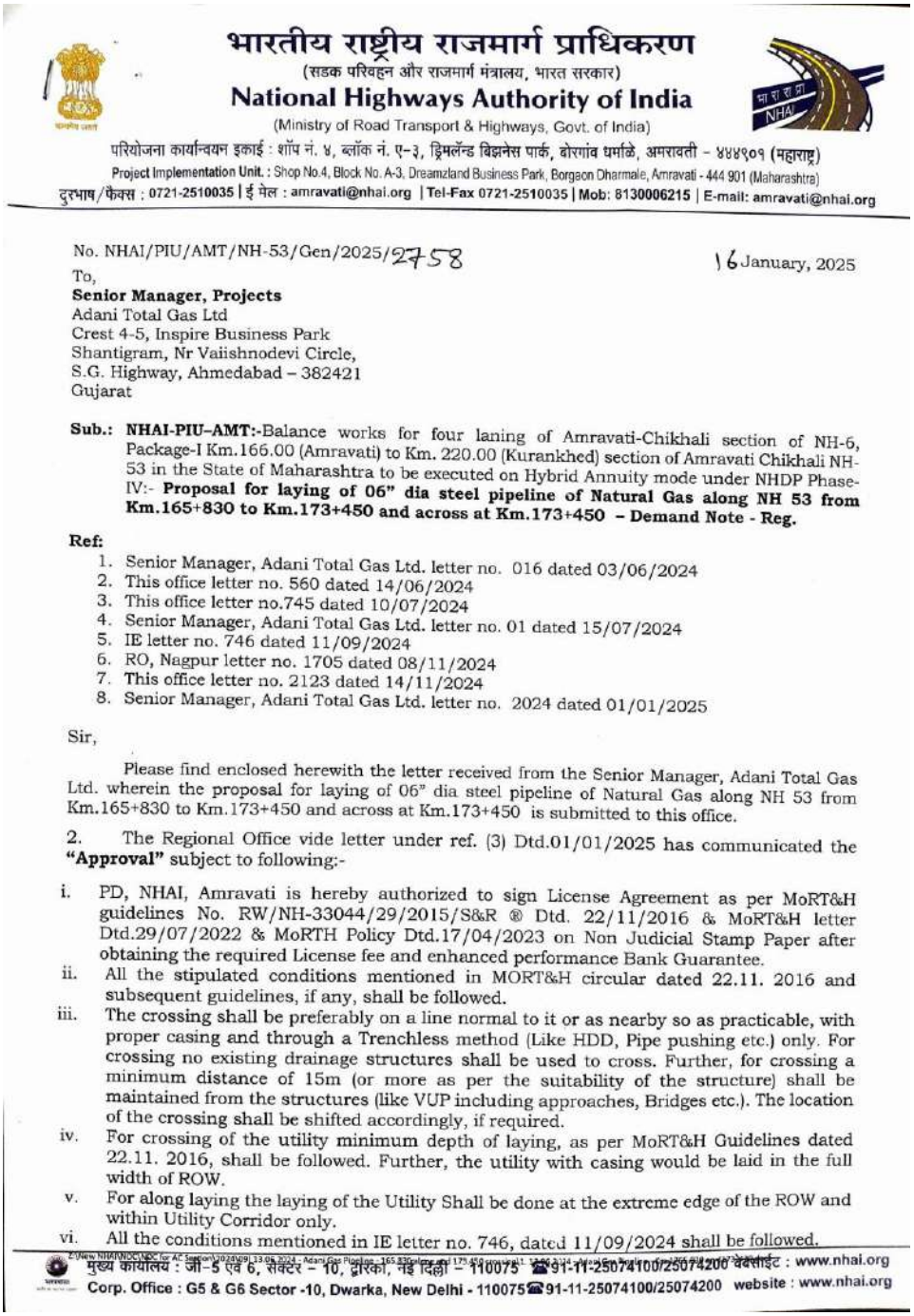
Encl:- As above

(श्रीकांत वी. ढगे)
उप- महाप्रबंधक (तकनीकी) एवं
परियोजना निदेशक

Copy to:-

1) M/s IRB Talegaon Amravati – For information please.
2) The Authorized Signatory, M/s MSV International Inc in Association with M/s. Sterling Indo Tech Consultants (P) Ltd. for information please.

Annexure 6: Permission from NHAI for NH-53 for laying a 06" diameter steel natural gas pipeline by Adani Total Gas Ltd



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सडक परिवहन और राजमार्ग मंत्रालय, भारत सरकार)
National Highways Authority of India
(Ministry of Road Transport & Highways, Govt. of India)
परियोजना कार्यान्वयन इकाई : शॉप नं. ४, ब्लॉक नं. ए-३, ड्रिमलॅन्ड बिझनेस पार्क, बोरगांव धर्माळे, अमरावती - ४४४९०१ (महाराष्ट्र)
Project Implementation Unit. : Shop No.4, Block No. A-3, Dreamzland Business Park, Borgaon Dharmale, Amravati - 444 901 (Maharashtra)
दुरभाष/फैक्स : 0721-2510035 | ई मेल : amravati@nhai.org | Tel-Fax 0721-2510035 | Mob: 8130006215 | E-mail: amravati@nhai.org

No. NHAI/PIU/AMT/NH-53/Gen/2025/2758 16 January, 2025

To,
Senior Manager, Projects
Adani Total Gas Ltd
Crest 4-5, Inspire Business Park
Shantigram, Nr Vaiishnodevi Circle,
S.G. Highway, Ahmedabad – 382421
Gujarat

Sub.: **NHAI-PIU-AMT:**-Balance works for four laning of Amravati-Chikhali section of NH-6, Package-I Km.166.00 (Amravati) to Km. 220.00 (Kurankhed) section of Amravati Chikhali NH-53 in the State of Maharashtra to be executed on Hybrid Annuity mode under NHDP Phase-IV:- **Proposal for laying of 06" dia steel pipeline of Natural Gas along NH 53 from Km.165+830 to Km.173+450 and across at Km.173+450 – Demand Note - Reg.**

Ref:
1. Senior Manager, Adani Total Gas Ltd. letter no. 016 dated 03/06/2024
2. This office letter no. 560 dated 14/06/2024
3. This office letter no.745 dated 10/07/2024
4. Senior Manager, Adani Total Gas Ltd. letter no. 01 dated 15/07/2024
5. IE letter no. 746 dated 11/09/2024
6. RO, Nagpur letter no. 1705 dated 08/11/2024
7. This office letter no. 2123 dated 14/11/2024
8. Senior Manager, Adani Total Gas Ltd. letter no. 2024 dated 01/01/2025

Sir,

Please find enclosed herewith the letter received from the Senior Manager, Adani Total Gas Ltd. wherein the proposal for laying of 06" dia steel pipeline of Natural Gas along NH 53 from Km.165+830 to Km.173+450 and across at Km.173+450 is submitted to this office.

2. The Regional Office vide letter under ref. (3) Dtd.01/01/2025 has communicated the **"Approval"** subject to following:-

i. PD, NHAI, Amravati is hereby authorized to sign License Agreement as per MoRT&H guidelines No. RW/NH-33044/29/2015/S&R ® Dtd. 22/11/2016 & MoRT&H letter Dtd.29/07/2022 & MoRTH Policy Dtd.17/04/2023 on Non Judicial Stamp Paper after obtaining the required License fee and enhanced performance Bank Guarantee.
ii. All the stipulated conditions mentioned in MORT&H circular dated 22.11. 2016 and subsequent guidelines, if any, shall be followed.
iii. The crossing shall be preferably on a line normal to it or as nearby so as practicable, with proper casing and through a Trenchless method (Like HDD, Pipe pushing etc.) only. For crossing no existing drainage structures shall be used to cross. Further, for crossing a minimum distance of 15m (or more as per the suitability of the structure) shall be maintained from the structures (like VUP including approaches, Bridges etc.). The location of the crossing shall be shifted accordingly, if required.
iv. For crossing of the utility minimum depth of laying, as per MoRT&H Guidelines dated 22.11. 2016, shall be followed. Further, the utility with casing would be laid in the full width of ROW.
v. For along laying the laying of the Utility Shall be done at the extreme edge of the ROW and within Utility Corridor only.
vi. All the conditions mentioned in IE letter no. 746, dated 11/09/2024 shall be followed.

मुख्य कार्यालय : जी-5 एवं 6, सेक्टर - 10, द्वारका, नई दिल्ली - 110075 ☎91-11-25074100/25074200 वेबसाईट : www.nhai.org
Corp. Office : G5 & G6 Sector -10, Dwarka, New Delhi - 110075 ☎91-11-25074100/25074200 website : www.nhai.org

Annexure 7: Baseline Monitoring Results

SHRI OM TESTING & RESEARCH LABORATORY

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GSTIN: 09ADHFS2444J1ZS

N.A.B.L. Accredited, ISO 9001, ISO 14001 & ISO 45001 Certified Laboratory.

TEST REPORT

Report No: STRLA- 1807202503-01 Issue Date. 18.07.2025

Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Amravati GA, Maharashtra, India

RESULTS
(Ambient Air Quality Analysis)

SAMPLING DETAILS

Sample Identification No	:	STRL 1007202501
Sample Description	:	Ambient Air
Sample Collection by	:	STRL Staff
Sampling Method	:	STRL/LAB/AIR/STP/01
Sampling Duration	:	24 Hours
Flow Rate of Gases	:	1.0 LPM
Sample Condition	:	OK
Analysis Duration	:	11.07.2025 to 17.07.2025

S. No.	Parameters	Unit	AAQ-01 At Junctions of SH-06 and NH-53, Near Ch-42 20°50'40.24"N 77°43'48.49"E	AAQ-02 Near Amravati Bus Stand, Near Ch-54 20°55'47.43"N 77°45'55.53"E	AAQ-03 Near Lori Village Near Ch-8.462 20°47'21.33"N 77°40'56.00"E	AAQ-04 Nandgaon Village, At Ch-16 20°40'52.23"N 77°49'59.34"E	NAAQ Standards
1.	Particulate Matter (PM-10)	µg/m³	66.8	62.2	61.8	63.2	100
2.	Particulate Matter (PM-2.5)	µg/m³	13.2	13.8	14.1	13.9	60
3.	Sulphur Dioxide (SO_2)	µg/m³	6.12	6.47	6.87	6.67	80
4.	Nitrogen Dioxide (NO_2)	µg/m³	12.1	11.7	13.5	12.7	80
5.	Ozone (O_3) -8Hr.	µg/m³	12.8	11.9	13.6	13.2	100
6.	Lead (Pb)	µg/m³	<1.0	<1.0	<1.0	<1.0	1.0
7.	Carbon Mono Oxide (CO)-1.0 Hr.	mg/m³	0.824	0.812	0.820	0.805	4.0
8.	Ammonia (NH_3)	µg/m³	< 10	< 10	< 10	< 10	400
9.	Arsenic (As)	ng/m³	<1.0	<1.0	<1.0	<1.0	6
10.	Nickel (Ni)	ng/m³	<1.0	<1.0	<1.0	<1.0	20

End of Report (Page No 01 of 01)

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Ravinder Kumar Sha
Technical Manag

Authorised Signatory
(Name, Designation & Signature with Seal)

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GSTIN: 09ADHFS2444J1ZS

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TEST REPORT

Report No: STRLN- 1807202503-02 Issue Date. 18.07.2025

Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Amravati GA, Maharashtra, India

RESULTS
(AMBIENT NOISE QUALITY ANALYSIS)

SAMPLING DETAILS

Sample Identification No	:	STRL 1007202502
Sample Description	:	**Ambient Noise**
Sample Collection by	:	**STRL Staff**
Sampling Method	:	**IS- 9989: 1981**
Sampling Duration	:	**24 Hours**
Sample Condition	:	**OK**
Analysis Duration	:	11.07.2025 to 17.07.2025

Sl. No.	Location	Location Code	Results in Db(A) Leq	
			Average Day Noise Level	Average Night Noise Level
1	ANQ-01 At Junctions of SH-06 and NH-53 near Ch-42 20°50'40.24"N 77°43'48.49"E	ANQ-01	48.2	39.8
2	ANQ-02 Near Amravati Bus Stand (Near Ch-54) 20°55'47.43"N 77°45'55.53"E	ANQ-02	50.9	38.8
3	ANQ-03 Near Lori Village Near Ch-8.462 20°47'21.33"N 77°40'56.00"E	ANQ-03	54.1	40.4
4	ANQ-04 Nandgaon Village, At Ch-16 20°40'52.23"N 77°49'59.34"E	ANQ-04	49.4	42.1

Limit for A Per CPCB Guidelines; Leq, dB (A)

Sl. No.	Zone	Day Time (6.00 AM to 10.00 PM)	Nighttime (10.00 PM to 6.00 AM)
1	Residential area	55	45
2	Commercial area	65	55
3	Industrial area	75	70
4	Silence area	50	40

* Day Time	6.00 a.m. to 10.00 p.m	**Night Time	10.00 p.m. to 6.00 a.m

** END OF REPORT**

Shri Om Testing & Research Labo
Ravinder Kumar Sh
Technical Mana
Authorised Signatory
(Name, Designation & Signature with Seal)

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GSTIN: 09ADHFS2444J1ZS

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TEST REPORT

Report No: STRLGW- 1807202503-03 **Issue Date. 18.07.2025**

Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Amravati GA, Maharashtra, India

RESULTS
(WATER QUALITY ANALYSIS)

SAMPLE DETAILS

Sample Identification No	:	STRL 1007202503
Sample Description	:	Ground Water
Sample Collection by	:	STRL Staff
Sampling Method	:	IS-3025(P-1)1987
Date of Sampling	:	10.07.2025
Sample Quantity	:	5L+500 ml
Sample Condition	:	OK
Analysis Duration	:	11.07.2025 to 17.07.2025

S. No.	Parameters	Limits (as per IS:10500-2012)		Results GW-01 At Junctions of SH-06 and NH-53 near Ch-42 20°50'40.24"N 77°43'48.49"E	Results GW-02 Nandgaon Village, At Ch-16 20°40'52.23"N 77°49'59.34"E	Test Methods
		Desirable Limit	Permissible Limit			
1	Color	--	--	0.1	0.1	IS : 3025(Pt-4) 1983, Reaff. 2017
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	IS : 3025(Pt-5) 1983, Reaff. 2017
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	IS : 3025(Pt-8)-1984, Reaff. 2017
4	Temperature	-	-	23.2	20.4	IS: 3025(Pt-9)1984 Reaff 2002
5	pH	6.5-8.5	No Relaxation	7.11	7.12	IS : 3025(Pt-11)1983, Reaff. 2017
6	Electric Conductivity	-	-	808	935	IS : 3025 (Pt-14)-2013
7	Total Hardness (as $CaCO_3$)	200	600	256.8	323.8	IS : 3025(Pt-21)1983, Reaff. 2014
8	Iron (as Fe)	0.3	No Relaxation	0.10	0.10	APHA 22nd Ed., 3120B (3111B (AAS),
9	Chlorides (as Cl)	250	1000	187.2	123.8	IS : 3025(Pt-32)1988, Reaff. 2014
10	Fluoride (as F)	1	1.5	< 0.5	< 0.5	APHA 22nd Ed., 4500F(D)
11	TDS	500	2000	671	659	IS: 3025(Pt-16)1984, Reaff. 2017
12	Calcium (as Ca^{2+})	75	200	48.9	56.6	IS :3025(Pt-40)1991, Reaff. 2014
13	Magnesium (as Mg^{2+})	30	100		47.8	APHA 22nd Ed., 3500-Mg (B)
14	Sulphate (as SO_4)	200	400	36.2	36.8	IS : 3025(Pt-24)1986, Reaff. 2014
15	Nitrate(as NO_3)	45	No Relaxation	26.1	25.0	IS : 3025(Pt-34)1988, Reaff. 2014
16	Alkalinity (as $CaCO_3$	200	600	312.1	318.8	IS: 3025(Pt-23)1986, Reaff. 2014
	Bacteriological Parameters					
1	Total Coli form	MPN/100ml	Shall Not Be Detectable	Not Detected (<2)	Not Detected (<2)	IS : 1622-1981 (Reaff.2003)
2	E.coli	E.coli/100ml	Shall Not Be Detectable	Absent	Absent	IS : 1622-1981 (Reaff-2003)

*END OF REPORT *** Page (01 of 01)

Shri Om Testing & Research Laboratory
Ravinder Kumar Sharma
Authorised Signatory
(Name, Designation & Signature with Seal)
Technical Manager

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GSTIN: 09ADHFS2444J1ZS

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TEST REPORT

Report No: STRLSW- 1807202503-04 **Issue Date. 18.07.2025**

Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Amravati GA, Maharashtra, India

RESULTS
(WATER QUALITY ANALYSIS)

SAMPING DETAILS

Sample Identification No	:	STRL 1007202504
Sample Description	:	*Surface Water*
Sample Collection by	:	STRL Staff
Sampling Method	:	IS-3025(P-1)1987
Date of Sampling	:	10.07.2025
Sample Quantity	:	5L+500 ml
Sample Condition	:	OK
Analysis Duration	:	11.07.2025 to 17.07.2025

S.NO	Parameter	Unit	Result SW-01 Pond Near Ch-09 20°41'37.61"N 77°53'41.65"E	Result SW-02 Amba Nala, Near Ch-52 20°55'33.75"N 77°46'41.98"E
1	Turbidity	NTU	4.6	2.94
2	pH (at 25°C)	-	7.47	7.50
3	EC	µS/cm	871	910
4	Total Dissolve Solids	mg/l	410	426
5	Total Hardness as $CaCO_3$	mg/l	206	258
6	Calcium as Ca	mg/l	47.4	42.6
7	Magnesium as Mg	mg/l	20.7	26.6
8	Sodium as Na	mg/l	98.4	110.4
9	Potassium as K	mg/l	50.1	64.8
10	Chloride as Cl	mg/l	210.9	224.4
11	Sulphate as SO_4	mg/l	78.1	79.7
12	Nitrate as NO_3	mg/l	36.0	42.3
13	Total Alaklinity as $CaCO_3$	mg/l	256	268.8
14	Fluoride	mg/l	0.22	0.19

Page (01 of 02)

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TEST REPORT

Report No: STRLSW- 1807202503-04

S.NO	Parameter	Unit	Result SW-01 Pond Near Ch-09 20°41'37.61"N 77°53'41.65"E	Result SW-02 Amba Nala, Near Ch-52 20°55'33.75"N 77°46'41.98"E
15	Cyanide	mg/l	<0.05	<0.05
16	Arsenic	mg/l	<0.01	<0.01
17	Boron as B	mg/l	<0.01	<0.01
18	Cadmium as Cd	mg/l	<0.01	<0.01
19	Chromium, Total	mg/l	<0.01	<0.01
20	Copper as Cu	mg/l	<0.05	<0.05
21	Lead as Pb	mg/l	<0.05	<0.05
22	Manganese as Mn	mg/l	<0.05	<0.05
23	Mercury	mg/l	<0.01	<0.01
24	Nickel as Ni	mg/l	<0.01	<0.01
25	Selenium as Se	mg/l	<0.01	<0.01
26	Zinc	mg/l	0.013	0.022
27	Dissolved Oxygen	mg/l	5.17	5.86
28	Total Suspended Solid	mg/l	13.6	28.3
29	Total Solid	mg/l	439.2	467.8
30	Chemical Oxygen Demand as O_2	mg/l	34.6	39.8
31	BOD, 3 days @27°C as O_2	mg/l	7.4	8.24
32	Oil & Grease	mg/l	<0.01	<0.01
33	Total Coliform	MPN /100 ml	10	18

*** End of Report ***

Page (02 of 02)

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Ravinder Kumar Sha
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TEST REPORT

Report No: STRLSW- 1807202503-05 Issue Date. 18.07.2025

Issued To : M/s. **Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Amravati GA, Maharashtra, India**

RESULTS
(SOIL QUALITY ANALYSIS

SAMPLING DETAILS

Sample Identification No	:	STRLS2801202503
Sample Description	:	*Soil*
Sample Collection by	:	STRL Staff
Sampling Method	:	STRL/STP/SOIL/01
Date of Sampling	:	10.07.2025
Sample Quantity	:	5 kg
Sample Condition	:	OK
Analysis Duration	:	11.07.2025 to 17.07.2025

S.No	PARAMETERS	UNIT	RESULTS	TEST PROTOCOL
			SQ-01 At Junctions of SH-06 and NH-53, Near Ch-42 20°50'40.24"N 77°43'48.49"E	
1.	Texture		Sandy clay Loam	IS: 2720 (part-4), 1985 Reaff:2015)
2.	Sand	%	36.3	IS: 2720 (part-4), 1985,(Reaff:2015)
3.	Silt	%	17.6	IS: 2720 (part-4), 1985,(Reaff:2015)
4	Clay	%	22.5	IS: 2720 (part-4), 1985,(Reaff:2015)

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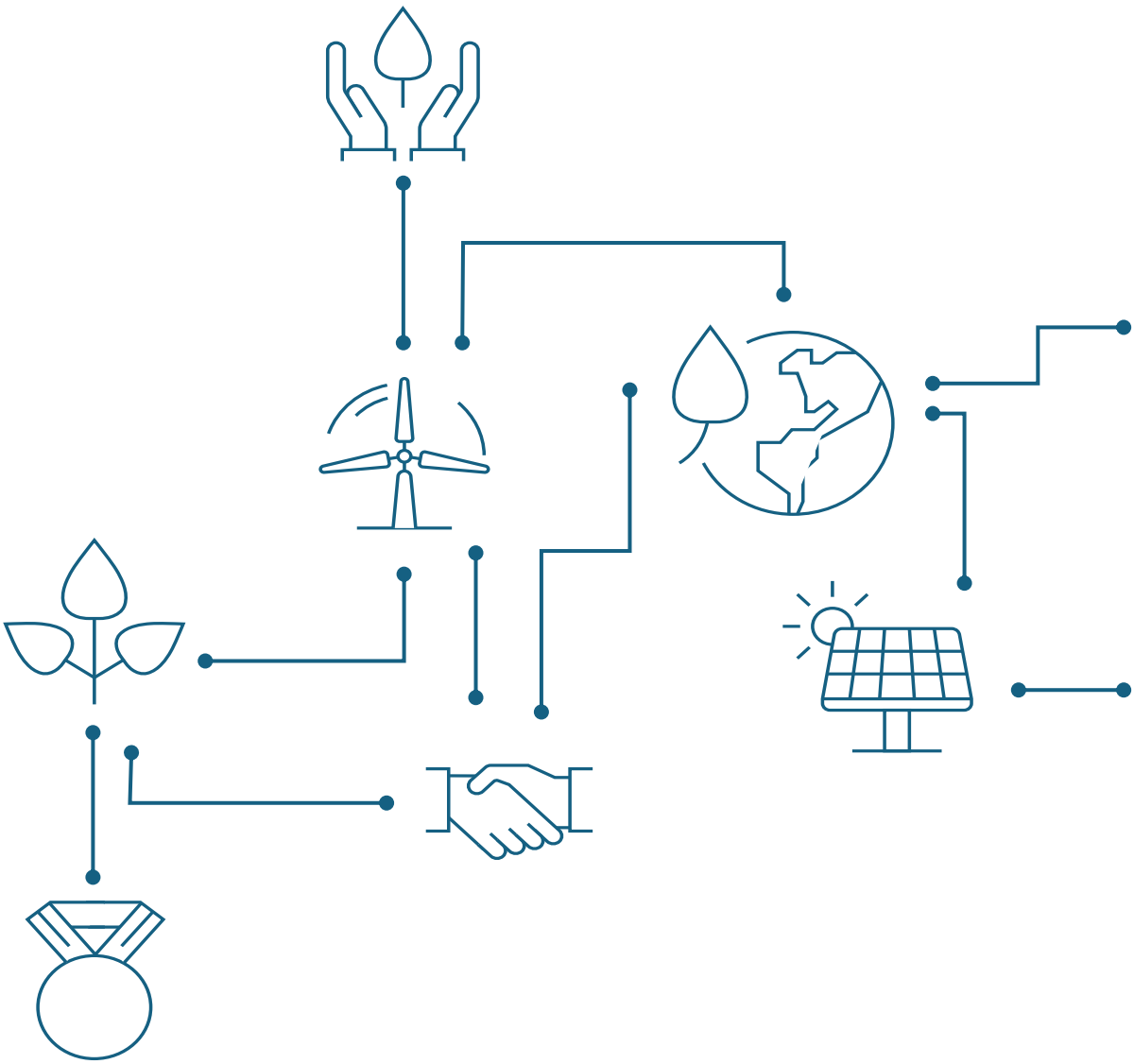
Inspire trust.



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