FINAL REPORT

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

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 "***a City Gate Distribution (CGD) of 35.459 km Natural Gas Pipeline Infrastructure***" in Bhandara Town and nearby villages of Bhandara 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 Bhandara GA in Bhandara 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 two rivers, canals, rural habitation, peri urban area and several cultivable lands.

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

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 construction of CGS and laying, building, operating or expanding the CGD of natural gas pipeline (8 inches diameter) network of 35.459 km divided in two routes Line Route 01 (L-01) is of 32.091 km from Proposed SV-27 Tudka Village to Bhandara Bus Depot and Line Route 02 (L-02) of 3.368 km from Rizvi Petrol Pump to Tamsar Bus Stand.

BASELINE ENVIRONMENTAL AND SOCIAL CONDITION

The baseline environmental and ecological conditions of the project area have been assessed for project footprint area within 05 km radius of study area and Area of Influence extending 500 m (either side) of the route. Whereas the socio-economic conditions were assessed for 20–30-meter radius of study area. The secondary baseline monitoring was conducted from **21st to 25th July 2025** and the assessment of physical environmental parameters along with the ecological, and environmental survey was conducted during the site visit from **08th July 2025**.

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

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

Permission is required for River, Canal & Drain crossings, Railway crossings and Roads such as for NH from the NHAI, for PWD Roads, and for Municipal Corporation, Gram Panchayat spread across the city. The Road, Railway crossing permissions, Canal & Drain crossing permissions are partially secured. Sensitive receptors such as cultivable land, schools, hospitals, and small shops and settlements 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 30% 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, especially considering Bhandara's flood and seismic vulnerability.

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. However, the impact on Ecology will still be moderate even after application of mitigation measures because removal of trees is involved and the impact due to this is irreversible. 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 (without mitigation 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	Minor	Moderate-beneficial
Occupational Health and Safety	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 proposed mitigation measures a separate budgetary provision has been proposed for implementation of Environmental Monitoring Plan in construction phase. The environmental monitoring cost is estimated of INR 3.73 Lakhs based upon the environmental monitoring program being considered for Construction Phase Environmental Management Plan (EMP)

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 being considered in **Table 9-7.** A budgetary provision of **INR 3.25 Lakhs** has been kept for Construction Phase Environmental Management Plan (EMP

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 domestic, industrial and 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 multiple Geographical Areas (GA) in India. Among those, **ATGL** received authorization for development of CGD for the GA: Bhandara, Gondia

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

& Gadchiroli Districts. To cater industrial, commercial and transportation demand of natural gas it has planned to develop a total of "***35.459 km Natural Gas Pipeline Infrastructure***" in Bhandara District of Maharashtra.

1.2 PROJECT BRIEF

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). With the intent of catering demand of natural gas of several industrial and commercial service sectors in, ATGL has planned to develop at total of "**a City Gate Station (CGS) and laying of 35.459 *km Natural Gas Pipeline Infrastructure in Bhandara District* "** The pipeline has been planned to be laid in two line routes, one starting from Todka Village to Bhandara Bus Depot spanning across 32.091 kms and another running from Razvi Petrol Pump to Tumsar Bus Depot in the Bhandara GA, in Bhandara District of Maharashtra, India.

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

1.4 PROJECT DEVELOPER

ATGL is a joint venture between Adani Group and Total Energies. ATGL is one of India's largest city gas distribution companies. The company specializes in the development of city gas distribution (CGD)

[22] standardtorreference.pdf

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.

1.6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) CONSULTANT

TÜV SÜD has been entrusted by **ATGL** for providing consultancy services of Environmental and Social

Impact Assessment Study (ESIA) for proposed Natural gas Pipeline project in Bhandara GA at Bhandara 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 EIA 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 TÜV SÜD 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	Environmental Description	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	Title	Description and Details
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 due to the proposed project. The environmental and ecological impacts in a study area of 05 km radius around and 500 m on both sides of the pipeline and the socio-economic impacts were assessed for 20–30-meter radius of study area. 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 baseline environmental and ecological conditions of the project area have been assessed for project footprint area within 05 km radius of study area and Area of Influence extending 500 m (either side) of the route. Whereas the socio-economic conditions were assessed for 20–30-meter radius of study area.

The broad scope of work will be undertaken by the consultant for ESIA study including 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.

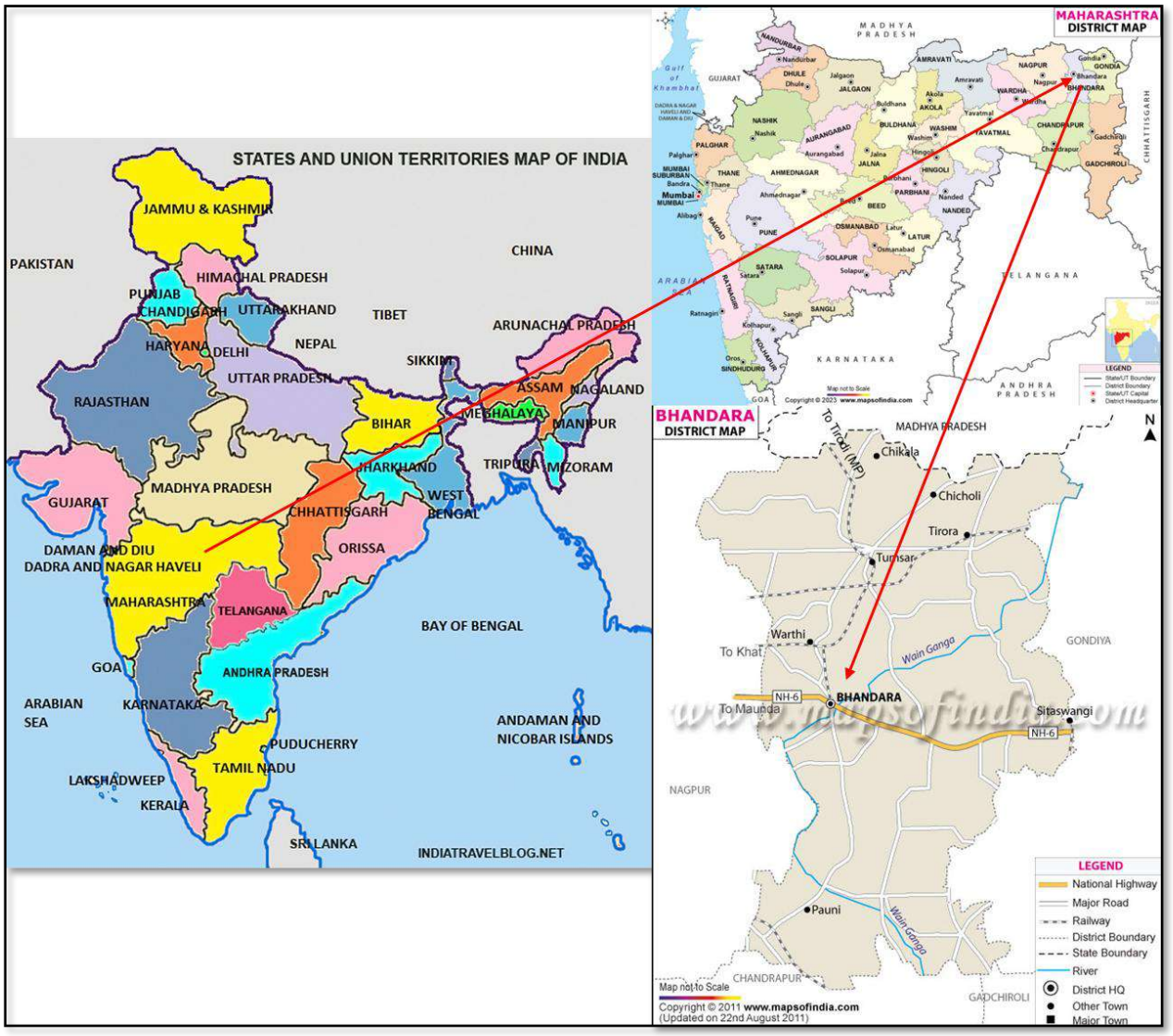
- **Environmental, Social & Biodiversity management & monitoring plan**
  - Identify and summarize all anticipated significant adverse E&S impacts along with mitigation measures.
  - Define a set of policies and objectives for environmental performance and continual enhancement of performance.
  - Monitoring 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 CGS AND NATURAL GAS PIPELINE NETWORK

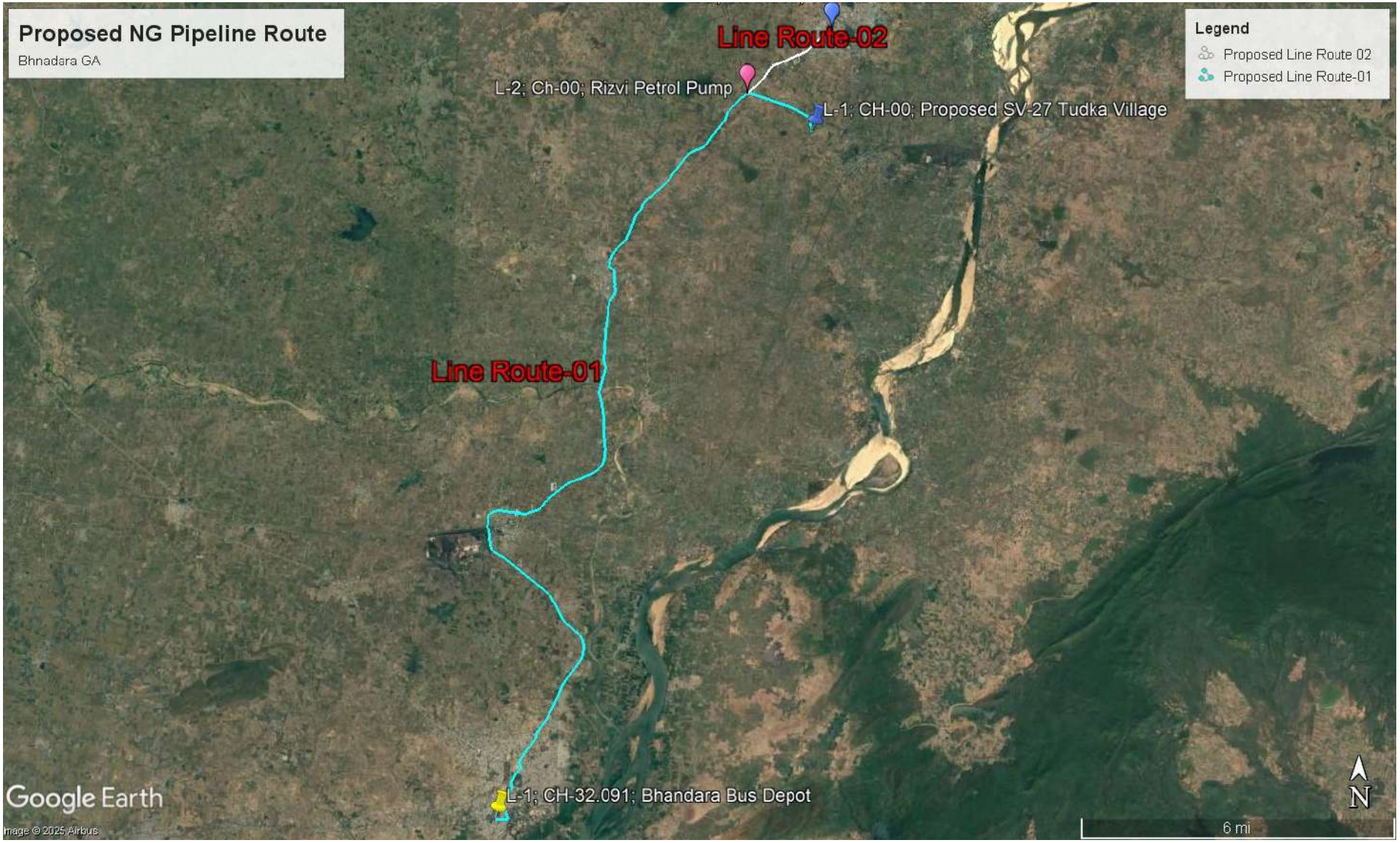
ATGL has been granted authorization for laying, building, operating or expanding the City Gas Distribution CGD Network in Bhandara GA for Domestic, Automobile, Commercial and Industrial sectors. ATGL has planned to lay Four inches (4'') and Eight inches (8") diameter natural gas pipeline network in approximately 35.459 km the pipeline route passes through the Bhandara Town and the nearby Villages. 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 and a City Gate Station (CGS). The infrastructure in the NG pipeline network will be adequate to maintain uninterrupted flow of natural gas in the Bhandara GA**. Figure 2-1** provides location map of the project area and **Figure 2-2** provides the details of the layout of the pipeline gas network.



Source: Maps of India

Figure 2-1: Location Map of Project Site



**Source: KMZ- ATGL*

Figure 2-2: Route Map of Proposed Natural Gas Pipeline Network of Bhandara GA

2.2 PIPELINE ROUTE & ACCESSIBILITY

The pipeline for the CGD that run along ROW of the Bhandara GA is sub divided in the Two (02) pipeline Routes the detail of each route is given below in **Table 2-1** and the details of all the crossings for both the proposed pipeline routes are given in the **Table 2-2.**

Table 2-1: Basic Details of the Pipeline

S. No.	Route	Length (Km)	Points	Description	Latitude	Longitude	Chainage
1	Line Route 01 (L-01)	32.091	Start Point	Proposed SV-27 Tudka Village	21°20'59.30"N	79°44'9.60"E	Ch-00
2			End Point	Bhandara Bus Depot	21° 9'26.38"N	79°38'38.99"E	Ch-32
3	Line Route 02 (L-02)	3.368	Start Point	Rizvi Petrol Pump	21°21'37.71"N	79°42'59.30"E	Ch-00
4			End Point	Tamsar Bus Stand	21°22'42.93"N	79°44'30.06"E	Ch-3.368
Total Length		**35.459**					

**Source: KMZ provided by ATGL Team*

Table 2-2: List of Crossing for both the Proposed Routes

S. No.	Crossing			Chainage		Location	Permission Status
	Type of Crossing	No. of Crossing	Description	Start	End		
Route 01; Tudka Village to Bhandara Bus Depot (32.091 Km)							
1	**Railway**	3	Southeastern Railway Main Line (Bhandara Road RS to Khat RS)	20477.05	20526.59	TP221-TP222	Permission is received and enclosed in the **Annexure 3**
			Southeastern Railway Main Line (Abandoned) (Bhandara RS to Ordnance Factory Bhandara)	23153.53	23176.41	TP246-TP247	
			Southeastern Railway Main Line (Abandoned) (Ordnance Factory Bhandara to Bhandara RS)	31954.7	31970.53	TP376-TP377	
2	**NH**	1	National Highway-247 (NH-53 to Panchala)	29695.7	29718.53	TP332-TP333	Received and enclosed in Error! R eference source not found.
3	**SH**	1	State Highway-355 (Bhandara to Tumsar) (19.88 m)	2581.31	2601.19	TP31-TP32	Permission letter is enclosed in the **Annexure 2**
4	**Other Roads**	93	-	-	-	-	
5	**Cart Track**	13	-	-	-	-	
6	**River**	2	Gaimukh Nadi (35.94 M Wide)	10995.22	11031.16	TP129-TP130	Pending

S. No.	Crossing			Chainage		Location	Permission Status
	Type of Crossing	No. of Crossing	Description	Start	End		
			Sur River (97.54 Wide)	13602.17	13699.71	IP155\1-IP55\2	
7	**Canal**	13	11 Unlined Canals and 2 lined Canals	-	-	-	
8	**Drain/Nala**	11	5 Minor Drains and 6 Nala are there	-	-	-	-
9	**H.T/Powerline**	136	-	-	-	-	-
10	**Pipeline**	1	Water Supply Pipeline	447.75	460.53	TP8-TP9	
11	**Forest**	NA	-	-	-	-	-
R-01-Total Crossings		**274**					
Route 02; Razvi Petrol Pump to Tumsar Bus Depot (3.368 Km)							
1	**NH**	1	National Highway-753 (Nagpur to Tirora) (35.32 m)	43.32	78.64	TP0-TP1	Received and enclosed in **Annexure 4**
2	**Other Roads**	21	-	-	-	-	-
3	**Cart Track**	2	-	-	-	-	-
4	**Drain/Nala**	1	-	-	-	-	-
5	**H.T/Powerline**	16	-	-	-	-	-
R-02-Total Crossings		**41**	-	-	-	-	-
Total Crossings in Both R-01 & R-02		**315**	-				-

**Source: Detailed Engineering Survey Report ATGL*

Photo Plate 2-1 provides the photographs of the site as per the primary survey conducted by the TÜV SÜD team in Bhandara City and the nearby areas where the pipeline route passes.

Photo Plate 2-1 Photographs of Site

Photo 2.1- CGS Start Point

Photo 2.2- Proposed Pipeline route Passes through Shree Ganesh High School

Photo 2.3- Proposed Pipeline Route Passes through Religious Location

Photo 2.4- Proposed Pipeline Route Passes through Natural Drain

Photo 2.5- Proposed pipeline passing through the Educational Institution

Photo 2.6- Proposed Pipeline Route Passing through Health facility

Photo 2.7- Pipeline Route Passing through Fuel Station

Photo 2.2- Proposed pipeline route passing through the area with Small Shops

Photo 2.9- Proposed Route Passing through LIC Office

Photo 2.10- Proposed Pipeline Route Passing through Religious Place

Photo 2.11- Stretch Passing through Educational Institution

Photo 2.12- Stretch Passing through Educational Institution

Photo 2.1- Road Crossing where heavy movement of traffic is observed

Photo 2.14-Proposed Pipeline Passing through Canal Crossing

Photo 2.15- Proposed Pipeline Passing through the Natural Drain

Photo 2.16- Proposed Pipeline Route Passing through the Bank

Table 2-3: Technical Specifications of Pipeline

Sl. No.	Description	Piping Details
1.	Pipeline internal Diameter (Inches)	8” and 4”

Sl. No.	Description	Piping Details
2.	Pipeline Wall Thickness (mm)	6.4 mm
3.	Pipeline Grade/Material Specifications	API 5L X-42 PSL-2
4.	Type of Coating	3 LP
5.	Normal Operating Pressure	30 Bar
6.	Maximum Allowable Operating Pressure (Design Pressure)	49 Bar
7.	Design Throughput (MMSCMD)	
8.	Pipeline Design Life	30 Years
9.	Design Temperature (°C)	-29 to 65°C
10.	Inter distance Between Mainline Valve Stations	3 km when laying within municipal boundary (As distance between two subsequent SV shall not be more than 3 km as per PNGRB regulation) 8 km when laying outside municipal boundary

**Source: DPR, 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 Station and 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 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 detailed market assessment of natural gas demand for all four segments, that are Domestic, Commercial, Industrial and CNG Demand, has been conducted for 25 years. The network is planned in such a way that it caters for all the major demand centers. The projected demand on 25th year is estimated to be 3.909 Million Metric Standard Cubic Meter per Day (MMSCMD) and the steel grid has been designed to take the load of 5.52 MMSCMD however the distributed network will be installed for 3.909 MMSCMD. Thus, calculation of CAPEX & OPEX has been done for steel grid complying with 3.909 MMSCMD.

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 2-4: 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 2-5: 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 TÜV SÜD team observed that since most of the stretches are passes through the roads that are alongside cultivable area and some minor habitation hence for the 60% of the stretch open cut method will be adopted. Whereas for the major crossings HDD method will be adopted.

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 600 mm. 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 2-6: 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 Land

Since pipeline will be laid across the RoW of the road hence no land procurement/leased will be required in the project.

2.5.2 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 50, most of the time around 15-20 labours will be deployed at the site. **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 5-8 workers for this stretch. Skilled workers will be employed for the operation and maintenance. All these will also be contracted out to the subcontractors.

2.5.3 Power Requirement

The power requirement (estimated to be around 320 to 330 units) will be met from DG sets during construction phase of the project. During operational phase, power will be only required for SCADA & associated facilities. The same shall be supplied via state grid.

2.5.4 Water Requirement

Water requirement (estimated to be around 100 L/day) will be minimal for the project associated only with domestic use by the workers during construction, for the sprinkling purpose to avoid air pollution 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.

2.5.5 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.

2.5.6 Construction Period

The proposed city gas distribution network, spanning a total length of 35.459 kilometers, is scheduled to be executed in three distinct phases:

- **Phase I**: The initial 10 kilometers are planned for construction during the financial year 2024–25.
- **Phase II**: The subsequent 14 kilometers are scheduled for implementation in the financial year 2025–26.
- **Phase III**: The remaining 11.459 kilometers will be laid in the financial year 2026–27.

Each phase is expected to be completed within a construction window of six months during the respective financial year.

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 controlling 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 to the MoEF&CC. CPCB works towards control of water, air and noise pollution, land degradation and 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 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). 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	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)	Required (GW abstraction charges to be paid)
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 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 solar power 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 implementation of environmental and social management plan

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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. **ATGL** will establish procedures to monitor & measure effectiveness of management program, as well as compliance with

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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: (i) Purpose, nature, and scale of the project. (ii) Duration of project activities (iii) Any risks to and potential impacts on such communities

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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 laws. • To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by	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 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,

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
	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.		pension, leave for illness, vacation, maternity, and holiday are communicated to workers clearly. Migrant workers, if employed shall also be provided same working conditions equivalent to those of non-migrant workers performing the same type of work. It will be the responsibility of all the construction 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 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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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 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.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
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. ***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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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 rights principles and in a manner that avoids or minimizes risks to the affected communities.	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 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.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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. **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.

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			<u>During Operation Phase</u>*:** 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. ***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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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 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.	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 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 additional 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	***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. 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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
		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 the 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.	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 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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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. • 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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
			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 participate in and benefit from development.	In the Bhandara district of Maharashtra, where the City Gas Distribution of Natural Gas project no land acquisition is there.	***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.
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	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

Title of Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project(Compliance)	Actions Taken/Requirements
	tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values.		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. 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 passes 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.
  - Permission from the **Bhandara Municipal Council**.
  - Permission for the **Pradhan Mantri Gram Sadak Yojna Road** (PMGSY).
- **Railway Crossings:**
  As the pipeline alignment intersects railway tracks, clearance from the **South-East Central Railways** is mandatory for safe and compliant execution of works in railway zones.
- **Water Bodies (Rivers, Drains and Canals):**
  The pipeline crosses rivers, several drains and irrigation canals. Therefore, prior approval

from the **Water Resources Department** is required to ensure protection of water infrastructure and flow regimes.

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, & Chhattisgarh Environment Conservation 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 rivers, canals, branches, distributaries, major-minor channels etc.	Water Resources Department Maharashtra (PWD)	Yes Application to be made to the Water Resources Department
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 South-East Central Railway's Department as the NG pipeline crosses railway tracks at several locations in Bhandara GA. Permission Letter is enclosed in **Annexure 3**
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. The proposed pipeline route passes through NH-247, NH 753 and NH 543 K	National Highway Authority of India (NHAI) & Road and Building Department	Yes. The permission has been received and enclosed in the **Annexure 4** for NH 753 and NH 543 K and for NH-247 in Error! Reference s ource not found..

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
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 areas sites require Environmental Clearance (EC).	MoEF&CC	No
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 Bhandara (Maharashtra)	No
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 Bhandara (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 measures 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 (PPCB)	Yes

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
13.	Public Liability Insurance Act, 1991	Insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith or incidental thereto	Contractor needs to stock hazardous material like diesel, Bitumen, Emulsions etc. safely in designated locations within the construction camp	Maharashtra Pollution Control Board (MPCB)	Yes
14.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 (Amended,2023)	Storage, handling, transportation, and disposal of hazardous waste	Storage and handling 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 Chhattisgarh	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	The Maharashtra Village Panchayats Act, 1959	Village Sarpanch	Yes, and the application letter from Gram Panchayat Khapa village is enclosed in the **Annexure 6** and the permission letter for the Kharabi village is enclosed in the **Annexure 7**
25	Maharashtra Zilla Parishads and Panchayat Samitis Act, 1961 Maharashtra Municipal Councils, Nagar Panchayats and Industrial Townships Act, 1965 Maharashtra Municipal Corporations Act, 1949	NOC from Municipal Corporation and Zila Parishad	Urban, rural and peri-urban infrastructure projects, public utility works and development schemes etc.	Municipal Corporation Nagar Parishad Zila Parishad	Yes The permission letter from Bhnadara Municipal Council, Mohadi nagar panchayat, Zila Parishad for district road is enclosed in **Annexure 8** and **Annexure 9**

Sl. No.	Legal Instrument	Objective	Reason for Applicability	Authority	Applicable (Yes/No)
26	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
27	NOC for State Highway- PWD e-Permission System (Administrative Framework)	To regulate and streamline permissions for utility services within RoW of PWD-managed roads.	The pipeline crosses SH-355	Maharashtra Public Works Department (PWD)	Yes The letter of permission is enclosed in the **Annexure 2**
28	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 near	Maharashtra Rural Road Development Authority	Yes Letter of Permission from the Maharashtra Rural Road Development Authority is enclosed in the **Annexure 1**Error! Reference source not found.

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 Adani 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. Adani 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
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

Sl. No.	Code No.	Description
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
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.

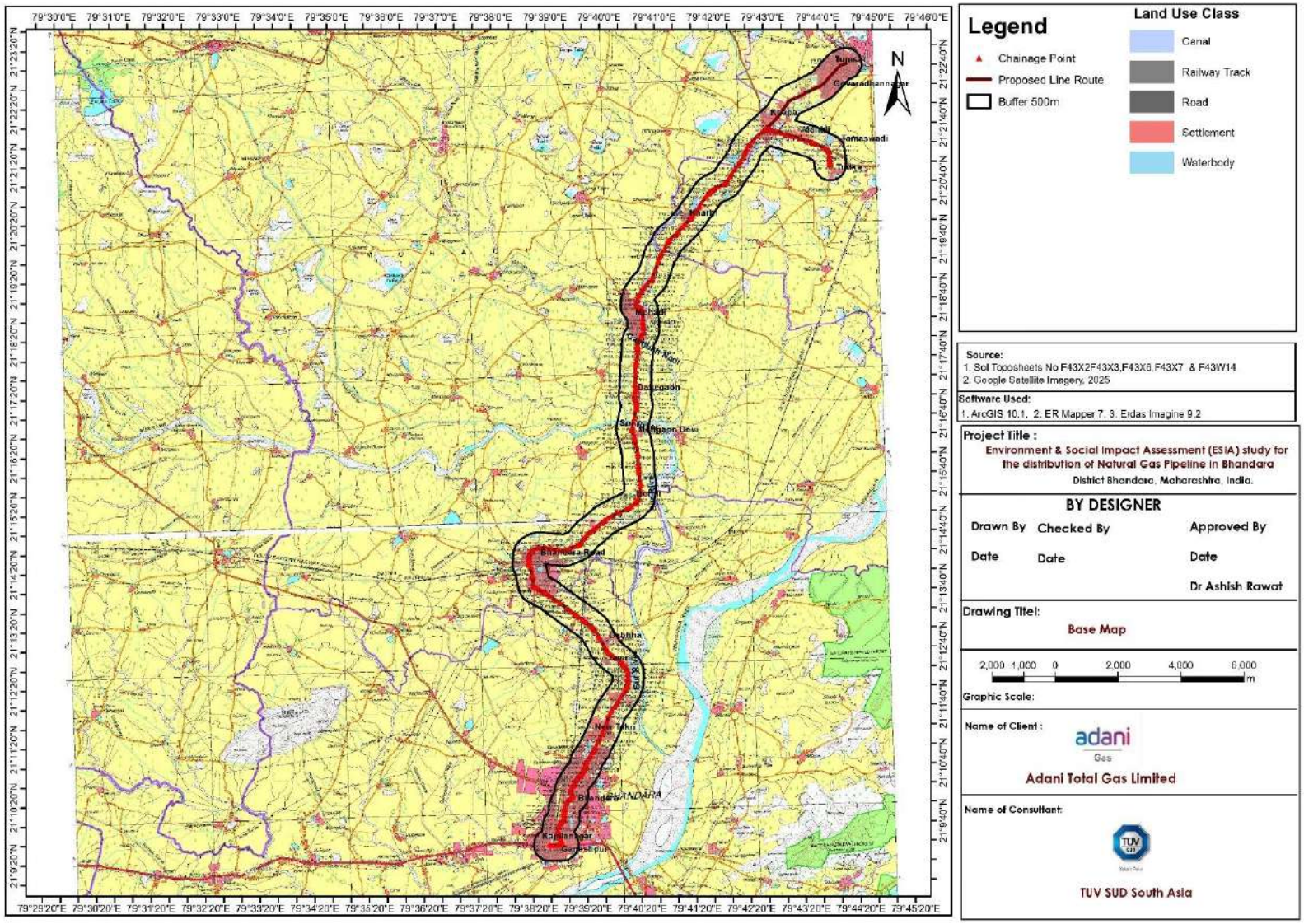
Sl. No.	Code No.	Description
44.	OISD 226	Natural Gas Transmission Pipeline & City gas Distribution
45.	OISD 179	Safety Requirements on Compression, Storage, Handling & Refueling of Natural Gas (CNG).
46.	PNGRB T4S	Technical Standards & Specifications including Safety Standards" for City or Local Natural 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) as depicted in **Figure 4-1**. While the primary field investigations for the physical and biological environment and socio-economic environment (20 to 50 m) have been collected from Project Footprint area and Area of influence. The primary Environmental baseline survey and study for the project has been carried out during the site visit on **08th July 2025** whereas the secondary baseline monitoring was conducted on the **21st to 25th July 2025**.



Source: TÜV SÜD 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 two stretches Stretch-1 (S-01) from Proposed SV-27 in Tudka Village to Bhandara Bus Depot and Stretch-2 (S-02) from Rizvi Petrol Pump to Tamsar Bus Stand.

4.3 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 and for social 20 to 50 m surrounding the project footprint area. 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			
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	05.00 km	An AoI of 05.00 Km radius 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.

4.4 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 **08th 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 **20th to 25th 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 Bhandara and adjacent villages in Bhandara 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

Sl. No.	Attributes	Parameters	Source & Frequency
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

4.5 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 **20th to 25th July 2025**.

4.6 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

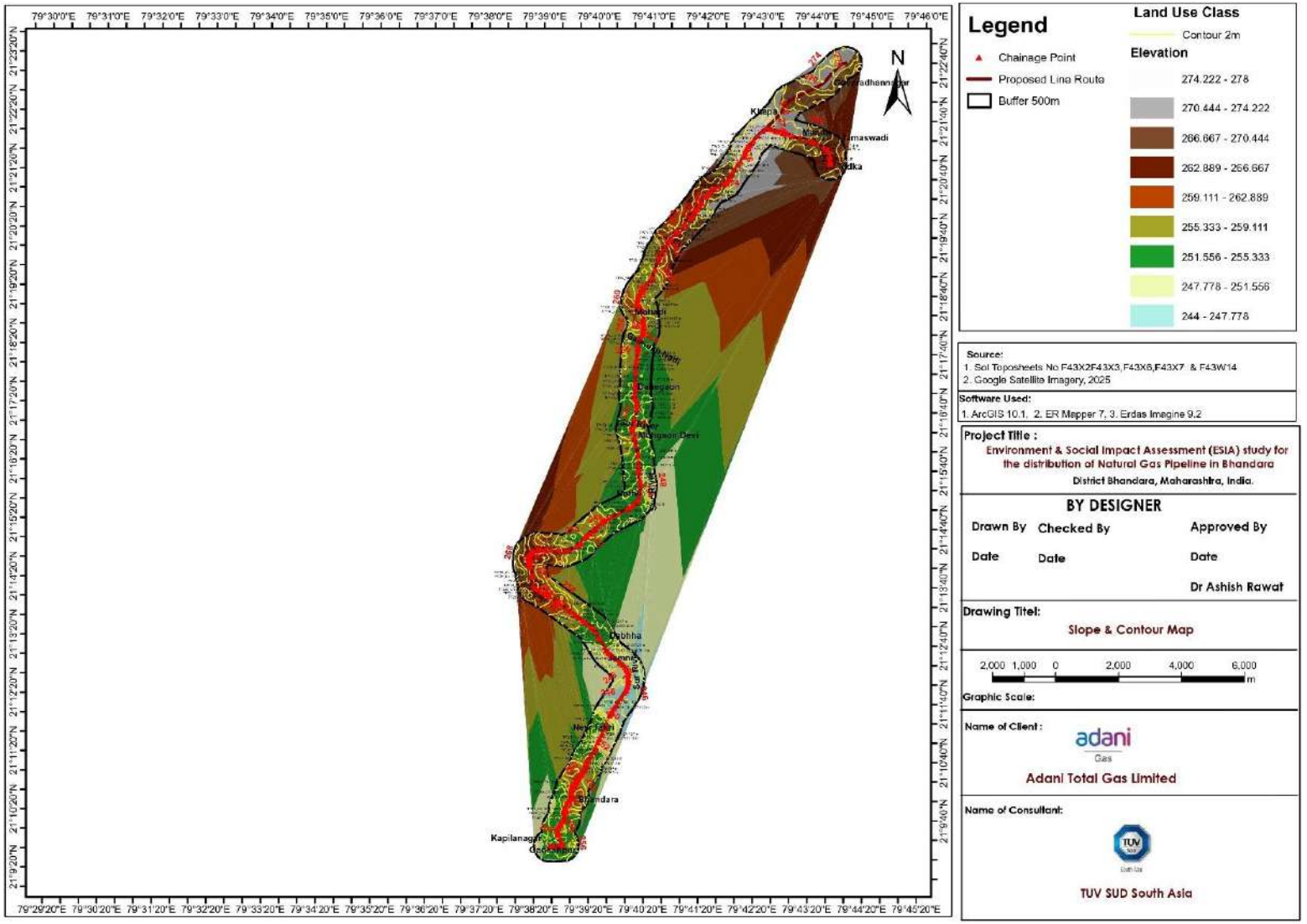
7. Climate & Meteorology
8. Ambient Air Quality
9. Ambient Noise Levels
10. Ground Water Quality
11. Surface Water Quality

4.6.1 Physiography and Topography

Bhandara district is situated in the northeastern part of Maharashtra between 20°38' and 21°36' North latitudes and 79°27' to 80°06' East longitudes. The total area of the district is 4087 sq. km. and falls in parts of survey of India degree sheets 55O, 55P, 64C and 64D. It is bounded on south by Chandrapur district, east by Gondia district, on north by Balaghat district of Madhya Pradesh State and on west by Nagpur district.

The district falls under the Wainganga basin with Wainganga River being the main River with tributaries namely Bagh, Bavanthadi, Chulbandh, Garhvi and Sur Rivers. The terrain of Bhandara district is generally flat with gentle slope. However, the northern part of the district is covered by the Satpura mountain range. It has major hills like Bhimsen, Koka, Gangajhari etc. The northern part is hilly and includes the Gaimukh, Chandpur, Ambagad, Gaikhuri hills. Bhandara district has the mountainous region of Gaikhuri in the central part and Pratapgad in the southeast, the mountainous region of Ambagad in the northwest, and the plains of Wainganga River in the west and south as well as the east and northeast. The lowest elevation in the district is found in Lakhandur taluka in the south-western part of the district at 213 meters above sea level, while the highest elevation is found at Pratapgad near Navegaon in the south-eastern corner of the district at 561 meters above sea level.[3]

[3] Bhandara-District – GSDA



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-2: Terrain and Contour Map of Project AOI

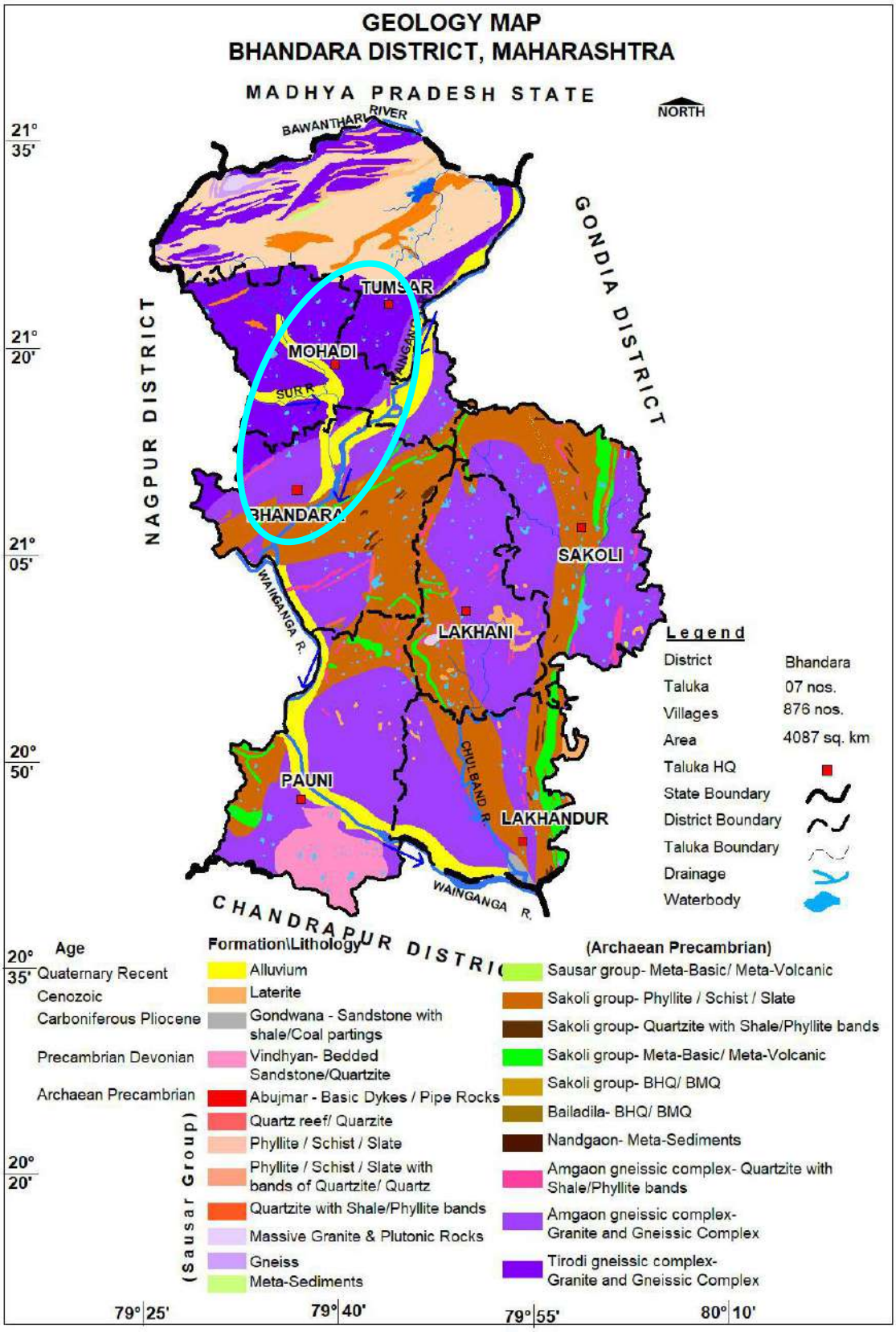
4.6.2 Geology

Bhandara district is unique in Maharashtra in the sense that the entire area of the district is occupied by metamorphic and igneous rocks. The district is underlain by various types of rock formations from the oldest Granites and Gneisses of the Precambrian to the Recent Alluvium. Geologically, the area is divided into two parts, i.e., Alluvium and Deccan Trap Basalt formations. The generalized geological sequence occurring in the area is given in **Table 4-4** and the geological map with basaltic flows is shown in **Figure 4-3**

Table 4-4: Generalized Geological Sequence of the Bhandara District

Geologic Period	Group	Formation	Lithology
Recent to Sub-Recent		Alluvium	Sand, silt, clay & laterites (yellow to reddish brown, ferruginous with pisolitic texture)
Permian	Lower Gondwanas	Kmathi	Sandstone and Ferruginous sandstone, dark brownish grey, pale red in colour, medium to coarse grained
Neoproterozoic	Vindhyans		Sandstone and Shale, Sandstone: light grey to light yellowish, medium to Coarse grained, gritty soft and friable. Shale: light grey to light reddish, thinly bedded.
Meso Proterozoic	Khairagarh Group		Granite, medium to coarse grained, composed of Quartz, feldspar, biotite and muscovite.
	Dharwar (Sausar/Sakoli Groups)		Dolomitic Limestone/shale, Calc-Gneiss, Quartzite, Phyllites, Schists, Meta asalt/Rhyolites, Granite and Quartz reef.
	Nandgaon group		Granite, Basic intrusive, Arkose, grit, Sandstone and shale, Rhyolite, conglomerate, Quartzite.
Paleo-Meso Proterozoic	Bailadila		Quartzite/ banded Hematite Quartzite
Archaeans to Paleo Proterozoic	Amgaon Gneissic group	Crystalline & Older Metamorphics	Granite, Granite Gneisses with migmatite and Quartzites.

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



**Source: Aquifer Map and Ground Water Management Plan of Bhandara District*

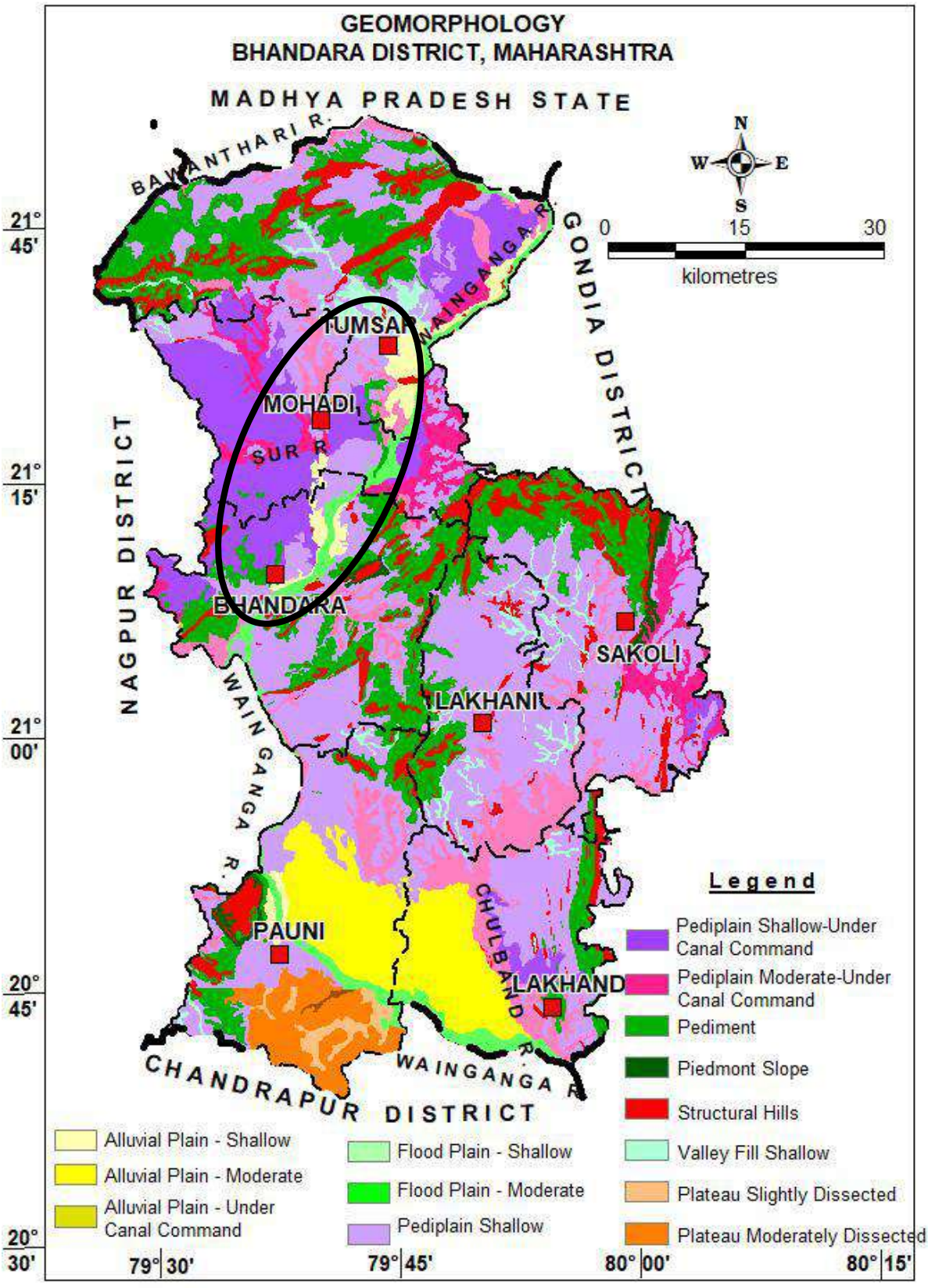
Figure 4-3: Geological Map of Bhandara District

As shown in the **Figure 4-3 t**he study area, marked in red on the geological map of Bhandara District, features soils primarily from the Amgaon Gneissic Complex, Tireodi Gneissic Complex, and Alluvium Clay/Sand. These soils are rich in minerals, have good drainage, and are highly fertile,

4.6.3 Geomorphology and Drainage

4.6.3.1 Geomorphology

The Bhandara district forms part of Wainganga sub-basin and has an undulating terrain with elevations ranging from 263 to 315 m amsl. Physiographically, the district can be broadly divided into two units viz; the one controlled by structural features i.e., the structural origin and the other controlled by differential weathering i.e., the denudation origin. The structural, hills and ridges are more common in the eastern and southern parts of the district, while the denudational features like pediments/pediplains are seen in north-central, west central and south-west portions. The geomorphology of the area is shown in **Figure 4-4**.



**Source: Aquifer Mapping and Management Plan of Bhandara District*

Figure 4-4: Geomorphological Map of Bhandara District (Study Area-Marked in Black)

4.6.3.2 Drainage

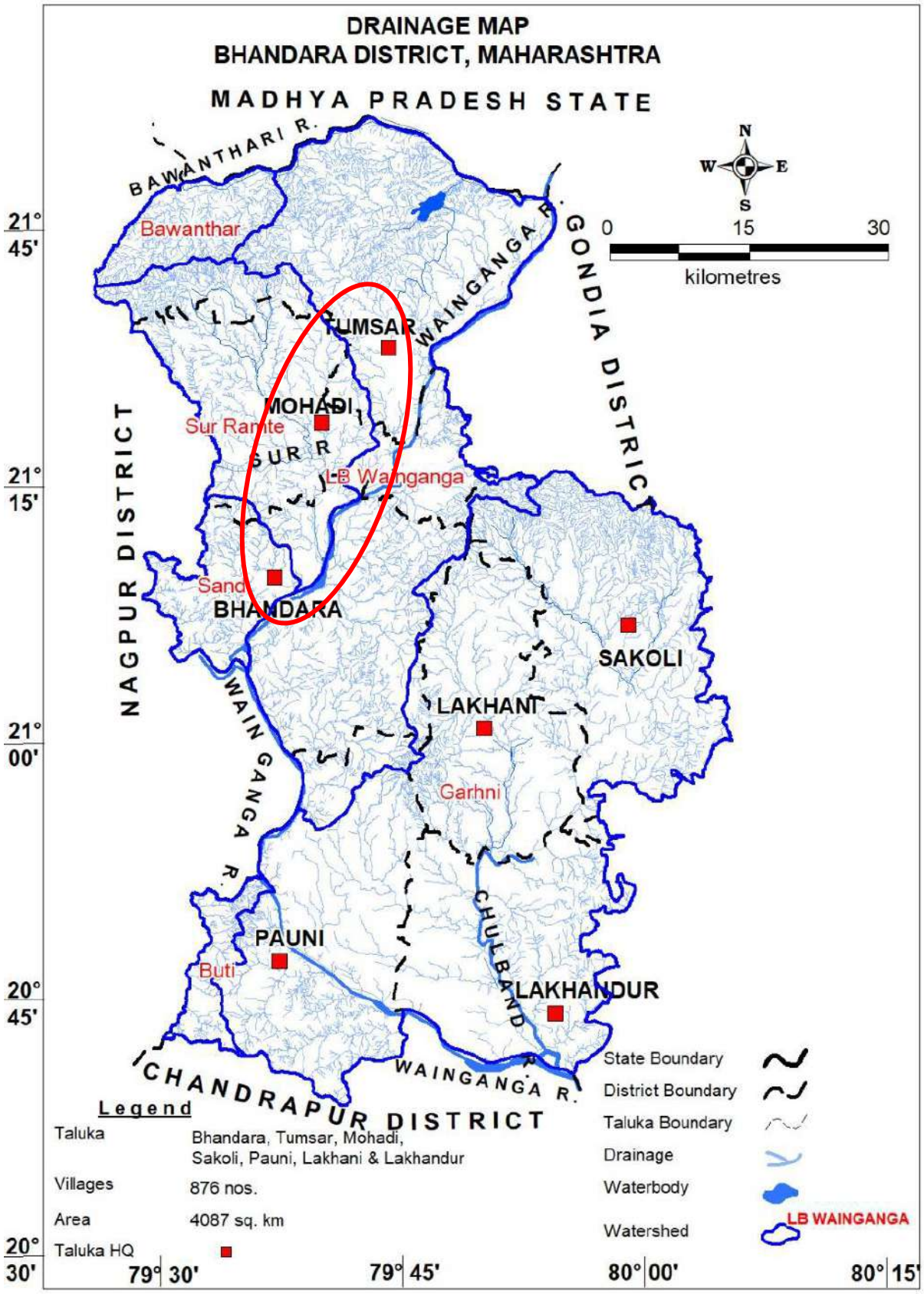
The entire area of the Bhandara district falls in Godavari basin. Wainganga is the main river flowing in the district as depicted in the **Figure 4-5**. The district is drained by the Wainganga River and its tributaries namely Bagh, Bavanthadi, Chulbandh, Garhvi and Sur Rivers. Sur River and Gaimukh River are the main river crossing the project study area as depicted in the drainage map of the project study area shown in the **Figure 4-6.** The district predominantly has a parallel and sub-parallel drainage system. The lowlands of Bhandara district lie mainly along the valleys of the rivers Wainganga, Bagh, Chulband and Bawanthari. There are a total of 25 watersheds in the district and the tributary-wise watersheds are 8 watersheds of Wainganga River, 3 watersheds of Bawanthadi, 8 watersheds of Chulband, 1 watershed of Maru and 5 watersheds of Sur have been formed.

The project study area has the following drainage patterns/river systems as mentioned in **Table 4-5**:

Table 4-5: Details of Waterbodies in Project Study Area

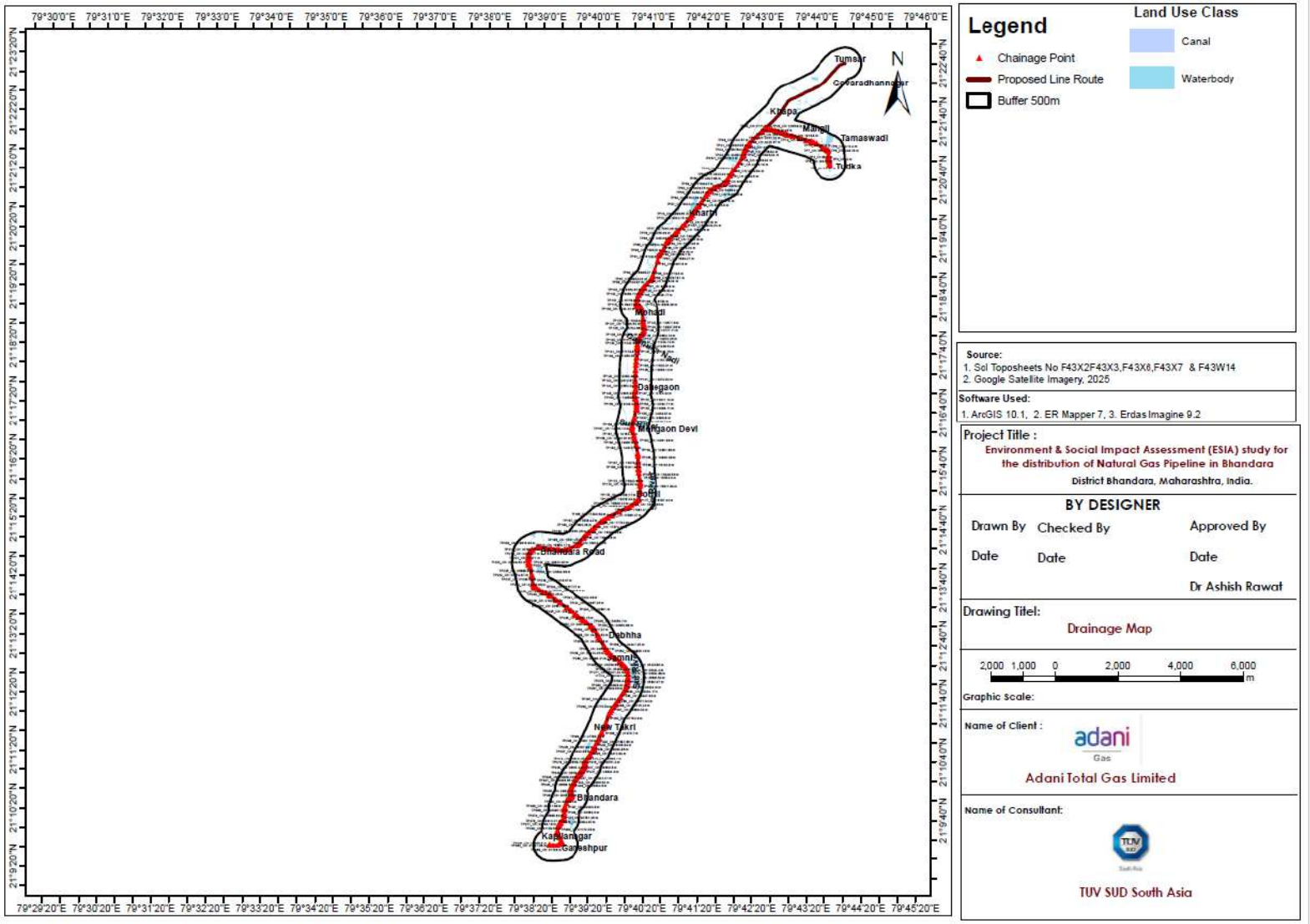
S. No.	Pipeline Stretch	Type of Water Body Crossing		
		River	Canal	Drain
1	Stretch 1 Tukda Village to Bhandara Bus Depot	2 Rivers 1. Gaimukh River 2. Sur River	13 (11 Unlined Canals and 2 Lined Canals)	11 (5 Minor Drains and 6 Nala)
2	Stretch 2: Razvi Petrol Pump to Tumsar Bus Depot	0	0	1

**Source: KMZ files of proposed pipeline route shared by ATGL Bhandara Team*



**Source: Aquifer Mapping and Management Plan of Bhandara District*

Figure 4-5: Drainage Map of Bhandara District (Study Area-Marked in Red)



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-6: Drainage Map of Project Study Area

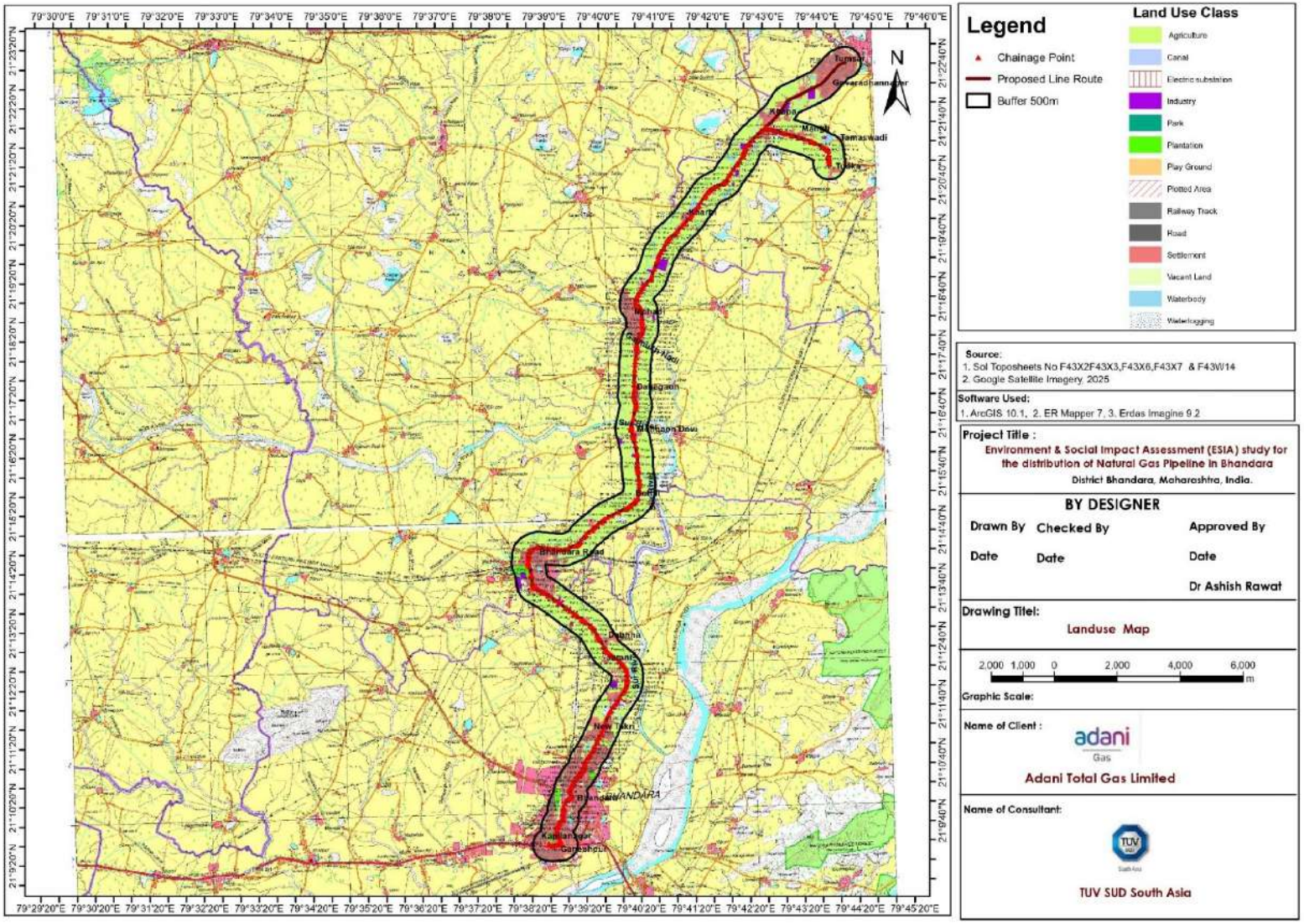
4.6.4 Land use and Land Cover

The total geographical area of the district is 4087 sq.km. The study area comprises diverse land use categories, including agriculture, canal, settlement, and waterbodies. The largest land use category is agriculture, covering 21.112 sq.km. (59.989%), followed by settlement at 8.869 sq.km. (25.202%). Other significant land uses include roads (1.412 sq.km, 4.012%) and water body (1.449 sq, 4.117%). The detailed land-use breakup of the study area is given in **Table 4-6** and Land Use map of study area is depicted in **Figure 4-7** as follows:

Table 4-6: Land use Details of Project Study Area

Sl. No.	Land Use	Area in Sq. Km	Area in %
1.	Agriculture	21.112	59.989
2.	Canal	0.371	1.055
3.	Electric substation	0.063	0.180
4.	Industry	0.643	1.826
5.	Park	0.035	0.099
6.	Plantation	0.367	1.042
7.	Playground	0.118	0.334
8.	Plotted Area	0.306	0.869
9.	Railway Line	0.146	0.415
10.	Road	1.412	4.012
11.	Settlement	8.869	25.202
12.	Vacant land	0.303	0.861
13.	Waterbody	1.449	4.117
14.	Waterlogging	0.427	1.214
Study Area		**35.193**	**100**

**Source: TÜV SÜD Land Use Study*



Source: TÜV SÜD GIS Mapping Study

Figure 4-7: Land Use Map of Project Study Area

4.6.5 Soil Quality

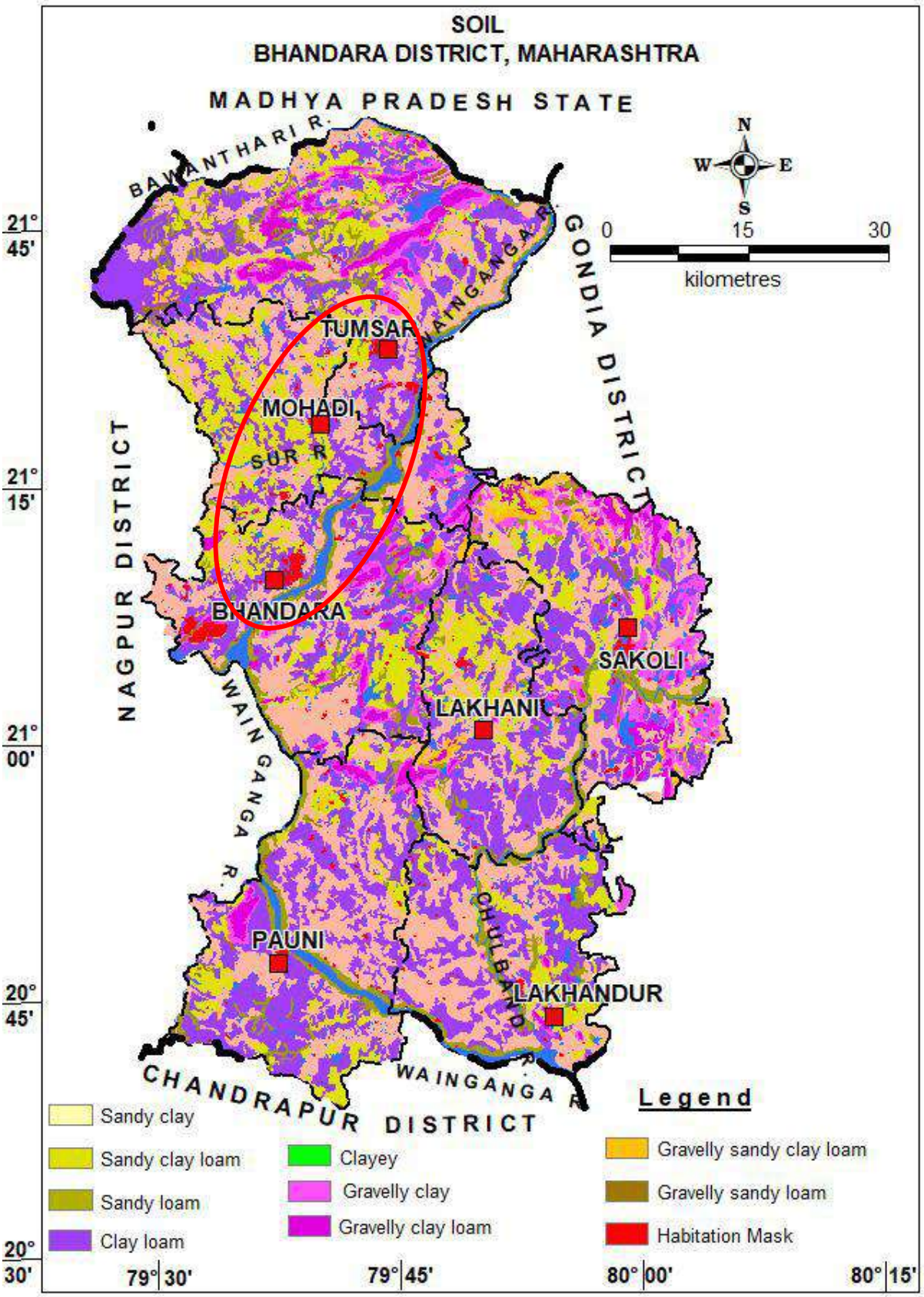
Soil plays a very important role in the agricultural activities and forest growth of the area. The fertility of the soil from an agricultural point of view depends upon the texture and structure which controls the retaining and transmitting capacity of the soil to hold the moisture content and various nutrients such as nitrogen, phosphorus and potassium present in the parent rock. The process of formation of the soil in the area is influenced by the climate, geology, vegetation, drainage and topography. The soils of the district are varied, arising out of the tropical sub-humid weathering of crystalline metamorphic and igneous rocks. They are essentially residual, though along the southern extremes of the Wainganga valley, downstream of Pauni, alluvial soils predominate. Based on the thematic map, it has been observed that about 61% of the area of the district is occupied by Clayey and Clay loam soil types. Nearly 20% of the area is covered by sandy loam and sandy clay loam soils; followed by Gravelly clay and loamy soil covering 10% area of the district. The remaining part of the district is covered by Silty clay, Silty clay loam, Gravelly clay and silty loam soils. Depth of soil is more in the vicinity of main drainages and shallow away from river channels and least in hilly terrains. The thematic map of soil distribution in the district is shown in the **Figure 4-9.**

The soil samples were analyzed for various physical and chemical parameters of soil. The soil quality monitoring locations are provided in **Table 4-7** The result of soil quality monitoring is provided in the **Table 4-8.**

Table 4-7: Soil Quality Monitoring Locations

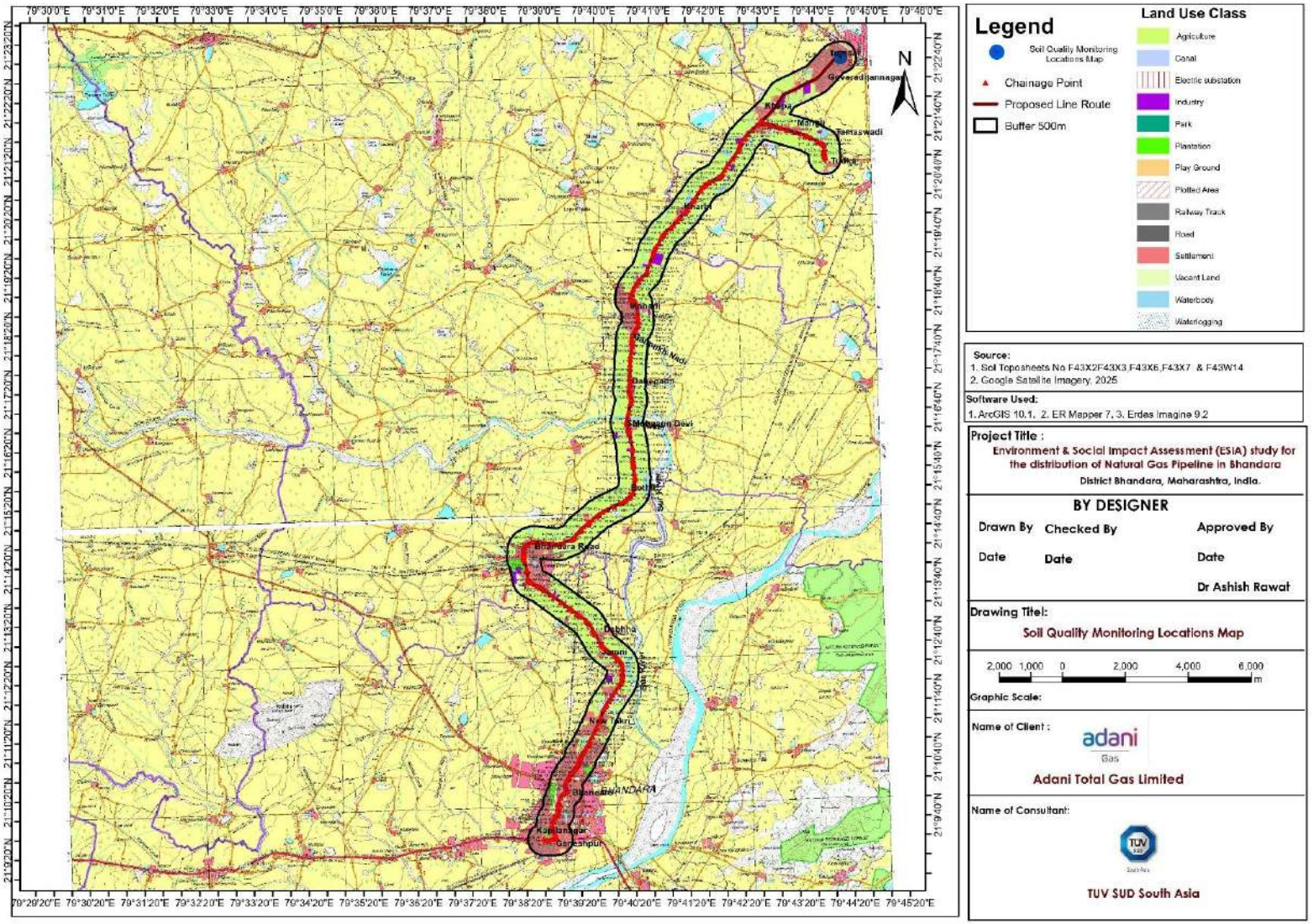
Sl. No.	Location code	Location name	Coordinates
1.	SQ-1	Near Tumsar Bus stand at Chainage Ch-3.368	21°22'42.96"N and 79°44'30.11"E

**Source: Identified by TÜV SÜD Team*



**Source: Aquifer Map and Ground Water Management Plan of Bhandara District*

Figure 4-8: Soil Map of the Bhandara District



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-9: Soil Quality Monitoring Locations

Table 4-8: Soil Quality Analysis Result

S. No.	Parameter	Unit	Test Protocol	SQ-1
1	Texture	-	IS: 2720 (part-4), 1985 Reaff:2015)	Sandy clay Loam
2	Sand	-	IS: 2720 (part-4), 1985, (Reaff:2015)	44.4
3	Silt	%	IS: 2720 (part-4), 1985, (Reaff:2015)	26.2
4	Clay	-	IS: 2720 (part-4), 1985, (Reaff:2015)	29.4
5	Porosity	%	STRL /STP/SOIL/01,	49.9
6	Bulk Density	g/cc	STRL /STP/SOIL/01	1.56
7	pH	....	STRL /STP/SOIL/01	7.59
8	E. Conductivity	µs/cm	STRL /STP/SOIL/01	0.48
9	Magnesium	mg/kg	STRL /STP/SOIL/01	46.1
10	Calcium	mg/kg	STRL /STP/SOIL/01	216.2
11	Chlorides	mg/kg	STRL /STP/SOIL/01	60.9
12	Sodium	mg/kg	STRL /STP/SOIL/01	83.9
13	Potassium	mg/kg	STRL /STP/SOIL/01	66.9
14	Organic Carbon	%	IS: 2720 (Part-24)-1976(R-2015)	0.88
15	Organic matter	%	IS: 2720 (Part-24)-1976(R:2015)	1.53
16	Phosphorous	mg/kg	IS: 2720 (part 26),1987 (R:2011)	63.7
17	SAR	meq	STRL /STP/SOIL/01	1.58
18	Nitrogen (as N)	mg/kg	STRL /STP/SOIL/01	0.19
19	Salinity (as NaCl)	%	STRL /STP/SOIL/01	0.38

Analysis of Results:

- **Soil Texture and Composition**:
  SQ-1 is Sandy Clay Loam, indicating moderate to good drainage with moderate water-holding capacity. Sand content is high (44.4%), with moderate silt (26.2%) and clay (29.4%), supporting moderate fertility and aeration.
- **Porosity and Bulk Density:**
  Porosity is moderate (49.9%), and bulk density is within acceptable limits (1.56 g/cc), suggesting good root penetration and aeration.
- **pH and Electrical Conductivity (EC):**
  Neutral pH (7.59) and low EC (0.48 µS/cm) indicate non-saline and chemically balanced soil, suitable for most crops.
- **Macronutrients:**
  Nitrogen is low (0.19 mg/kg), which may limit plant growth.
  Phosphorus is high (63.7 mg/kg), beneficial for root development.
  Potassium is moderate (66.9 mg/kg), supporting plant metabolism

Both soils have neutral pH, low salinity, and adequate nutrient levels, making them suitable for various crops. However, nitrogen supplementation may be necessary to enhance fertility. The laboratory results of the secondary baseline monitoring are enclosed in the **Annexure 11.**

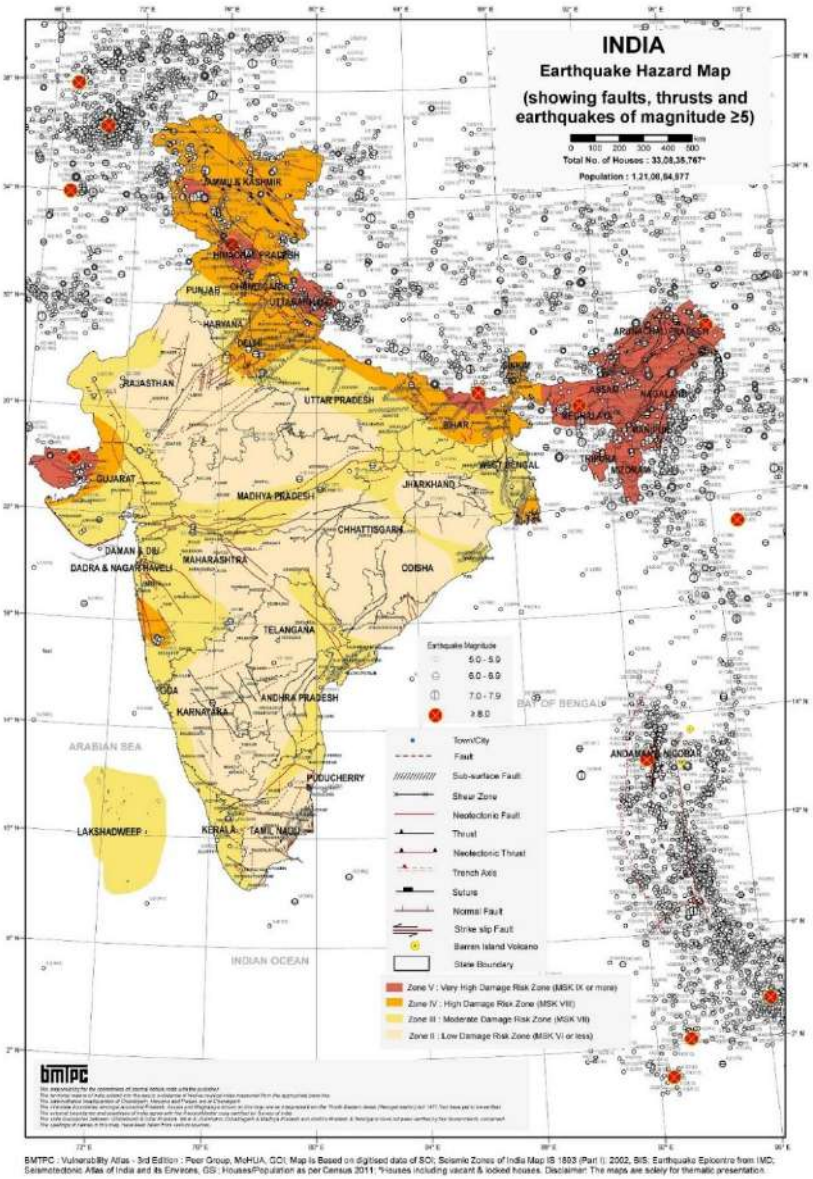
4.6.6 Natural Hazards

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.

Maharashtra is prone to multiple hazards, including landslides, floods, cyclones, earthquake, drought and lightning strikes.

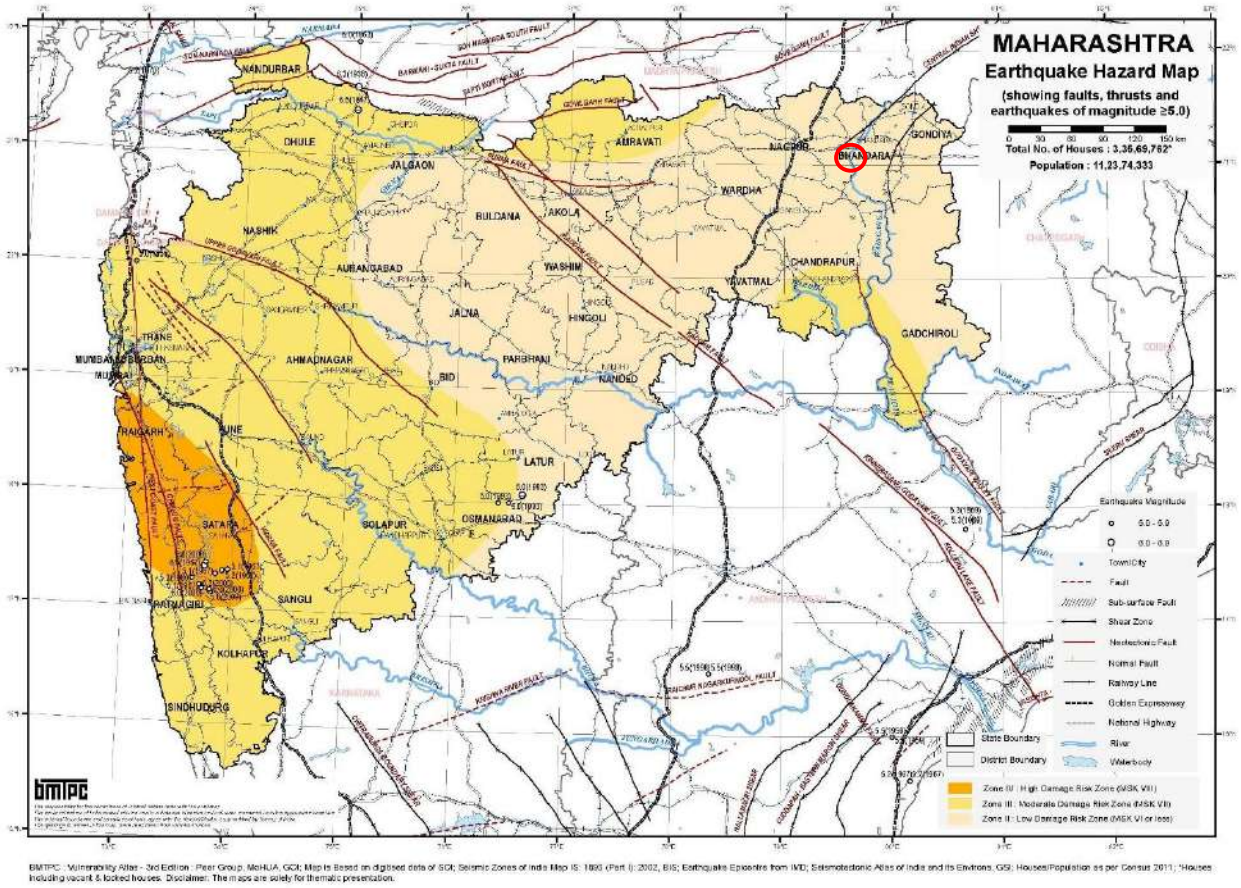
4.6.6.1 Seismicity

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 Bhandara district 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 4-10** and the seismic map of the state of Maharashtra in **Figure 4-11**.



**Source-BMTPC Vulnerability Atlas*

Figure 4-10: Earthquake Hazard Map of India



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.

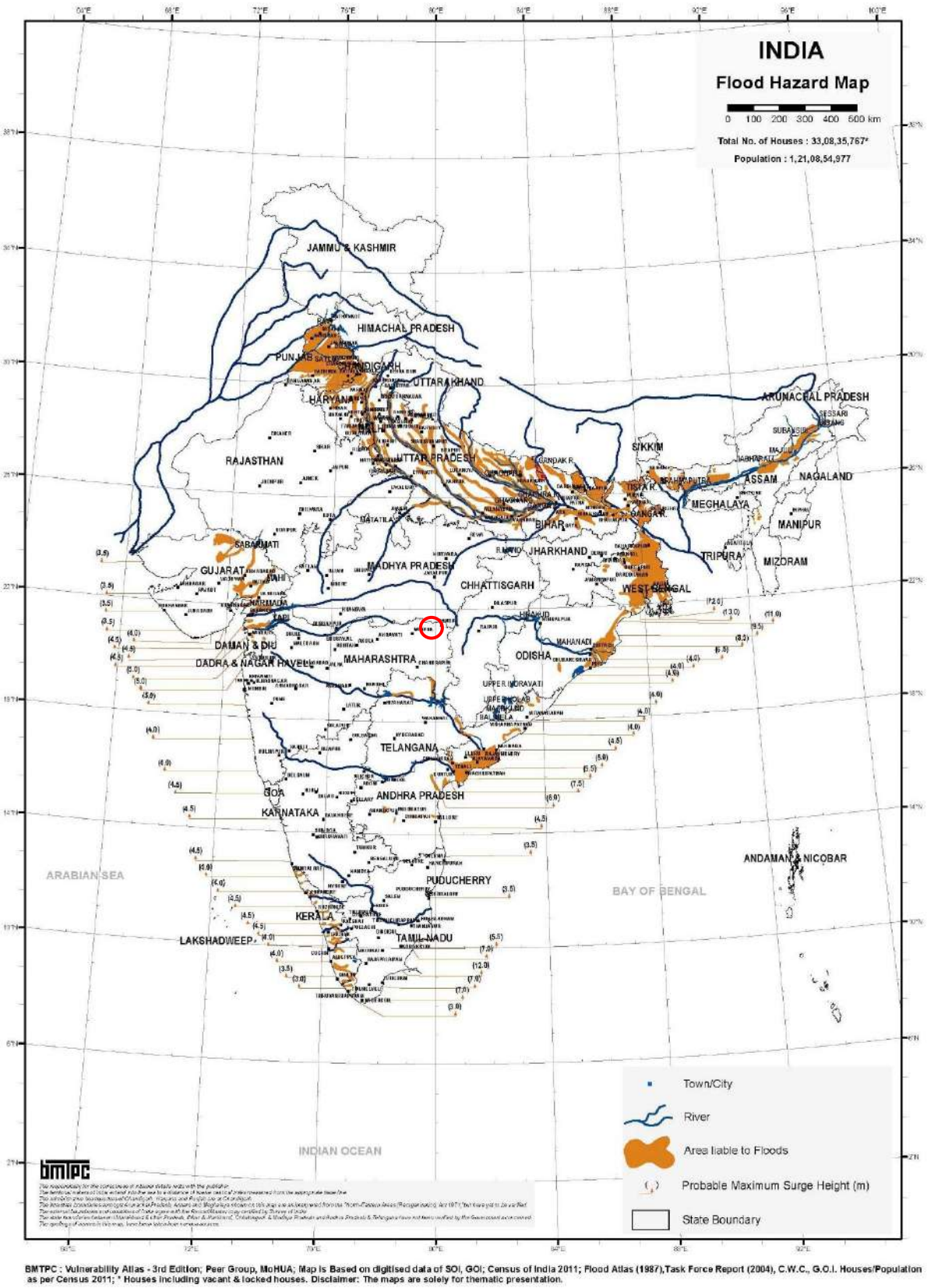
**BMTPC Vulnerability Atlas*

Figure 4-11: Earthquake Hazard Map of Maharashtra (Red Circle-Project Study Area)

4.6.6.2 Flood

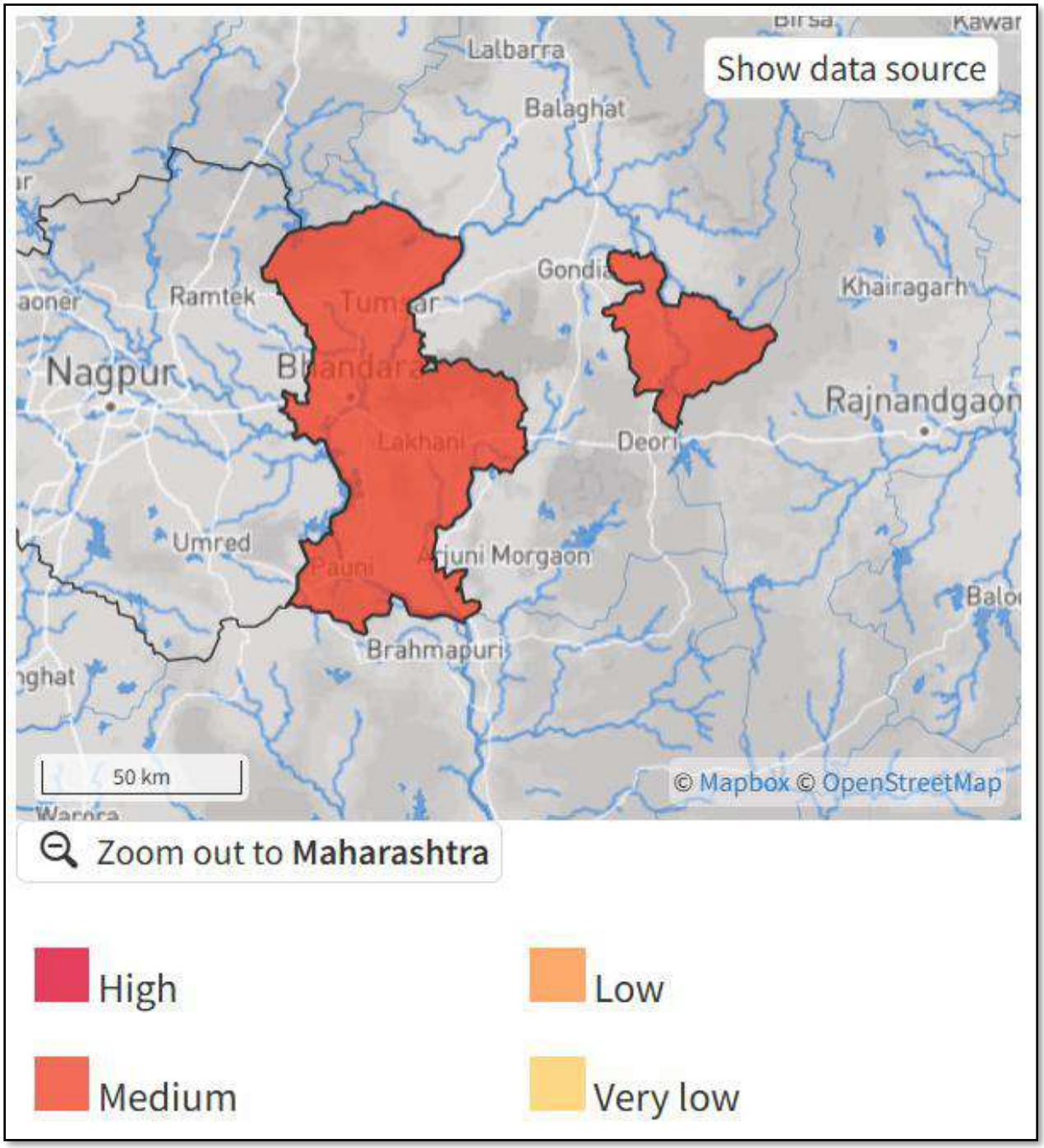
The flood hazard in Bhnadara District is classified as **Medium,** this means that there is a chance of more than 20% that potentially damaging and life-threatening river floods occur in the coming 10 years.

The Flood Hazard map of the India is provided in **Figure 4-12.** The Flood Hazard map of the Bhandara district is provided **Figure 4-13.**



**Source-BMTPC Vulnerability Atlas*

Figure 4-12: Flood Hazard Map of India (Red Circle indicating Project Area)

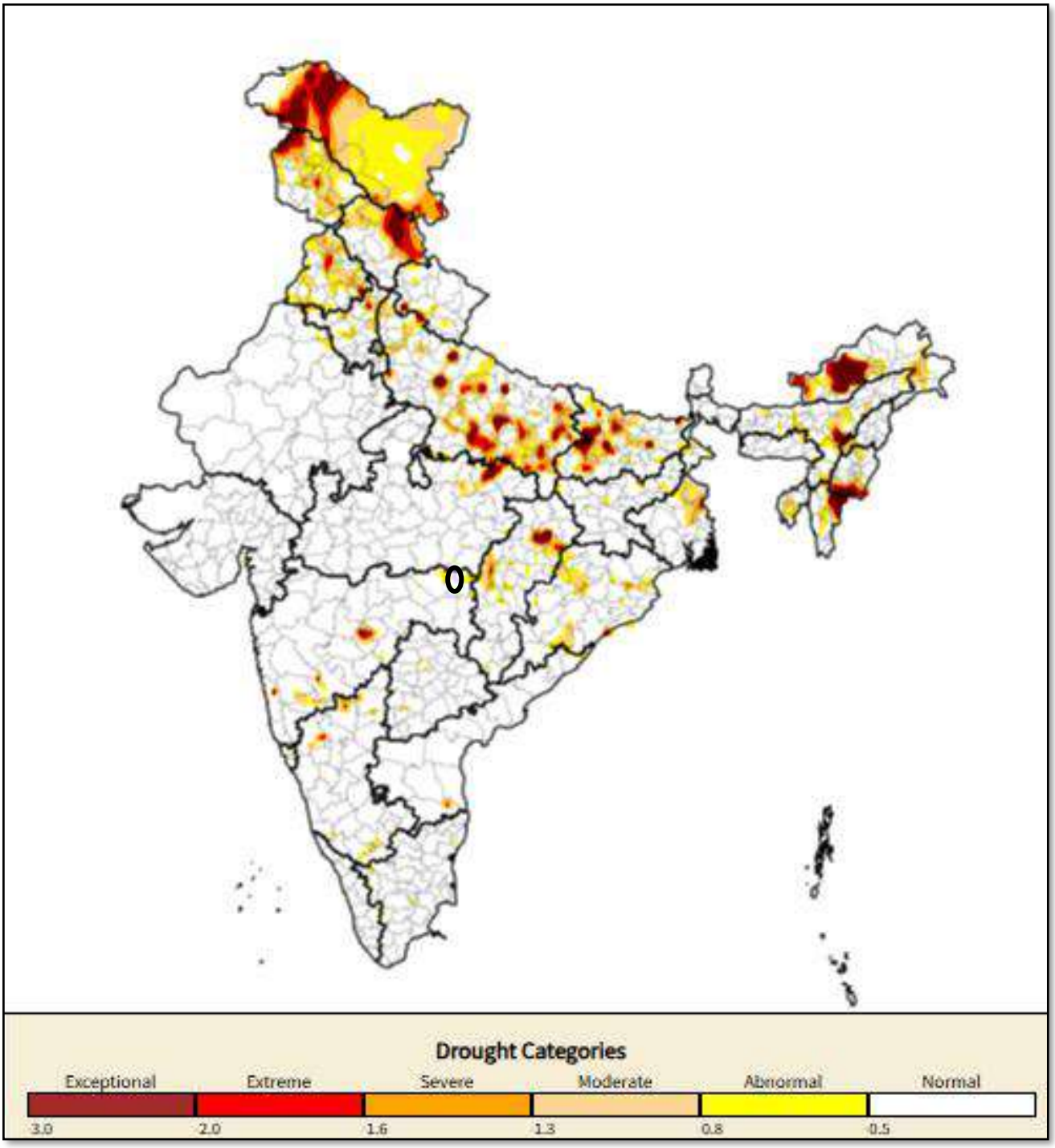


** Source: Global Facility for Disaster Reduction and Recovery by World Bank*

Figure 4-13: Flood Hazard Map of Bhandara District

4.6.6.3 Drought

Bhandara district in Maharashtra is in Normal drought zone as depicted in the **Figure 4-14** 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 Wainganga River and the several tertiary channels and tributaries of the Purna river hence the risk of draught in the region is less.

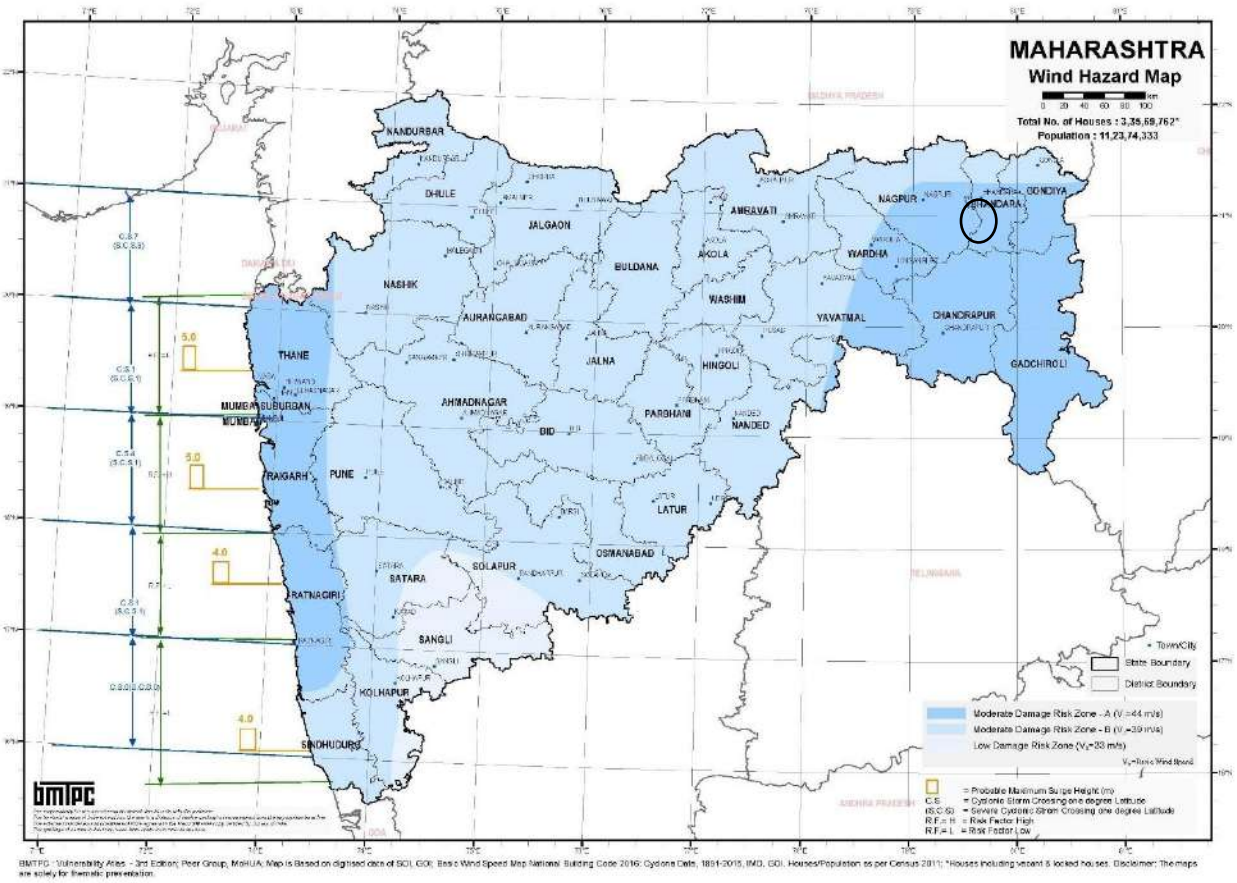


**Source: India Drought Monitor by IIT Gandhinagar*

Figure 4-14: Drought Prone Map of India (Black Circle indicating Project Area)

4.6.6.4 Wind Hazard

The project study area has been identified through Moderate Damage Risk Zone-B (Vb=39m/s) for a length of 9.60 km & Moderate Damage Risk Zone -A (Vb=44m/s) for a length of 22.491 km according to the DES shared by ATGL and the Wind Hazard map of Maharashtra, Vulnerability Atlas of 3rd edition, 2019 prepared by BMTPC that has been depicted in **Figure 4-15** indicating project study area marked under Black circle.



**BMTPC Vulnerability Atlas*

Figure 4-15: Wind Hazard Map, Maharashtra (Project Area identified with "Black Circle")

4.6.7 Climate and Meteorology

The climate of Bhandara district is characterized by a hot summer and general dryness throughout the year except during the south-west monsoon season. In accordance with [4]Köppen–Geiger Climate Classification system (**Figure 4-16)** the climate zone of project area of Bhandara 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 upto the end of September. October and November constitute the post-monsoon season. The climatological trend in the district is depicted in **Figure 4-17.**

The climate of the Bhandara district is characterized by hot summer and general dryness throughout the year except during south-west monsoon season. The mean minimum temperature is 60°C and the mean maximum temperature is 45°C. The average annual rainfall of the district varies from 1250 to 1500 mm. The south-west monsoon in the district arrives in the second week of June. The rainfall during the period from June to Septembers constitutes about 90 percent of annual rainfall. July and August are the months

[4] Köppen-Geiger Climate Classification is one of the most widely used climate classification systems. The system is based on the concept that native vegetation is the best expression of climate. Thus, climate zone boundaries have been selected with vegetation distribution in mind. It combines average annual and monthly temperatures and precipitation, and the seasonality of precipitation.

with heavy rainfall, July being the rainiest month. The variation in the annual rainfall from year to year is small.

Figure 4-18 depicts the precipitation data of the study area, the temperature trend of the study area is depicted in **Figure 4-19**. Temperature rises rapidly after February till May which is the hottest month of the year. 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.

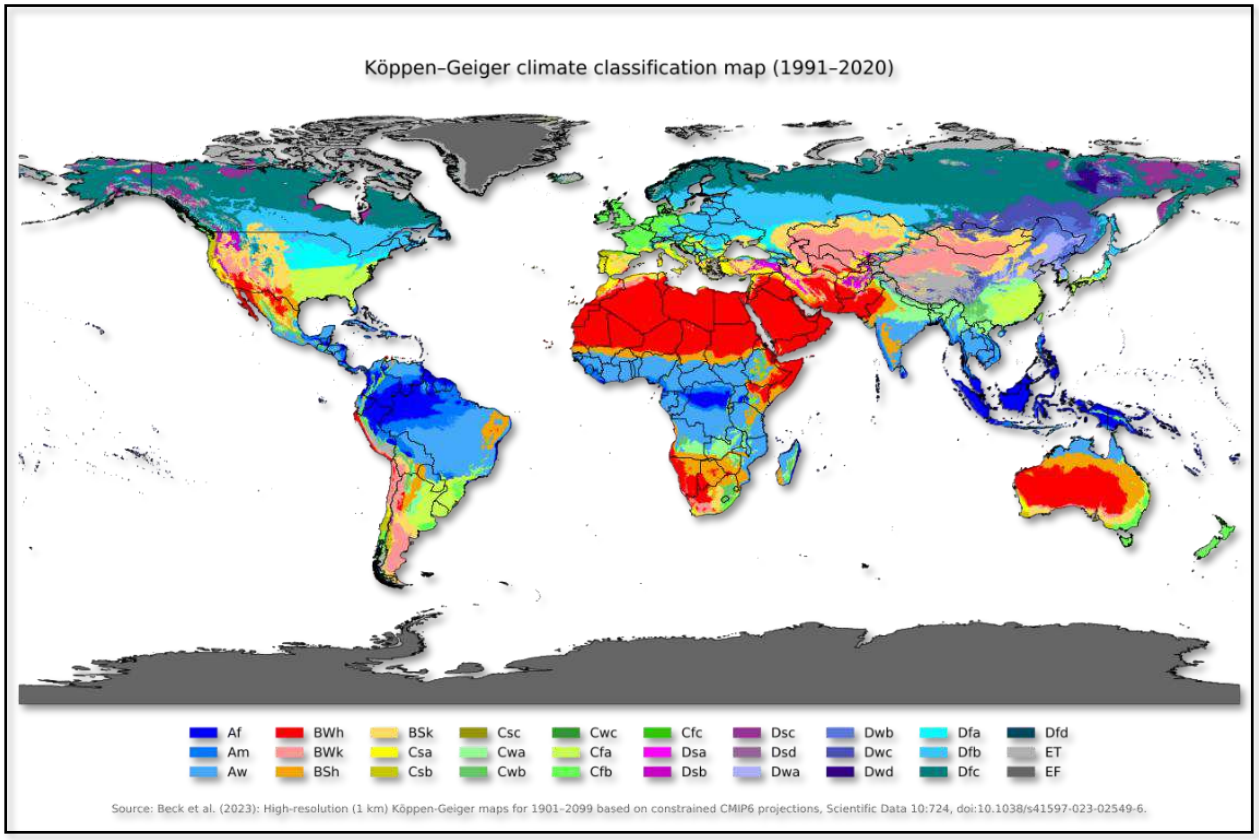
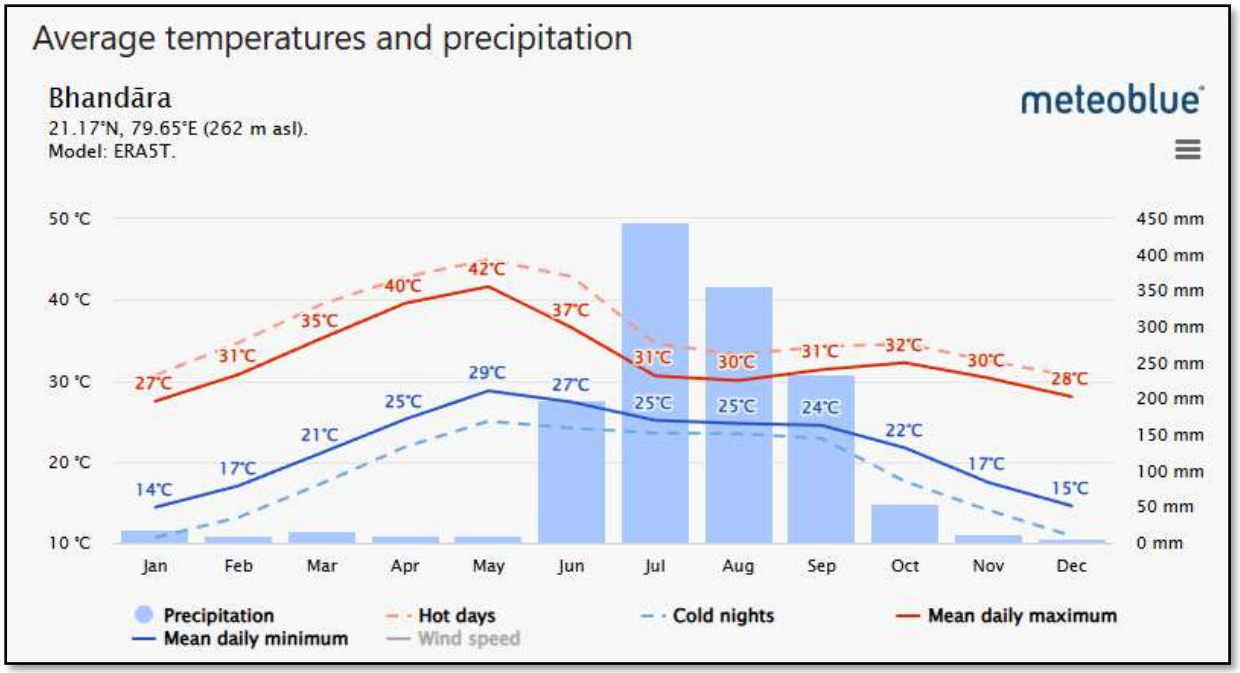
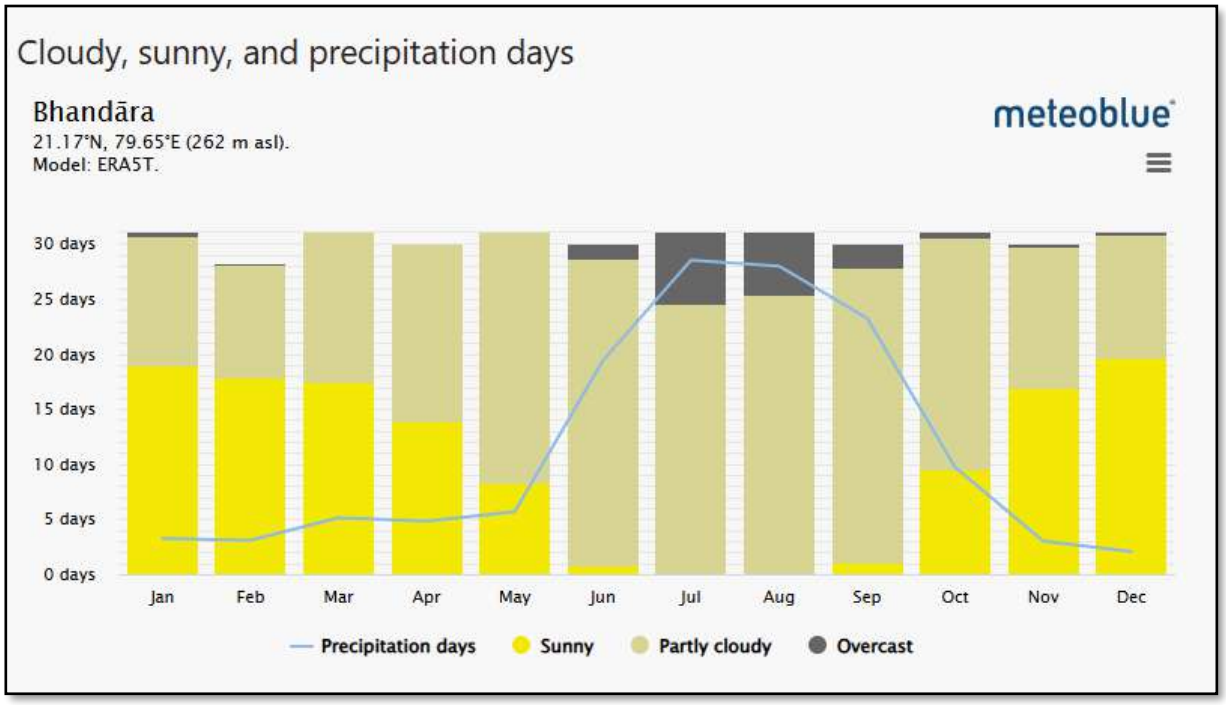


Figure 4-16: World Map of Köppen–Geiger Climate Classification



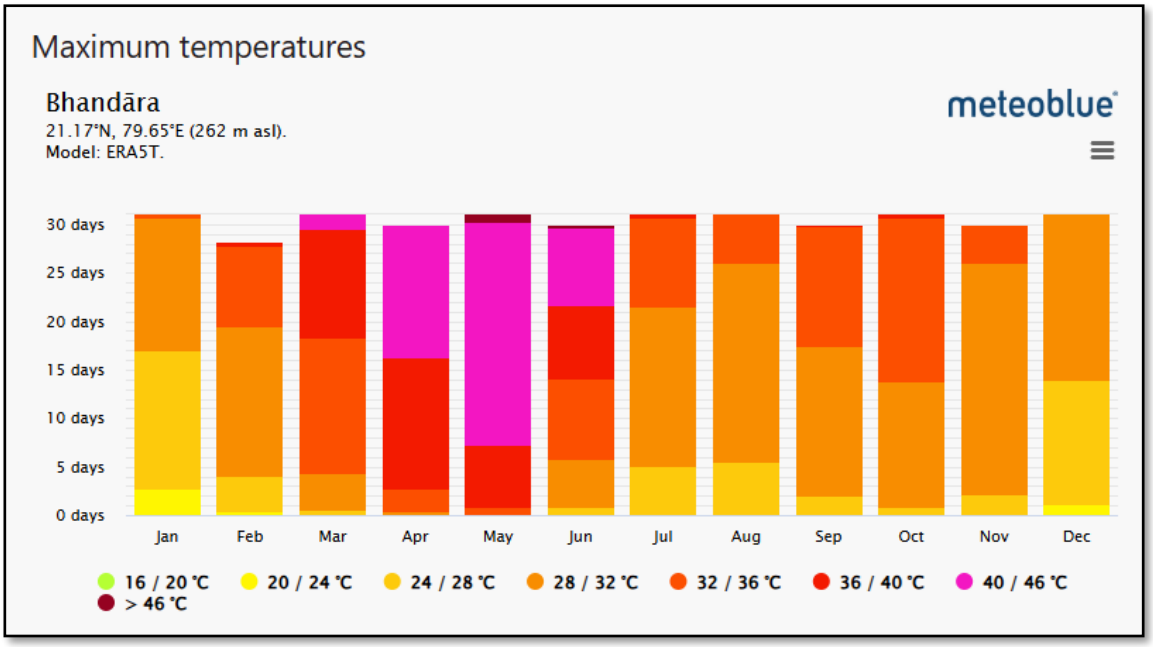
Source: Meteoblue.com

Figure 4-17: Climatological Trend in Study Area (Last 30 years)



Source: Meteoblue.com

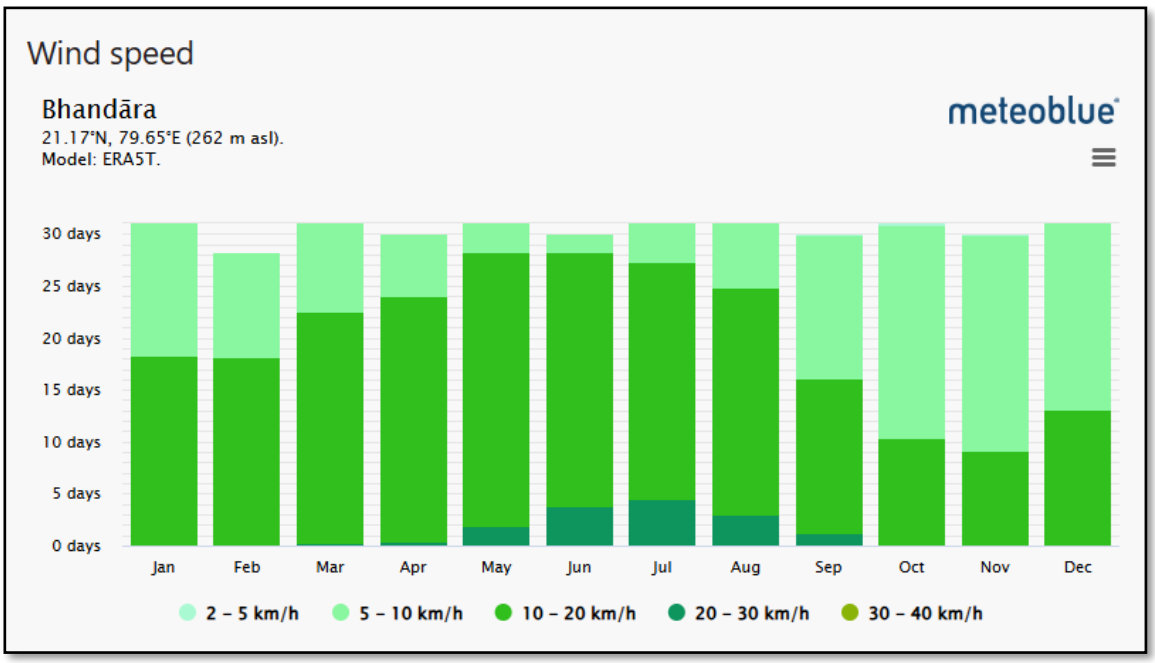
Figure 4-18: Precipitation Graph of Study Area



Source: Meteoblue.com

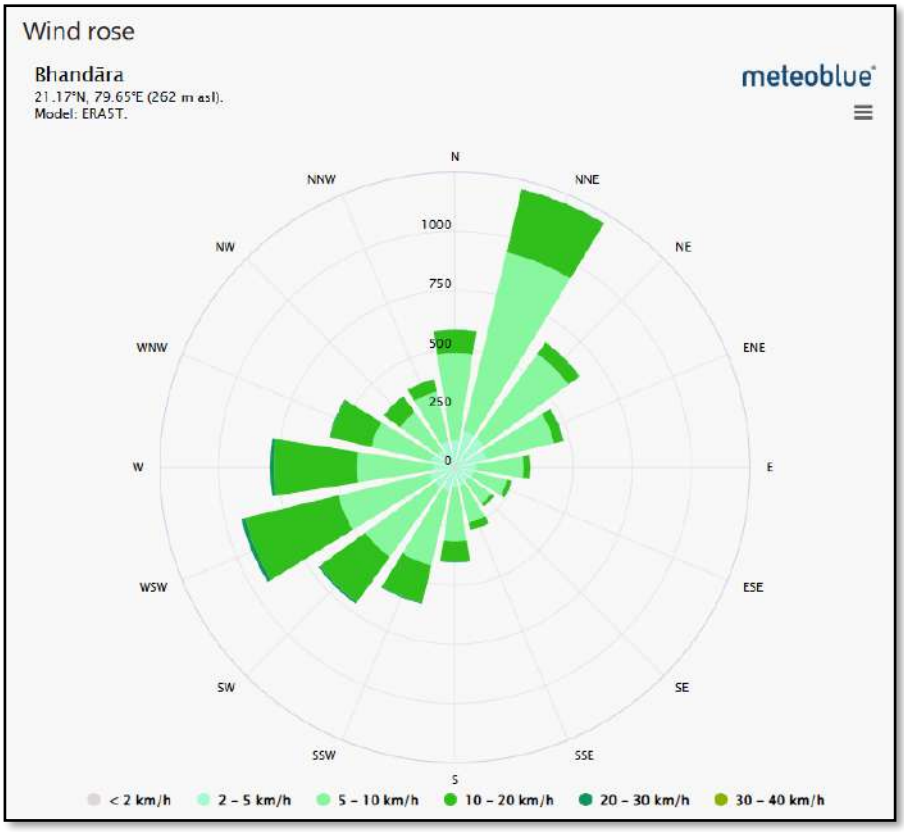
Figure 4-19: Temperature Trend in Study Area (for last 30 Years)

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 and wind-rose diagram for study area is given in **Figure 4-20** and **Figure 4-21** respectively.



Source: Meteoblue.com

Figure 4-20: Wind Intensity of Study Area



Source: Meteoblue.com

Figure 4-21: Windrose Diagram of Project Study Area

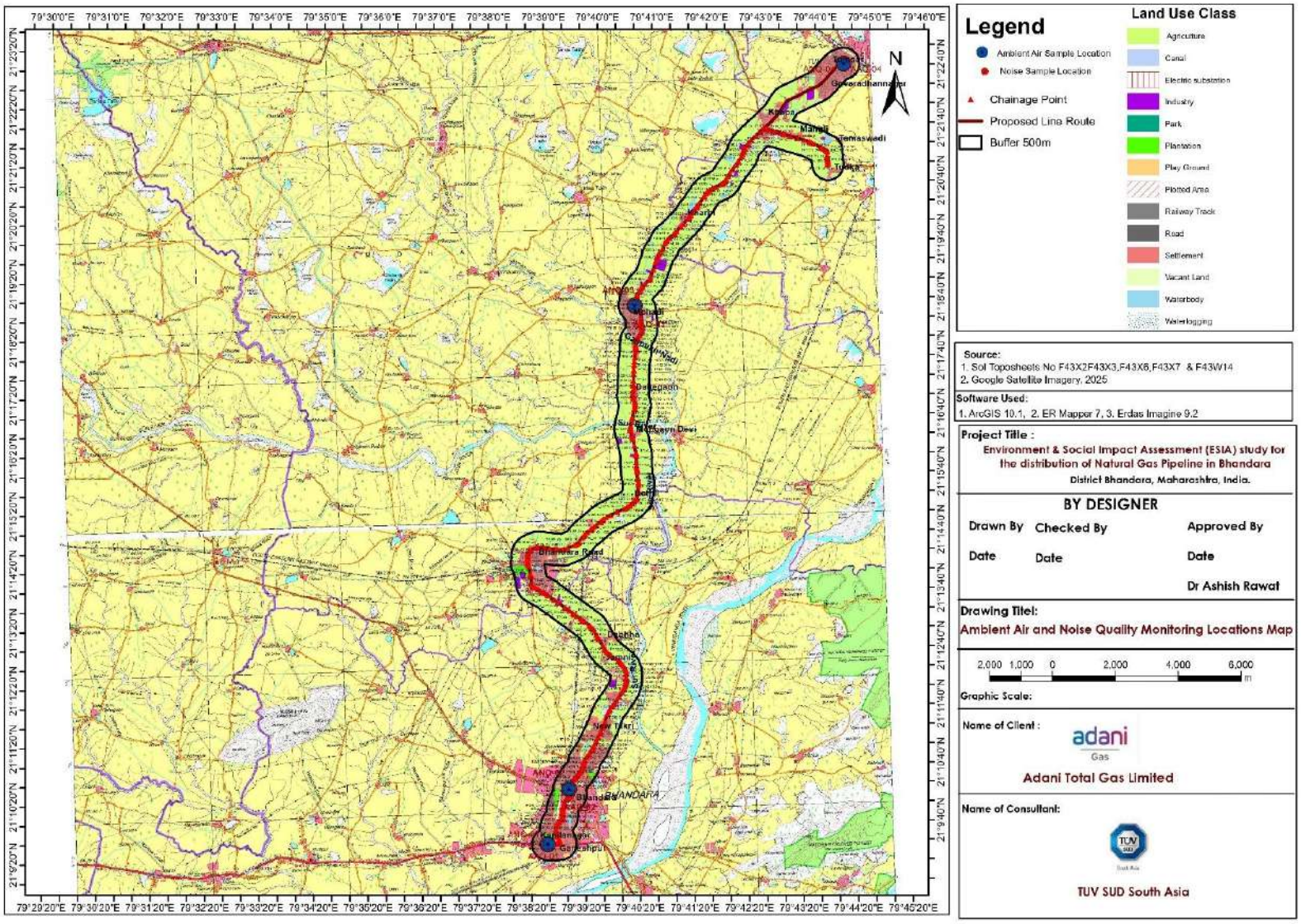
4.6.8 Ambient Air Quality

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

Table 4-9 and depicted in **Figure 4-22**. 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 4-10**.

Table 4-9: Ambient Air Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	AAQ-01	Near Bhandara Bus Depot at Chainage Ch-31.959	21° 9'26.12"N and 79°38'38.98"E
2.	AAQ-02	Road Crossing Near 29.599	21°10'22.38"N and 79°39'3.93"E
3.	AAQ-03	Near Mohadi Village at Chainage Ch-9.719	21°18'39.33"N and 79°40'31.84"E
4.	AAQ-04	Near Tumsar Bus stand at Chainage Ch-3.368	21°22'42.96"N and 79°44'30.11"E



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-22: Ambient Air and Noise Monitoring Locations within Project AOI

Table 4-10: Air Quality Analysis Result

Sl. No.	Parameter	Unit	AAQ-01	AAQ-02	AAQ-03	AAQ-04	NAAQS Standard
1.	Particulate Matter-10 (PM-10)	µg/m³	23.3	26.2	24.2	23.8	**100**
2.	Particulate Matter-2.5 (PM- 2.5)	µg/m³	7.0	7.4	7.6	8.2	**60**
3.	Sulphur Dioxide (SO2)	µg/m³	7.9	7.8	7.1	7.50	**80**
4.	Nitrogen Dioxide (NO2)	µg/m³	8.55	8.30	8.43	8.64	**80**
5.	Ozone (O3) -8Hr.	µg/m³	12.9	14.7	4.4	13.9	**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	0.15	0.18	0.14	0.17	**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	0.17	0.11	0.19	0.14	**20**
Air Quality Index			**(23) Good**	**(26) Good**	**(24) Satisfactory**	**(24) Satisfactory**	

Analysis of Result:

AAQ monitoring results for all four locations were assessed against NAAQS in 2009. Trace metals such as Pb, As, and Ni were found in negligible concentrations, and Ammonia (NH_3) levels were below detection limits. The concentration of the primary pollutant in the project location is such that:

Particulate Matter (PM10 & PM2.5)

- **PM10**: All stations report PM10 levels between 23.3 µg/m³ and 26.2 µg/m³, which are below the 24-hour NAAQS limit of 100 µg/m³.
- **PM2.5**: The PM2.5 concentrations range from 7 µg/m³ to 8.2 µg/m³, well below the 24-hour NAAQS limit of 60 µg/m³.

Gaseous Pollutants

- **Sulphur Dioxide (SO_2)**: Measured levels are between 7.1 µg/m³ and 7.9 µg/m³, significantly lower than the 24-hour NAAQS limit of 80 µg/m³.
- **Nitrogen Dioxide (NO_2)**: Concentrations range from 8.30 µg/m³ to 8.64 µg/m³, well below the 24-hour NAAQS limit of 80 µg/m³.
- **Ozone (O_3)**: The 8-hour average ozone levels are between 4.4 µg/m³ and 14.7 µg/m³, which are below the 8-hour NAAQS limit of 100 µg/m³.
- **Carbon Monoxide (CO)**: CO concentrations range from 0.14 mg/m³ to 0.18 mg/m³, well within the 8-hour NAAQS limit of 2.0 mg/m³.

The Air Quality Index (AQI) across all locations fell in the "Good" category (as per CBCB), reflecting a clean air environment with minimal health impact on the general population. Overall, the ambient air quality in the project area is considered safe. The laboratory results of the secondary baseline monitoring is enclosed in the **Annexure 11**.

4.6.9 *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 has been identified to carry out the secondary noise monitoring (as mentioned in **Table 4-11** and depicted in **Figure 4-22**) 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 4-11: Ambient Noise Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	ANQ-01	Near Bhandara Bus Depot at Chainage Ch-31.959	21° 9'26.12"N and 79°38'38.98"E
2.	ANQ-02	Road Crossing Near 29.599	21°10'22.38"N and 79°39'3.93"E
3.	ANQ-03	Near Mohadi Village at Chainage Ch-9.719	21°18'39.33"N and 79°40'31.84"E
4.	ANQ-04	Near Tumsar Bus stand at Chainage Ch-3.368	21°22'42.96"N and 79°44'30.11"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 4-12**.

Table 4-12: Ambient Noise Quality Monitoring Result

Sl. No.	Location	Location Code	Results in Db(A) Leq	
			Average Day Noise Level	Average Night Noise Level
1	Near Bhandara Bus Depot at Chainage Ch-31.959	ANQ-01	49.3	38.8
2	Road Crossing Near 29.599	ANQ-02	50.1	39.3
3	Near Mohadi Village at Chainage Ch-9.719	ANQ-03	49.9	40.4
4	Near Tumsar Bus stand at Chainage Ch-3.368	ANQ-04	51.4	41.1
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

Ambient noise levels were monitored at four locations along the project corridor. The average daytime noise levels ranged from 49.3 dB(A) to 51.4 dB(A), and the average nighttime levels ranged from 38.8 dB(A) to 41.1 dB(A). All recorded noise levels remained well within the prescribed CPCB limits of 65 dB(A) for daytime and 55 dB(A) for nighttime for industrial or commercial zones. The highest noise levels were

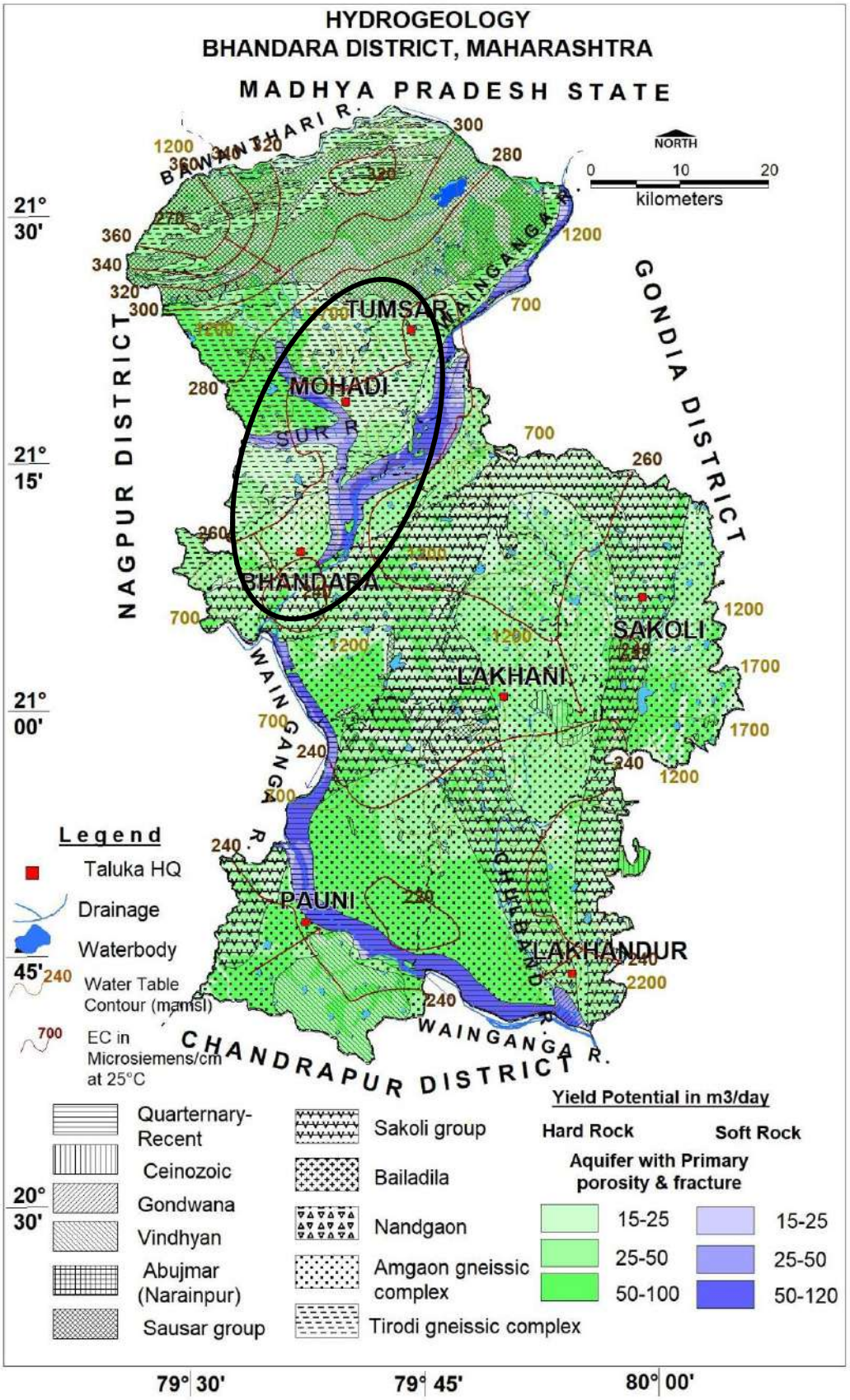
observed at ANQ-3 (51.4 dB during the day), which lies Near Tumsar Bus stand, but this still complies with the CPCB threshold. The results indicate that the ambient noise environment in the study area is currently within acceptable limits, posing no significant noise pollution concern. The laboratory results of the secondary baseline monitoring are enclosed in the Error! Reference source not found.

4.6.10 Hydrogeology and Ground Water Table

4.6.10.1 Hydrogeology

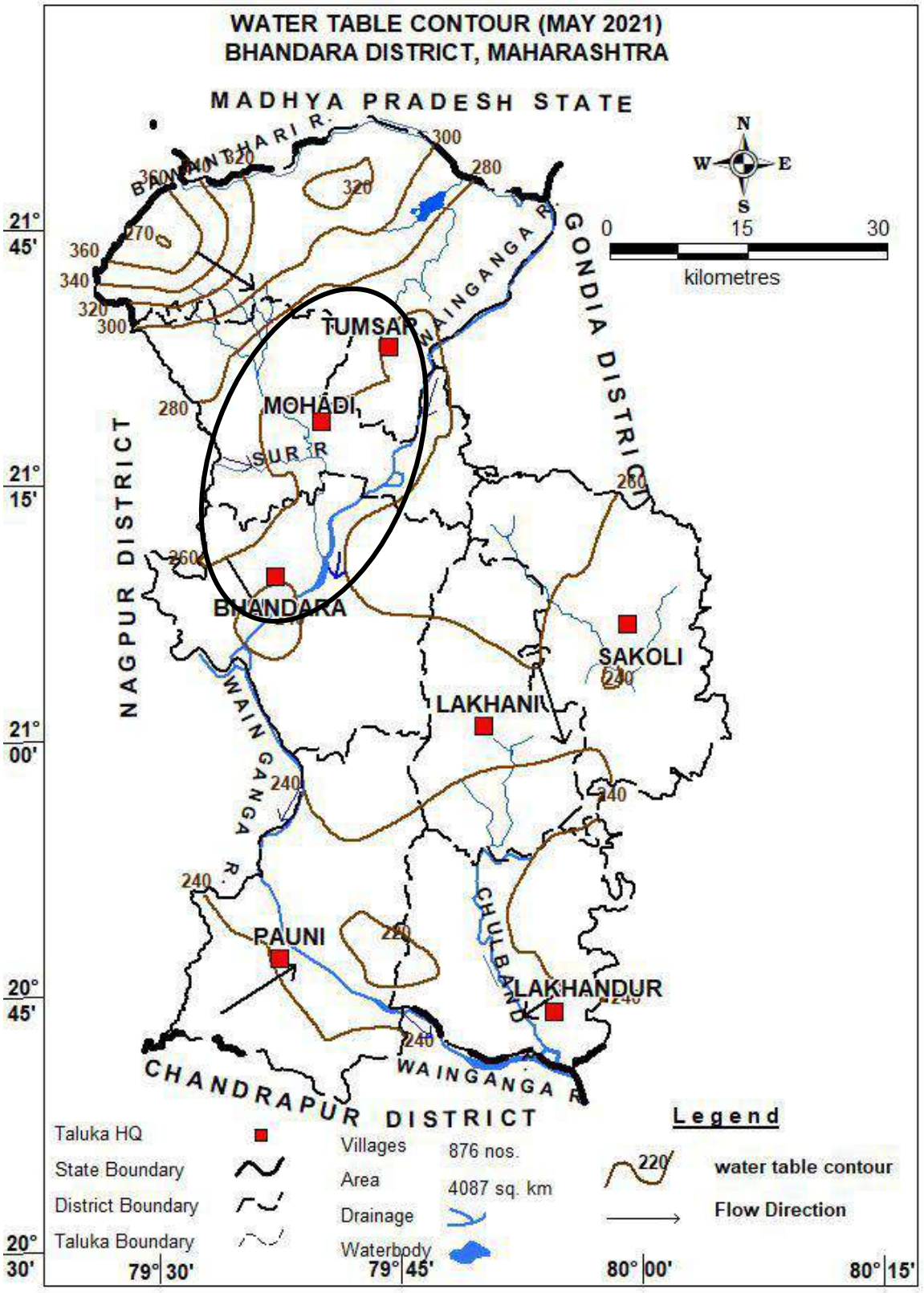
The major water-bearing geological formations in the district are Alluvium, Gondwana Kamthi Sandstone, Vindhyan Sandstone/shales and Archaean metamorphic and crystalline rocks. Amongst these, Kamthi sandstone and alluvium are very rich in ground water potential. The alluvium consisting of clay, Silt, Sand and Gravel occurs along the course of major rivers. A map depicting hydrogeological features of Bhandara is presented in **Figure 4-23.**

Based on the Pre-monsoon water level data, a Pre-monsoon water table contour map as presented in **Figure 4-24**. The map depicts the occurrence and movement of ground water in the district. The ground water flow lines are marked to show the direction of ground water flow. The elevation of water table ranges from 215 to 370 m amsl and generally follows the topography. In general, the ground water movement is towards the south and southeast. The ground water movement is generally sluggish in the alluvial areas with high permeable zones and in the areas of convergent ground water flow. Such areas have been demarcated as ground water potential zones. In area of low permeability, the water table contours are closely spaced indicating steep gradient.



Source: Aquifer Map and Management Plan, Bhandara District

Figure 4-23: Hydrogeological Map of Bhandara District (Project Study Area-in Black)

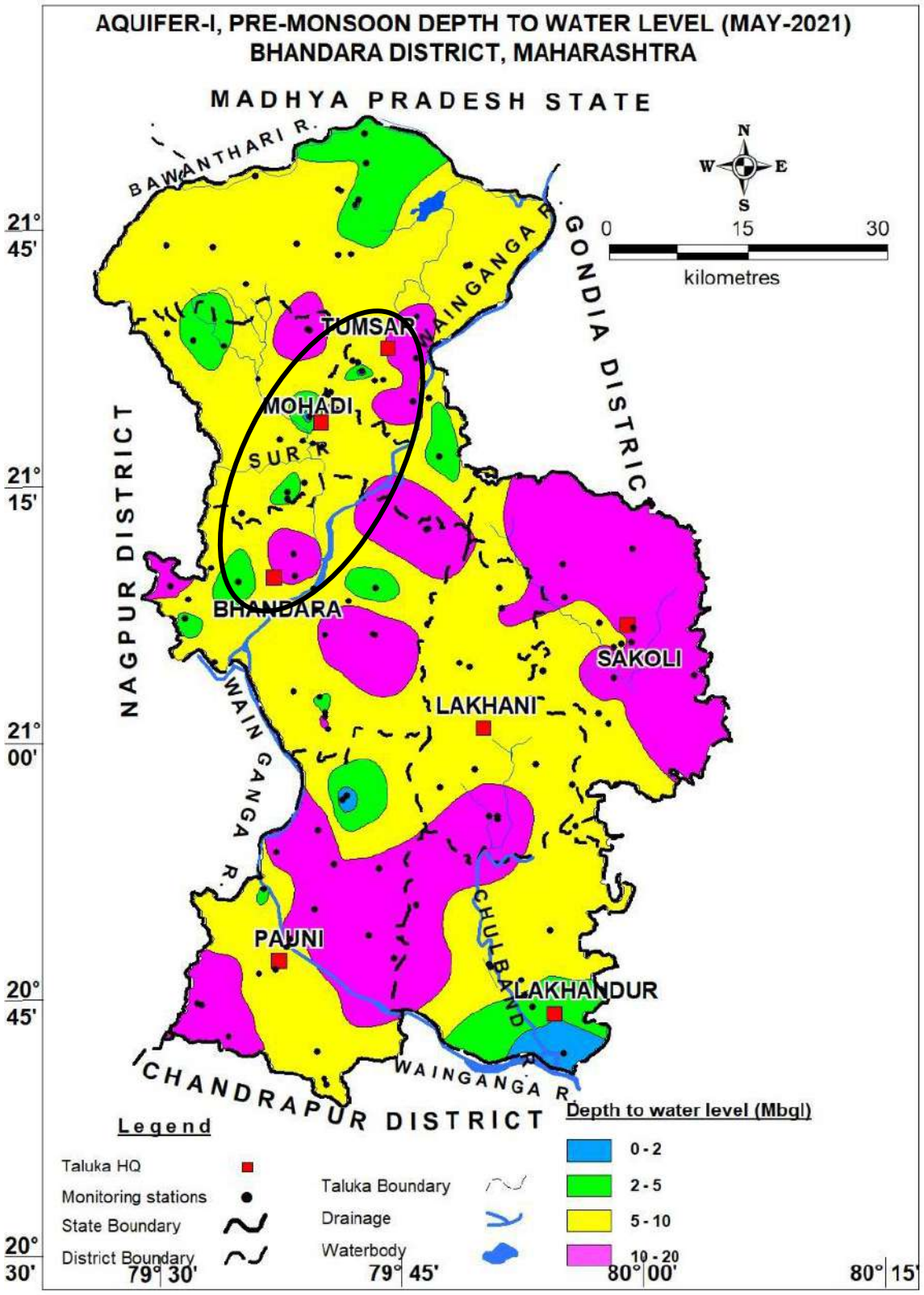


**Source: Aquifer Map and Management Plan, Bhandara District*

Figure 4-24: Water Table Contour, Bhandara district l Map of Bhandara District (Black Area- Project Study Area)

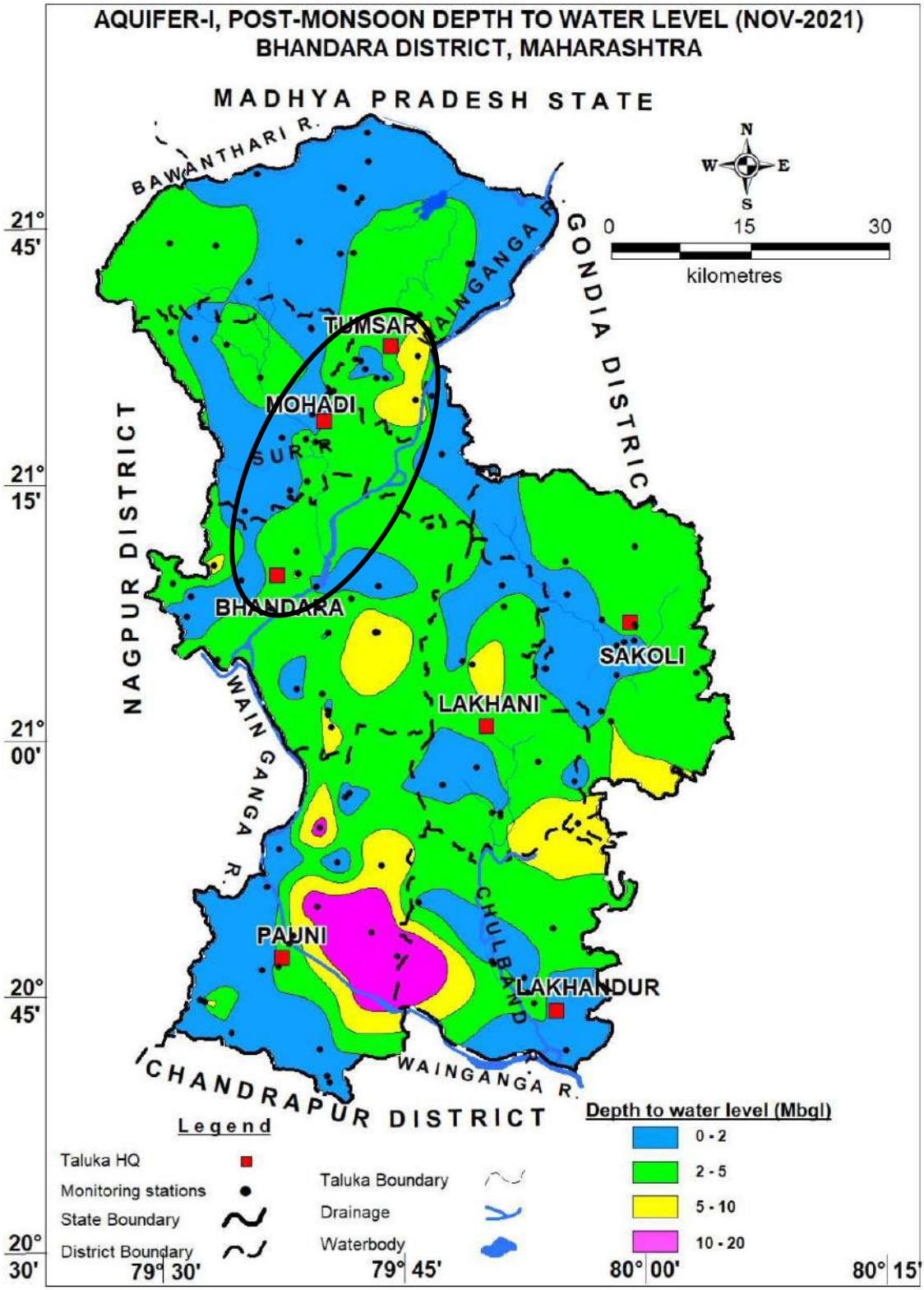
DEPTH TO WATER LEVEL

Water levels between 5 and 10 mbgl during the pre-monsoon have been observed in a major part of the district covering about 2506 sq. km. Water levels between 2-5 mbgl have been observed in major parts of the district covering 2144 sq. km. area. Water levels between 5 and 10 mbgl are observed post monsoon as isolated patches in the southern part of the district covering about 364 sq. km. area. Maps indicating depth to water level during pre-monsoon & post-monsoon have been depicted in **Figure 4-25** and **Figure 4-26**.



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

Figure 4-25: Pre-Monsoon Water Level, Bhandara District (Project Study Area demarcated in "Black")



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

Figure 4-26: Post-Monsoon Water Level, Bhandara District (Project Study Area demarcated in Black)

GROUND WATER RESOURCES

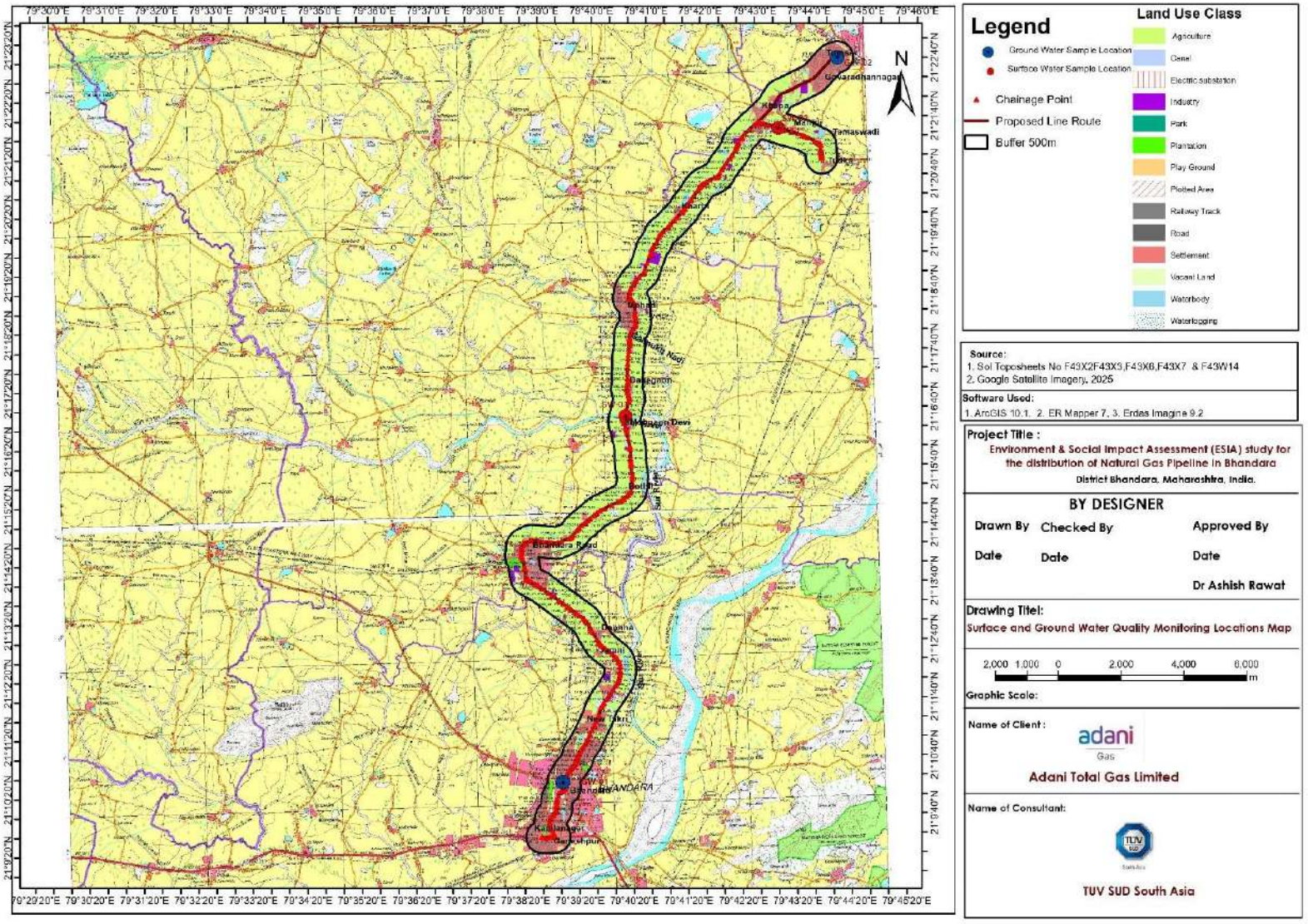
The overall stage of ground water development for the Akola district is 43.44%. Block wise assessments indicate that all the blocks in the district fall under "**Safe**" category.

4.6.10.2 Ground Water Quality

To conduct the ground water monitoring in project study area, three (03) locations have been identified as mentioned in the **Table 4-13** and depicted in **Figure 4-27** 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 4-14.**

Table 4-13: Ground Water Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	GWQ-1	Near Tumsar Bus stand at Chainage Ch-3.368	21°22'42.96"N and 79°44'30.11"E
2.	GWQ-2	Road Crossing Near Chainage Ch-29.599	21°10'22.38"N and 79°39'3.93"E



**Source: TÜV SÜD GIS Mapping Study*

Figure 4-27: Surface and Groundwater Quality Monitoring Locations

Table 4-14: Ground Water Quality Monitoring Result

Sl. No.	Parameter	Unit	GWQ-1	GWQ-2	Limits (as per IS:10500-2012)	
					Desirable Limit	Permissible Limit
1	Color	--	0.1	0.1	--	--
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable
4	Temperature	^oC	22.6	22.5	-	-
5	pH	-	7.34	7.38	6.5-8.5	No Relaxation
6	Electric Conductivity	µhos/cm	880	945	-	-
7	Total Hardness (as $CaCO_3$)	mg/l	248.8	318	200	600
8	Iron (as Fe)	mg/l	0.18	0.18	0.3	No Relaxation
9	Chlorides (as Cl)	mg/l	146.3	156.7	250	1000
10	Fluoride (as F)	mg/l	0.12	0.08	1	1.5
11	TDS	mg/l	528	567	500	2000
12	Calcium (as Ca^{2+})	mg/l	46.8	50.7	75	200
13	Magnesium (as Mg^{2+})	mg/l	32.2	32.1	30	100
14	Sulphate (as SO_4)	mg/l	35.3	38.8	200	400
15	Nitrate (as NO_3)	mg/l	26.9	26.9	45	No Relaxation
16	Alkalinity (as $CaCO_3$	mg/l	322.1	334.1	200	600
Bacteriological Parameter						
1	Total Coli form	Cfu/100gm	Not Detected (<2)	Not Detected (<2)	MPN/100ml	Shall Not Be Detectable
2	E. coli	Cfu/100g	Absent	Absent	E. coli/100ml	Shall Not Be Detectable

Analysis of Results:

1. **Physical and Chemical Parameters**: Both GWQ-1 and GWQ-2 samples fall within the desirable limits for most parameters. However, some parameters exceed the desirable limits:
   - **Total Hardness**: Both samples exceed the desirable limit of 200 mg/l, with GWQ-1 at 248.8 mg/l and GWQ-2 at 318 mg/l. Whereas both the parameters are within the permissible limit of 600 mg/l.
   - **TDS (Total Dissolved Solids)**: Both samples exceed the desirable limit of 500 mg/l, with GWQ-1 at 528 mg/l and GWQ-2 at 567 mg/l. The permissible limit is 2000 mg/l.
   - **Calcium**: Both samples exceed are within the desirable limit of 75 mg/l, with GWQ-1 at 46.8 mg/l and GWQ-2 at 50.7 mg/l. The permissible limit is 200 mg/l.
   - **Magnesium**: Both samples exceed the desirable limit of 30 mg/l, with GWQ-1 at 32.2 mg/l and GWQ-2 at 32.1 mg/l. The permissible limit is 100 mg/l.
2. **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 Error! Reference source n ot found.

4.6.11 Surface Water Quality

Total Two (02) locations have been identified (as mentioned in the **Table 4-15** and map depicted in **Figure 4-27**. 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 4-16.

Table 4-15: Surface Water Quality Monitoring Locations

Sl. No.	Location code	Location Name	Coordinates
1.	SWQ-1	Sur River Near Ch-13.59	21°16'38.61"N 79°40'24.59"E
2.	SWQ-2	Lined Canal near Chainage Ch-1.8 km	21°21'31.54"N 79°43'22.90"E

Table 4-16: Surface Water Quality Monitoring Result

Sl. No.	Parameter	Unit	Result	
			SWQ-1	SWQ-2
1	Turbidity	NTU	4.4	4.0
2	pH (at 25°C)	-	7.26	7.29
3	Conductivity,	µS/cm	578	694
4	Total Dissolve Solids	mg/l	345	415
5	Total Hardness as $CaCO_3$	mg/l	222	234.8
6	Calcium as Ca	mg/l	45.7	44.7
7	Magnesium as Mg	mg/l	26.3	29.8
8	Sodium as Na	mg/l	98.8	94.6
9	Potassium as K	mg/l	59.8	62.4
10	Chloride as Cl	mg/l	188.0	189.9
11	Sulphate as SO_4	mg/l	44.5	76.2
12	Nitrate as NO_3	mg/l	36.0	37.7
13	Total Alkalinity as $CaCO_3$	mg/l	267	268.8
14	Fluoride	mg/l	0.10	0.09
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	5.65	5.6
28	Total Suspended Solid	mg/l	15.4	27.5
29	Total Solid	mg/l	448.4	454.4
30	Chemical Oxygen Demand as O_2	mg/l	32.4	34
31	BOD, 3 days @27°C as O_2	mg/l	8.9	9
32	Oil & Grease	mg/l	<0.01	<0.01
33	Total Coliform	MPN/100 ml	10	08

Analysis of Results:

Both SWQ-1 and SWQ-2 samples meet the physical and chemical quality standards set by IS 10500:2012 for drinking water. However, the presence of total coliforms in both samples suggests potential microbiological contamination, which requires attention. The laboratory results of the secondary baseline monitoring are enclosed in the **Annexure 11.**

4.7 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.

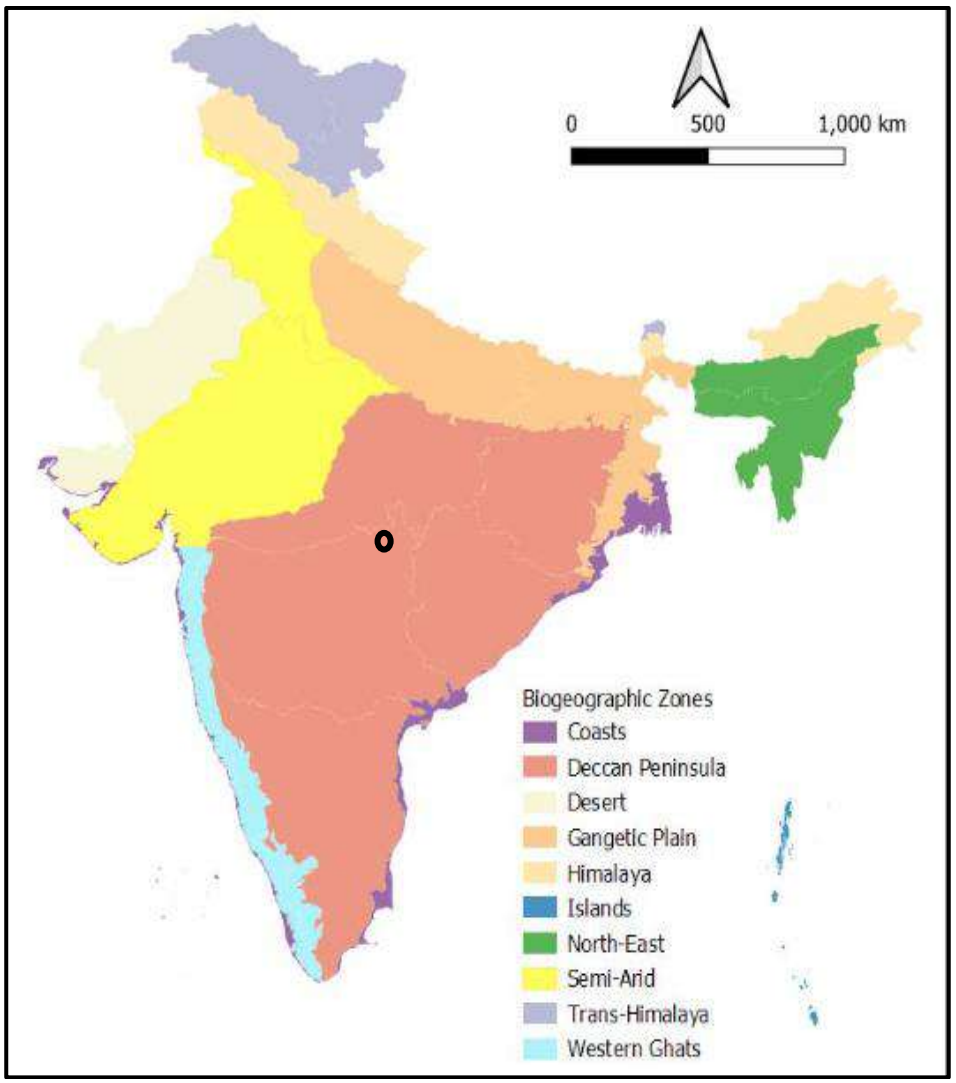
4.7.1 Scope and Objectives

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.

4.7.2 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 4-28**).



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

Figure 4-28: Biogeographic Regions of India

4.7.3 Methodology for Ecological Survey

4.7.3.1 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

4.7.3.2 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.

4.7.3.3 Study of Ecological Habitat

4.7.3.3.1 Forests

Maharashtra's ecological habitat is characterized by a diverse range of ecosystems, including mangrove swamps, deep forests of the Western Ghats, and various river systems. The state's geography, with its plateau character and mountainous regions, contributes to the rich biodiversity found in its habitats. The Narmada, Tapti, Godavari, and Krishna rivers are major river systems that support a variety of flora and fauna, making Maharashtra a hotspot for ecological research and conservation efforts.

As per the Champion & Seth Classification of Forest types (1968), the forests in Bhandara district belong to Southern Tropical Dry Deciduous Forests. Bhandara district has a total area of 9,383.6 sq. km. out of which 45.81 per cent is forest area. Out of the total forest area in the district, 31.24 per cent is under reserved forests, 50.41 per cent under protected forests and the remaining 18.35 per cent is unclassed forest area. Of the forest areas in the district 81.65 per cent is under the management of the Forest Department and 18.35 per cent under the Revenue Department. None of the area under the proposed pipeline route passes through the forest area.

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4.7.3.3.2 Scrubland

This type of vegetation is extensively found in non-cultivated lands, particularly revenue lands/grazing land located within the study area. In Bhandara, Scrubland it has been observed to be decreasing over time. A study using remote sensing and GIS techniques indicated that scrubland areas decreased by 2.04 km² between 2011-12 and 2015-16. This reduction includes both closed and open scrublands, with open scrublands seeing a larger decrease.

4.7.3.3.3 Cropping Pattern of Study Area

The cropping pattern of Bhandara district in Maharashtra is predominantly shaped by its agro-climatic conditions and irrigation availability. The district is known for its extensive paddy (rice) cultivation, which is the major crop grown during the Kharif season, covering the largest share of the cultivated area. Other important Kharif crops include soybean, pigeonpea (tur), and sesame, though these are grown on comparatively smaller areas. In the Rabi season, farmers cultivate wheat and gram (chickpea), while ground nuts is grown in limited areas during the summer season. The district also supports horticultural crops, with mango being the most prominent fruit, along with vegetables like brinjal, tomato, chilli, and okra. The cropping intensity is around 136%, indicating that multiple crops are grown on the same land within a year. While paddy benefits from irrigation, most other crops rely on rainfall, making the district's agriculture moderately dependent on monsoon patterns.

4.7.3.3.4 Water Bodies

Bhandara district in Maharashtra features several notable water bodies, including:

1. Rivers: For Bhadara district Wainganga River and its tributaries like Bagh, Chulbandh, Panghodi Suz, Gadhavi, Chandan, Bavanthadi are prominent rivers. Whereas, for study area the proposed pipeline crosses 2 Rivers one is Gaimukh River and other is Sur River.
2. Several lined, unlined canals and natural drains.

The list of water bodies in the study area is provided in the **Table 4-5**

4.7.3.3.5 Protected Area and Eco-sensitive Areas

The study area comprising of core and buffer zone was assessed for the presence of important wildlife habitats and protected areas, breeding and nesting habitats of fauna, important wetlands, and grassland areas from project locations and pipeline' core and buffer zones. These important areas such as Protected areas (National Park, Wildlife Sanctuaries, Conservation Reserves etc.), Wetlands of national importance, Ramsar sites, Important Bird Areas (IBAs), classified by Birdlife International and Bombay Natural History Society etc. 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 4-17**.

Table 4-17: 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 radius Study Area Nearest- Koka Wildlife Sanctuary located around 15 km of arial distance of the proposed pipeline route
Important Bird Areas (IBAs)	None within 10 km radius study area

Ecological Sensitive Habitat	Description
	Nearest- Rawanwadi lake and reservoir located approximately 16 km away from project site
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

4.7.3.3.6 Migratory Birds and Migratory Pathway

No Important Bird Area (IBA) is located within 10 km radius of the project site. India lies along the Central Asian Flyway, a global migratory pathway that connects the Palearctic (Europe and Northern Asia) to the Indian subcontinent. The birds that utilize this flyway, travel south to the Indian subcontinent between October-early December depending on the end of the monsoon season and remain in the country till February-March. Bird species travelling along the Central Asian Flyway, utilize several large water bodies across India as congregation sites or rest stops. The nearest Important Bird Area (IBA) is Rawanwadi lake and reservoir located approximately 16 km from the project site in the SE direction.

4.7.4 Floral Diversity

The present study revealed that diversity of faunal species were present in both core zone and buffer zone area up to 10 km radius of study area. Secondary data was also considered while listing the species for validation. Since open bare lands and Agri ecosystem are predominant in study areas, this region supports low plant diversity and therefore, not many large trees with sizable canopies were observed.

CORE ZONE HABITAT

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

Table 4-18: List of Floral species in Study Area

S.No.	Scientific Name	Common Name	IUCN Status
1	Tridax procumbens	Daisy	Least Concern
2	Calotropis gigantea	Giant Milkweed	Data Deficient
3	Evolvulus alsinoides	Dwarf Morning Glory	Data Deficient
4	Ipomoea obscura	Obscure Morning Glory	Data Deficient
5	Mangifera indica	Mango	Least Concern
6	Catharanthus roseus	Madagascar periwinkle	Least Concern
7	Jatropha gossypiifolia	Bellyache Bush	Least Concern
8	Vanda tessellata	Grey Orchid	Least Concern
9	Clitoria ternatea	Butterfly Beam	Not Evaluated
10	Nymphoides indica	Indian Marshwort	Least Concern
11	Ocimum tenuiflorum	Tulsi	Least Concern
12	Acalypha wilkesiana	Copper leaf	Least Concern
13	Azadirachta indica	Neem	Least Concern
14	Ficus racemosa	Audumbara	Least Concern
15	Coldenia procumbens	Tripankhi	Least Concern
16	Subgenus Leptostemonum	Bitter Brinjal	Least Concern
17	Nerium oleander	Kanher	Least Concern

S.No.	Scientific Name	Common Name	IUCN Status
18	Antigonon leptopus	Icecream flowers	Data Deficient
19	Lantana camara	Gold Mound	Least Concern
20	Gaillardia pulchella	Firewheel	Least Concern
21	Ficus benghalensis	Banyan	Least Concern
22	Portulaca oleracea	Purslane	Least Concern
23	Ceiba pentandra	White Silk-Cotton Tree	Least Concern
24	Annona squamosa	Custard Apple	Least Concern
25	Ipomoea cairica	Cairo morning glory	Least Concern

**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*

4.7.5 Faunal Diversity

Diversity of faunal distribution shows the health of ecosystem. In this study area a total of several faunal species were observed or reported in which 7 species of mammals**,** 90 birds, 6 reptiles and 2 Amphibians were recorded**.**

4.7.5.1 Mammals

Mammals occupy higher tropical levels in many ecosystems and respond quickly to the changes in their habitats, therefore, serve 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 4-19** were predominantly recorded in the project study area.

Table 4-19: List of Mammals Species in Project Study Area

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status
Mammals				
1	*Boselaphus tragocamelus*	Nilgai	II	Least Concern
2	*Canis aureus*	Jackal	I	Least Concern
3	*Funambulus pennantii*	Five-striped Palm Squirrel	-	Least Concern
4	*Macaca mulatta*	Rhesus Macaque	-	Least Concern
5	*Pteropus giganteus*	Indian Flying Fox	II	Least Concern
6	*Sus scrofa*	Wild Boar	II	Least Concern
7	*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

4.7.5.2 Herpetofauna

The diversity of amphibian and reptilian species in an ecosystem is cumulatively called Herpetofaunal 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 4-20** and **Table 4-21**) species of herpetofauna were observed in the study area.

Table 4-20: Amphibian Species recorded in Project Study Area

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status
Amphibians				
1	*Duttaphrynus melanostictus*	Common Indian Toad	II	Least Concern
2	*Hoplobatrachus tigerinus*	Indian Bull Frog	II	Least Concern

Table 4-21: Reptiles Species recorded in Project Study Area

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status
Reptiles				
1	*Amphiesma stolatum*	Buff Striped Keelback	II	Least Concern
2	*Calotes versicolor*	Oriental Garden Lizard	-	Least Concern
3	*Daboia russelii*	Russell's Viper	I	Least Concern
4	*Fowlea piscator*	Checkered Keelback	I	Least Concern
5	*Hemidactylus frenatus*	Common House Gecko	-	Least Concern
6	*Varanus bengalensis*	Bengal Monitor Lizard	I	Near Threatened

**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

4.7.5.3 Avifauna

A total of 90 bird species were observed or reported in Bhandara district. Also, there is no Important Bird Area (IBA), Bird migratory paths and congregatory birds' locations were observed in study area. The list of avifauna observed or reported in study area is presented in **Table 4-22**[5].

Table 4-22: List of Avifaunal species in Project Study Area

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status
Avifauna				
1	*Accipiter badius*	Shikra	I	Least Concern
2	*Acridotheres tristis*	Common Myna	II	Least Concern
3	*Actitis hypoleucos*	Common Sandpiper	II	Least Concern
4	*Aegithina tiphia*	Common Iora	II	Least Concern
5	*Alcedo atthis*	Common Kingfisher	II	Least Concern
6	*Amaurornis phoenicurus*	White-breasted Waterhen	II	Least Concern
7	*Ammomanes phoenicura*	Rufous-tailed Lark	II	Least Concern
8	*Anas poecilorhyncha*	Indian Spot-billed Duck	II	Least Concern
9	*Anastomus oscitans*	Asian Openbill	II	Least Concern
10	*Anhinga melanogaster*	Oriental Darter	II	Near Threatened
11	*Anthus rufulus*	Paddyfield Pipit	II	Least Concern
12	*Ardea purpurea*	Purple Heron	II	Least Concern
13	*Ardeola grayii*	Indian Pond Heron	II	Least Concern
14	*Argya caudata*	Common Babbler	II	Least Concern
15	*Argya malcolmi*	Large Grey Babbler	II	Least Concern
16	*Argya striata*	Jungle Babbler	II	Least Concern
17	*Athene brama*	Spotted Owlet	II	Least Concern

[5] Diversity and conservation status of avifauna in the Surguja region, Chhattisgarh, India

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status
18	*Bubulcus ibis*	Cattle Egret	II	Least Concern
19	*Cacomantis passerinus*	Grey-bellied Cuckoo	II	Least Concern
20	*Caprimulgus asiaticus*	Indian Nightjar	II	Least Concern
21	*Cecropis daurica*	Red-rumped Swallow	II	Least Concern
22	*Centropus sinensis*	Greater Coucal	II	Least Concern
23	*Ceryle rudis*	Pied Kingfisher	II	Least Concern
24	*Chrysomma sinense*	Yellow-eyed Babbler	II	Least Concern
25	*Cinnyris asiaticus*	Purple Sunbird	II	Least Concern
26	*Cisticola juncidis*	Zitting Cisticola	II	Least Concern
27	*Clamator jacobinus*	Pied Cuckoo	II	Least Concern
28	*Columba livia*	Rock Pigeon		Least Concern
29	*Copsychus fulicatus*	Indian Robin	II	Least Concern
30	*Copsychus saularis*	Oriental Magpie-Robin	II	Least Concern
31	*Cuculus canorus*	Common Cuckoo	II	Least Concern
32	*Curruca crassirostris*	Eastern Orphean Warbler	II	Least Concern
33	*Curruca curruca*	Lesser Whitethroat	II	Least Concern
34	*Dendrocygna javanica*	Lesser Whistling Duck	II	Least Concern
35	*Dicrurus macrocercus*	Black Drongo	II	Least Concern
36	*Egretta garzetta*	Little Egret	II	Least Concern
37	*Elanus caeruleus*	Black-winged Kite	II	Least Concern
38	*Eudynamys scolopaceus*	Asian Koel	II	Least Concern
39	*Euodice malabarica*	Indian Silverbill	II	Least Concern
40	*Ficedula parva*	Red-breasted Flycatcher	II	Least Concern
41	*Francolinus pictus*	Painted Francolin	II	Least Concern
42	*Francolinus pondicerianus*	Grey Francolin	II	Least Concern
43	*Gallinago gallinago*	Common Snipe	II	Least Concern
44	*Halcyon smyrnensis*	White-throated Kingfisher	II	Least Concern
45	*Himantopus himantopus*	Black-winged Stilt	II	Least Concern
46	*Hirundo rustica*	Barn Swallow	II	Least Concern
47	*Hirundo smithii*	Wire-Tailed Swallow	II	Least Concern
48	*Hypothymis azurea*	Black-naped Monarch	II	Least Concern
49	*Ixobrychus cinnamomeus*	Cinnamon Bittern	I	Least Concern
50	*Ixobrychus flavicollis*	Black Bittern	II	Least Concern
51	*Lanius cristatus*	Brown Shrike	II	Least Concern
52	*Lanius schach*	Long-tailed Shrike	II	Least Concern
53	*Lanius vittatus*	Bay-backed Shrike	II	Least Concern
54	*Leptocoma zeylonica*	Purple-rumped Sunbird	II	Least Concern
55	*Lonchura punctulata*	Scaly-breasted Munia	II	Least Concern
56	*Merops orientalis*	Green Bee-eater	II	Least Concern
57	*Merops philippinus*	Blue-tailed Bee-eater	II	Least Concern
58	*Microcarbo niger*	Little Cormorant	II	Least Concern
59	*Milvus migrans*	Black Kite	II	Least Concern
60	*Mirafra erythroptera*	Indian Bushlark	II	Least Concern
61	*Motacilla maderaspatensis*	White-browed Wagtail	II	Least Concern
62	*Nettapus coromandelianus*	Cotton Pygmy-Goose	I	Least Concern
63	*Ocyceros birostris*	Indian Grey Hornbill	II	Least Concern

S. No	Scientific Name	Common Name	WPA 2022	IUCN Status
64	*Oriolus kundoo*	Indian Golden Oriole	II	Least Concern
65	*Orthotomus sutorius*	Common Tailorbird	II	Least Concern
66	*Pericrocotus cinnamomeus*	Small Minivet	I	Least Concern
67	*Phalacrocorax fuscicollis*	Indian Cormorant	II	Least Concern
68	*Ploceus philippinus*	Baya Weaver	II	Least Concern
69	*Porphyrio poliocephalus*	Grey-headed Swamphen	II	Least Concern
70	*Prinia hodgsonii*	Grey-breasted Prinia	II	Least Concern
71	*Prinia inornata*	Plain Prinia	II	Least Concern
72	*Prinia socialis*	Ashy Prinia	II	Least Concern
73	*Psilopogon haemacephalus*	Coppersmith Barbet	II	Least Concern
74	*Psittacula krameri*	Rose-ringed Parakeet	II	Least Concern
75	*Ptyonoprogne concolor*	Dusky Crag Martin	II	Least Concern
76	*Pycnonotus cafer*	Red-vented Bulbul	II	Least Concern
77	*Pycnonotus luteolus*	White-browed Bulbul	II	Least Concern
78	*Rhipidura albogularis*	Spot-breasted Fantail	II	Least Concern
79	*Saxicola caprata*	Pied Bushchat	II	Least Concern
80	*Streptopelia chinensis*	Spotted Dove	II	Least Concern
81	*Streptopelia decaocto*	Eurasian Collared Dove	II	Least Concern
82	*Streptopelia senegalensis*	Laughing Dove	II	Least Concern
83	*Streptopelia tranquebarica*	Red Collared Dove	II	Least Concern
84	*Sturnia pagodarum*	Brahminy Starling	II	Least Concern
85	*Tephrodornis pondicerianus*	Common Woodshrike	II	Least Concern
86	*Terpsiphone paradisi*	Indian Paradise-Flycatcher	II	Least Concern
87	*Tringa glareola*	Wood Sandpiper	II	Least Concern
88	*Tringa ochropus*	Green Sandpiper	II	Least Concern
89	*Vanellus indicus*	Red-wattled Lapwing	II	Least Concern
90	*Zosterops palpebrosus*	Indian White-eye	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

4.8 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.

4.8.1 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 around 20 to 50 meters from the proposed pipeline project have been considered as project impact areas. The pipeline route passes along Tukda, Mangali, Kharabi, Khapa (Tumsar), Wadegaon, Mohadi, Kalamna, Dahegaon, Mohagaon (Devi), Bothali, Shirsi, Dabha, Jamni, Hasara villages along with one Census Towns (CT) viz Warthi and two Municipal Council viz Bhandara (M CI) and Tumsar (M CI). The details of the proposed NG pipeline that passes through the line route is tabulated below:

Table 4-23: Tehsil Wise List of Villages Passing through Proposed pipeline route

S. No.	Tehsil	Village	Pipeline Route
1.	Bhandara	Shirsi	Route 01
2.		Dabha	Route 01
3.		Jamni	Route 01
4.		Bhandara (M Cl)	Route 01
5.	Mohadi	Khapa (Tumsar)	Route 01 & Route 02
6.		Wadegaon	Route 01
7.		Mohadi	Route 01
8.		Kalamna	Route 01
9.		Dahegaon	Route 01
10.		Mohagaon (Devi)	Route 01
11.		Bothali	Route 01
12.		Warthi (CT)	Route 01
13.	Tumsar	Tukda	Route 01
14.		Kharabi	Route 01 & Route 02
15.		Mangali	Route 01 & Route 02
16.		Hasara	Route 02
17.		Tumsar (M Cl)	

4.8.2 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.

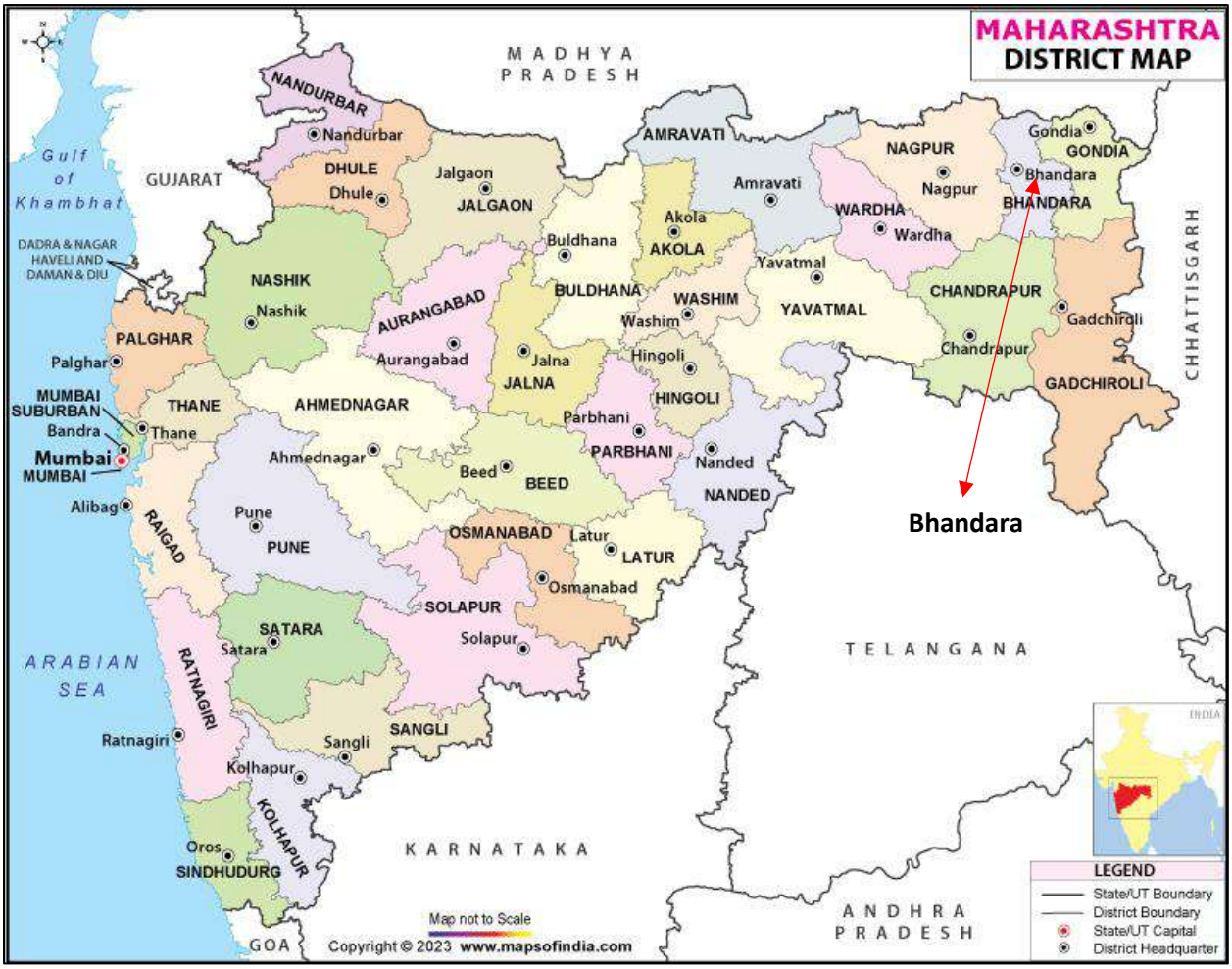
i) **Marginal Workers:** Those workers who did not work for a major part of the reference period (i.e., less than 6 months) are termed as Marginal Workers.

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.

4.9 State Profile (Maharashtra)

Maharashtra is the third largest state of India, with an area of about 3,07,713 square kilometers, occupying approximately 9.36% of the total geographical area of the country. Maharashtra is bounded by the Indian states of Gujarat to the northwest, Madhya Pradesh to the north, Chhattisgarh to the east, Telangana to the southeast, Karnataka to the south, and Goa to the southwest and by the union territory of Dadra and Nagar Haveli and the Arabian Sea to the west. It extends from the Tapi River in the north to the Krishna River in the south.

With a population of 11,23,74,333 persons as specified in the Census of India 2011, the state is second most populated of the country. Maharashtra is divided into 36 districts, which are grouped into six divisions, which also act as administrative divisions. Maharashtra is the world's second-most populous first-level administrative country sub-division. While the number of towns in the state was recorded as 378, the number of villages was 41,000. The sex ratio of the state has been recorded as 929 as against the national figure of 943. The proportion of Scheduled Caste population has been recorded as 1,32,75,898 as per 2011 Census, while the Schedule Tribe population constitutes of 10,510,213 people. As per Census 2011, Hinduism was the most followed religion in the state with 79.83 percent population followed by Muslim population accounting for 11.54 percent and minor proportions of Christians, Sikhs, Jains, Buddhists and others.



Source: Maps of India

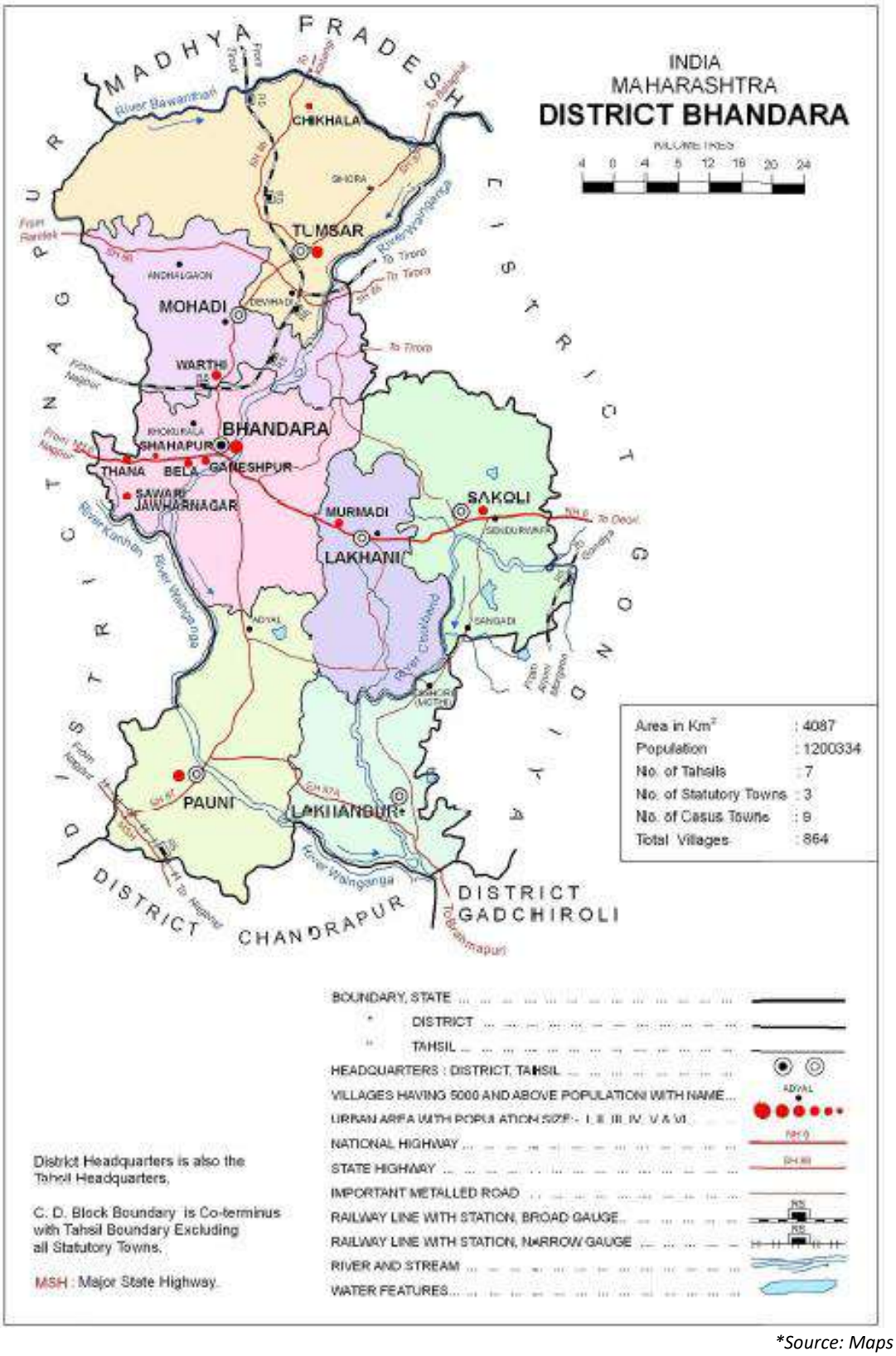
Figure 4-29: State Map of Maharashtra

4.9.1 District Profile (Bhandara)

Bhandara district is one of the districts of the Vidarbha Region in Maharashtra State. It is a newly formed district and carved out by the division of Bhandara district into Bhandara and Gondia districts in May 1999. It is situated in the northeastern part of Maharashtra between 20°38' and 21°36' North latitudes and 79°27' to 80°06' East longitudes. The total area of the district is 4087 sq. km. and falls in parts of survey of India degree sheets 55O, 55P, 64C and 64D. It is bounded on south by Chandrapur district, east by Gondia district, on north by Balaghat district of Madhya Pradesh State and on west by Nagpur district.

The district headquarters is located at Bhandara Town. For administrative purposes the district has been divided into 2 subdivisions and seven blocks. Bhandara sub-division includes Bhandara, Mohadi, Tumsar and Pauni blocks, Whereas Sakoli sub-division includes Sakoli, Lakhani and Lakhandur blocks.

Bhandara is one of the least urbanized districts of Maharashtra having about 19.5 percent of its population living in urban areas of the district. Bhandara is known as the mining district of the state for its rich mineral resources. The economy of the district is mainly dependent on agriculture, mining and forest products. In Bhandara district most of the cropped area is under rice cultivation revealing that rice is king crop of the district.



Source: Maps of India

Figure 4-30: District Map of Bhandara

4.9.2 Block Profile

The planned natural gas (NG) pipeline project passes through three blocks that include Bhandara, Mohadi and Tumsar blocks. According to the 2011 Census of India, the pipeline route also crosses 14 villages, viz Tukda, Mangali, Kharabi, Khapa (Tumsar), Wadegaon, Mohadi, Kalamna, Dahegaon, Mohagaon (Devi), Bothali, Shirsi, Dabha, Jamni, Hasara villages along with one Census Towns (CT) viz Warthi and two Municipal Council viz Bhandara (M CI) and Tumsar (M CI) encompassing both rural and urban areas.

Table 4-24 provides an overview of the area and demographic characteristics, covering both urban and rural areas of all the blocks, Census Towns (CT) and Bhandara Municipal Corporation as per Census 2011.

Table 4-24: Demographic Details

Block	Area (in Sq. Km)	No. on HH	Percent Male	Percent Female	Percent SC	Percent ST	Percent Literate
Bhandara	488.61	34,082	50.6%	49.4%	10.1%	5.9%	83.7%
Mohadi	632.32	43,845	50.7%	49.3%	21.4%	5.8%	84.8%
Tumsar	830.2	39,905	50.2%	49.8%	10.3%	13.3%	81.5%

4.10 Project Impact Area

The proposed route traverses through the 12 villages and 3 municipal towns which are Tukda, Mangali, Kharabi, Khapa (Tumsar), Wadegaon, Mohadi, Kalamna, Dahegaon, Mohagaon (Devi), Bothali, Shirsi, Dabha, Jamni, Hasara villages along with one Census Towns (CT) i.e. Warthi and two Municipal Council which are Bhandara (MCI) and Tumsar (MCI).

4.10.1 Demography

According to Census 2011 data, the demographic details of villages in the impact area highlight variations in area, population, and social composition. Kharabi recorded the largest geographical area amongst all villages while Hasar recorded the highest population amongst villages. Bhandara reported the highest population amongst the urban areas. Schedule Caste population was recorded in all villages with Hasara recording the highest proportion of SCs amongst all villages/towns in the project impact area accounting for 34.8 percent of total population. Schedule Tribe population was also reported in almost all villages with the exception of Tudka village. Mohadi reported the highest proportion of ST population accounting for 19.3 percent of its total population, while the rest of the villages/towns recorded marginal proportion of STs depicted in **Table 4-25.**

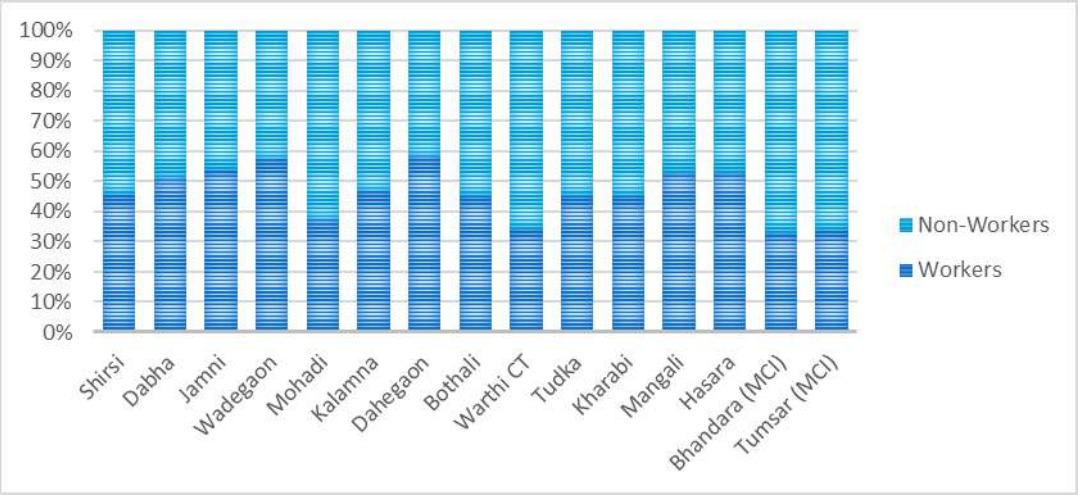
Table 4-25: Demography- Project Impact Area

Village	Area *(in Ha)*	No. on HH	Tot Pop	Percent Male	Percent Female	Percent SC	Percent ST	Literacy rate
Shirsi	444.29	368	1,640	51.5	48.5	8.5	0.5	40.1
Dabha	233.18	401	1,792	51.0	49.0	8.9	1.6	38.9
Jamni	272.76	107	466	51.3	48.7	10.9	7.7	34.2
Wadegaon	407	319	1,387	50.0	50.0	3.9	1.4	34.5
Mohadi	230.98	1,530	6,635	49.8	50.2	6.7	19.3	40.1
Kalamna	234.14	240	1,023	50.5	49.5	6.8	4.7	36.3
Dahegaon	317.18	233	1,041	50.2	49.8	1.6	0.6	38.4
Bothali	274.04	185	811	51.2	48.8	3.1	1.0	39.0
Warthi CT	436	3,065	13,058	50.8	49.2	28.1	2.0	42.7
Tudka	339.58	232	1,048	45.2	54.8	7.2	0	39.8

Village	Area *(in Ha)*	No. on HH	Tot Pop	Percent Male	Percent Female	Percent SC	Percent ST	Literacy rate
Kharabi	650.74	452	1,919	51.5	48.5	3.4	1.5	37.4
Mangali	256.56	319	1,571	50.3	49.7	11.4	0.7	37.3
Hasara	461.95	596	2,638	50.1	49.9	34.8	0.3	41.7
Bhandara (MCl)	1680	20,429	91,845	50.5	49.5	16.4	5.1	44.3
Tumsar (MCl)	740	10,057	44,869	50.3	49.7	15.7	2.3	43.8

4.10.2 Working Population

Figure 4-31 provides details of the working and non-working populations in villages within the project impact area, based on Census 2011. Analysis of data suggests that the average working population was lower than the proportion of non-workers with an average of 46 percent of the population reporting as working. Dahegaon recorded the highest proportion of working population with 58 percent of the total population recorded as working. Almost all the municipal areas recorded lower proportions of workers accounting for less than 40 percent of the population as recorded in Bhandara (MCl), Tumsar(MCT), Warthi (CT) and Mohadi.



**Source: Census,2011*

Figure 4-31: Segregation of Working and Non-working Population

Analysis of the working population in the project impact area reveals a higher proportion of main workers as compared to marginal workers with the exception of Jamni and Kharabi village where the proportion of marginal workers were almost equivalent or more than main workers as suggested in **Figure 4-32** .

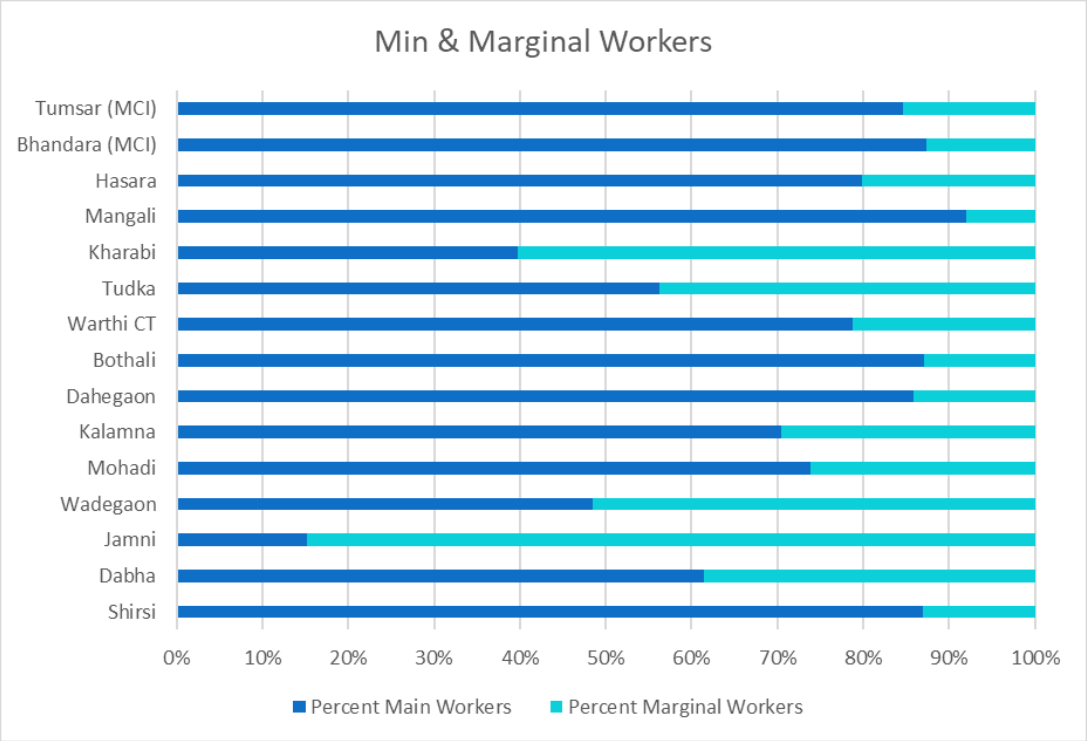
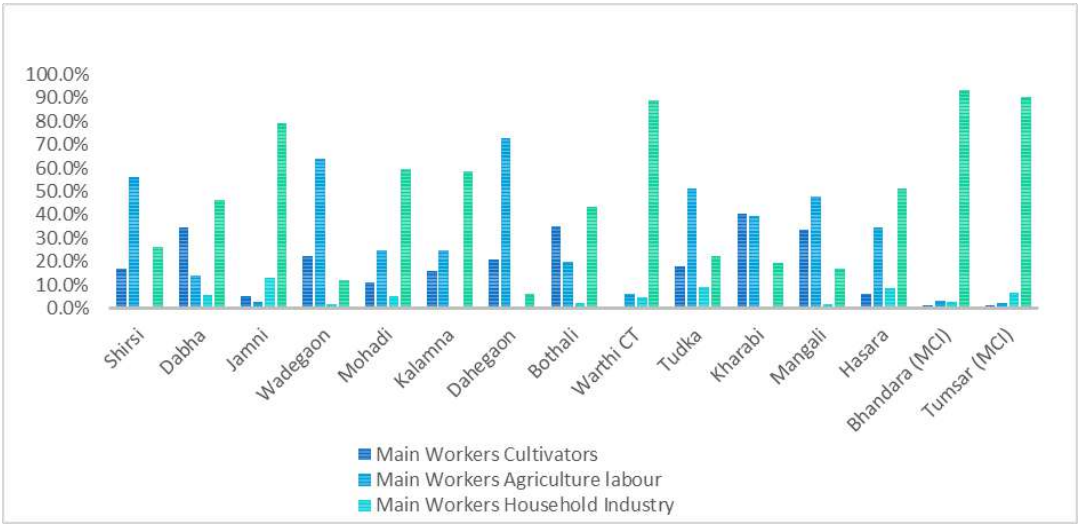


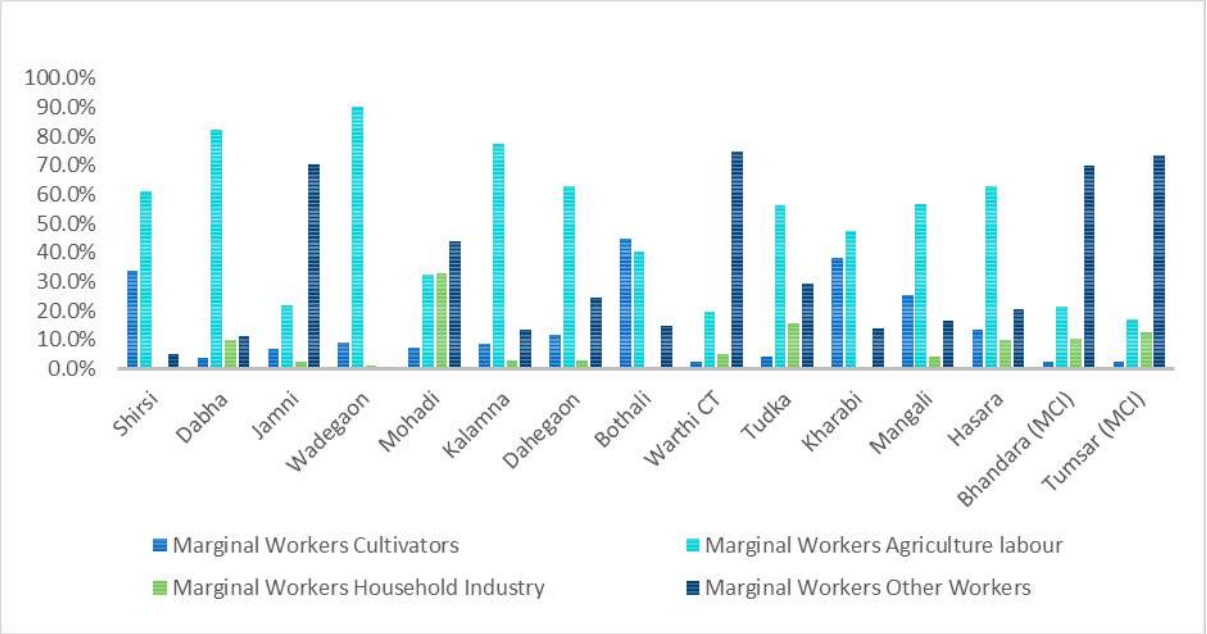
Figure 4-32: Segregation of Working Population – Main & Marginal

Figure 4-33 and **Figure 4-34** provide a snapshot of the further segregation of main and marginal workers with respect to type of occupation. While most of the villages reported comparatively higher proportion of workers (both main and marginal) engaged in agriculture activities as Cultivators and agriculture labours, urban areas recorded more proportion of workers engaged in occupational activities other than agriculture or household industries.



**Source: Census,2011*

Figure 4-33: Segregation of Main Workers as per Occupational Activity



Source: Census,2011

Figure 4-34: Segregation of Marginal Workers as per Occupational Activity

4.10.3 Education Facilities

Table 4-26 provides details of educational facilities in villages located along the proposed pipeline route. Almost all villages reportedly have primary and pre-primary schools or are present within 5 km distance. All the urban areas (municipal areas and towns) reportedly have all educational facilities available till college education.

Table 4-26: Educational Facilities- Project Impact Area

Village	Pre-primary	Primary	Middle	Secondary	Higher Secondary
Shirsi	3	1	1	less than 5 Kms	less than 5 Kms
Dabha	3	1	1	0	less than 5 Kms
Jamni	2	1	less than 5 Kms	less than 5 Kms	less than 5 Kms
Khapa	less than 5 Kms	1	within 5-10 kms	within 5-10 kms	within 5-10 kms
Wadegaon	2	1	1	within 5-10 kms	within 5-10 kms
Mohadi	7	3	3	3	3
Kalamna	2	1	1	less than 5 Kms	less than 5 Kms
Dahegaon	2	1	less than 5 Kms	less than 5 Kms	less than 5 Kms
Mohagaon (Devi)	3	2	1	1	within 5-10 kms
Bothali	2	1	1	less than 5 Kms	less than 5 Kms
Tudka	2	1	less than 5 Kms	less than 5 Kms	within 5-10 kms
Kharabi	3	1	1	less than 5 Kms	less than 5 Kms
Mangali	3	2	1	within 5-10 kms	within 5-10 kms
Mangali	3	2	1	within 5-10 kms	within 5-10 kms
Hasara	3	2	1	less than 5 Kms	less than 5 Kms

Source: Census,2011

4.10.4 Health Facilities

Table 4-27 provides availability of water sources across the project impact area, which highlights a mix of infrastructure and natural resources. Tap water is accessible in most villages except Shahpur, Kahlwan, Hazara and Arjanwal. All villages in the project impact area reportedly lack access to well water facilities except Jagral, Udesian and Sarmastpur.

Table 4-27: Health Facilities- Project Impact Area

Village Name	Community Health Centre	Primary Health Centre	Primary Health Sub Centre	Maternity and Child Welfare Centre
Shirsi	more than 10 kms	within 5-10 kms	1	within 5-10 kms
Dabha	within 5-10 kms	within 5-10 kms	within 5-10 kms	within 5-10 kms
Jamni	within 5-10 kms	within 5-10 kms	less than 5 Kms	within 5-10 kms
Khapa	within 5-10 kms	within 5-10 kms	less than 5 Kms	within 5-10 kms
Wadegaon	within 5-10 kms	within 5-10 kms	1	within 5-10 kms
Mohadi	1	within 5-10 kms	1	1
Kalamna	more than 10 kms	within 5-10 kms	1	within 5-10 kms
Dahegaon	more than 10 kms	less than 5 Kms	less than 5 Kms	less than 5 Kms
Mohagaon (Devi)	more than 10 kms	within 5-10 kms	1	within 5-10 kms
Bothali	more than 10 kms	less than 5 Kms	less than 5 Kms	less than 5 Kms
Tudka	within 5-10 kms	within 5-10 kms	less than 5 Kms	within 5-10 kms
Kharabi	within 5-10 kms	within 5-10 kms	1	within 5-10 kms
Mangali	within 5-10 kms	within 5-10 kms	within 5-10 kms	within 5-10 kms
Mangali	within 5-10 kms	within 5-10 kms	within 5-10 kms	within 5-10 kms
Hasara	within 5-10 kms	within 5-10 kms	less than 5 Kms	within 5-10 kms

Source: Census,2011

4.10.5 Drinking Water Facilities

Table 4-28 provides availability of water sources across the project impact area, which highlights a mix of infrastructure and natural resources. Tap water is accessible in most villages except Shahpur, Kahlwan, Hazara and Arjanwal. All villages in the project impact area reportedly lack access to well water facilities except Jagral, Udesian and Sarmastpur.

Table 4-28: Drinking Water Facilities- Project Impact Area

Village Name	Tap Water	Well Water	Hand Pump	Spring	River
Shirsi	Not Available	Available	Available	Not Available	Not Available
Dabha	Not Available	Available	Available	Not Available	Not Available
Jamni	Not Available	Available	Available	Not Available	Available
Khapa	Not Available	Available	Available	Not Available	Not Available
Wadegaon	Available	Available	Available	Not Available	Available
Mohadi	Available	Available	Available	Not Available	Not Available
Kalamna	Available	Available	Available	Not Available	Not Available
Dahegaon	Not Available	Available	Available	Not Available	Not Available
Mohagaon (Devi)	Available	Available	Available	Not Available	Not Available

Bothali	Not Available	Available	Available	Not Available	Not Available
Tudka	Available	Available	Available	Not Available	Not Available
Kharabi	Available	Available	Available	Not Available	Not Available
Mangali	Not Available	Available	Available	Not Available	Not Available
Mangali	Not Available	Available	Available	Not Available	Not Available
Hasara	Not Available	Available	Available	Not Available	Not Available

**Source: Census,2011*

4.11 SITE VISIT OBSERVATIONS

The social sensitivity analysis for the natural gas pipeline project proposed in the two stretches of Bhandara district indicates the proposed route of the running parallel to the village roads, district roads, state and national highway. It has also been observed that some parts of the route pass through the area where heavy movement of traffic is observed and sensitive areas like hospitals, schools and colleges fall within the proposed pipeline route. 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.

While the project is expected to bring long-term benefits such as improved energy access and reduced pollution, short-term impacts during construction (e.g., dust, noise, restricted access) may affect local communities. Early and continuous stakeholder engagement, grievance redress mechanisms, and awareness campaigns will be crucial for maintaining community support.

Key observation for the entire stretches and potential mitigation measures has been elucidated.

4.11.1 Stretch-01 (Proposed SV-27 Tudka Village to Bhandara Bus Depot)

Length of the Stretch -32.091 km

Sensitivities Identified:

- National Highway/ PWD Road/ Municipal Corporation Road: the proposed gas pipeline route traverses along the NH-247, NH-53, NH-753 and NH 543, SH-355, DR-21, PWD Road and Municipal Corporation Road and village roads.
- Railway crossing: The gas pipeline crosses through the railway crossing at the following three locations-
  - Southeastern Railway Main Line (Bhandara Road RS to Khat RS) at Ch-20477.05 m.
  - Southeastern Railway Main Line (Abandoned) (Bhandara RS to Ordnance Factory Bhandara) at ch-23153.53 m
  - Southeastern Railway Main Line (Abandoned) (Ordnance Factory Bhandara to Bhandara RS) at ch-31954.7 m
- Rivers: the pipeline passes through two prominent rivers
  - Around 35.94 m wide crossing of Gaimukh River located between the Ch-10995.22 m and Ch-11031.16 m.
  - Around 97.54 m wide crossing of Sur River located between the Ch-13602.17 m and Ch-13699.71 m.

- Canal and Drains/Nala: The gas pipeline also crosses through 11 unlined canals and 2 lined canals and total 11 drains (both natural and manmade), wherein underground laying of gas pipelines shall be done. As these canals and drains are active bodies, permission from the Water Resource Department is required for the same.
- Industry: The proposed pipeline passes through the Sunflag Iron & Steel Co. Ltd. That is a significant player in the steel industry located in Warthi CT, Shanti Steel Industry near Ch-8086.1 m at NH-543 Bhandara-Balaghat Road.
- Sensitive Receptors- Several sensitive receptors have been identified in the project vicinity, including four educational institutions (such as Shree Ganesh High School and Aanganwadi), approximately three healthcare facilities (including Prayas Hospital), and multiple colleges (e.g., ITI College, Atawale College of Social Work near Ch. 26866.03 m, and Mahila Mahavidyalaya located in Warthi). Additionally, the area comprises several religious structures (notably the Balpuri Math Mandir), the Maharashtra Milk Dairy Corporation, numerous petrol pumps, commercial establishments, retail shops, hotels, and market areas.
- Initial stretch till of the proposed pipeline traverses primarily through the cultivable areas and some villages where settlements are observed, from Ch-18960.21 m to Ch-21847.31 m densely populated Warthi CT is there. The end part of the stretch from Ch-26775.03 m to the terminating end located at Ch-31959.6 m the densely populated Bhandara Town is located where heavy traffic volume is observed (notably at the Khamad talao chowk Bhandara).
- Pipeline Alignment and Surrounding Land Use: The initial stretch of the proposed pipeline alignment primarily traverses through cultivable land and passes through several villages with observable settlements. Notably, from Ch. 18960.21 m to Ch. 21847.31 m, the alignment passes through the densely populated Warthi Census Town (CT). Towards the end of the alignment, from Ch. 26775.03 m to the terminal point at Ch. 31959.6 m, the pipeline enters the urban limits of Bhandara Town, which is characterized by high population density and significant vehicular traffic, particularly around key junctions such as Khamad Talao Chowk.

4.11.2 Line Route 02 (L-02): from Rizvi Petrol Pump to Tamsar Bus Stand

Length of Stretch -3.368 km

Sensitivities Identified:

- The 3.368 km stretch runs parallel to the National (NH-753) and other roads which mainly pass through the settlement area of the Tumsar, some cultivable land parcels, few shops and marketplace, one drain and agriculture produce market located near chainage Ch-2062.34 m.

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.
Duration: based on duration of impact and the time taken by an environmental component to	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.

Criteria	Sub-Classification	Defining Limit	Remarks
recover back to current state	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

Spread	Duration	Intensity	Likelihood	Overall Significance	
				Adverse	Beneficial
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
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	•	•			•	•			•
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

The surrounding area features a mix of flat terrains. The current land use of project study area is Dominated by agriculture (59.989% of study area), followed by settlements (25.202% of study area), roads, and waterbodies. The drainage system includes 2 major rivers Gaimukh River and Sur River, including 13 canals and 11 drains/nalas that implies that study area passes through several natural

streams (as mentioned in Section 2.2) in its right of way that helps manage runoff and the pipeline crossing may affect the surface drainage temporarily.

Receptors:

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

Embedded/In-Built Control

- Using trenchless construction methods like Horizontal Directional Drilling (HDD) for prominent peri-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		Adverse				
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, hydro testing and to sprinkle for dust suppression. 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 6 to 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 5-2**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.

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	Adverse

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 months in each FY (as mentioned in the **Section-2.5.6)** 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 the 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		Adverse				
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	Moderate	Insignificant

5.5.4 Land and Soil Environment

Impacts- Context and Receptors

Construction activities associated with pipeline laying within the Right of Way (RoW) involve excavation, backfilling, and movement of heavy machinery, which can significantly affect the land and soil environment. The removal of surface vegetation and disturbance of topsoil during trenching operations may lead to increased vulnerability to soil erosion, especially in exposed stretches. Heavy vehicle movement can compact the soil, reduce its permeability and affecting its natural structure. Additionally, improper disposal of solid waste and accidental leakage of lubricants or fuels from machinery may result in localized soil contamination. Although the excavated material is typically reinstated post-laying, the temporary loosening of soil and loss of vegetative cover can elevate sediment runoff into nearby water bodies, impacting both soil quality and downstream ecosystems.
The primary receptors include agricultural land, roadside vegetation, and nearby watercourses.

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 (HDD) for stream, canal and drain crossings, designing proper drainage systems to prevent erosion, and managing de-watering to avoid soil erosion.
- 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**, due to the combined effects of excavation, soil compaction, removal of topsoil, trenching.

Impact Significance

The significance can range from **moderate**, 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 (50 cm) 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 1 m 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 should be provided at the slopes near the irrigation and natural drainage / rivers to prevent silting of soil into these water bodies.
- 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		Adverse				
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)		Moderate				
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 project alignment lies within the RoW of existing roads, which are already disturbed environments with limited natural vegetation. As such, natural habitats, forests, and ecologically sensitive areas are largely avoided. However, minor vegetation, roadside shrubs, and small fauna may still be affected during construction. Receptors include roadside flora, small mammals, birds, insects, and aquatic life near water crossings (rivers, canals, drains).

Embedded/In-Built Control

- Shrubs removal will be limited to the minimum required for safe and efficient pipeline installation.
- 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

During the construction phase, potential environmental impacts include habitat disturbance, vegetation clearance, as well as noise and light pollution. These impacts are expected to be localized along the linear alignment of the project. The duration of these effects is anticipated to be short-term, limited to the construction period. The intensity of the impacts is assessed to be low to moderate, with a likely occurrence in the absence of appropriate control measures. Overall, the magnitude of these impacts is moderate.

Impact Significance

The significance of ecological and biodiversity impacts is considered moderate without mitigation, due to potential disturbance to local biodiversity and vegetation. With proper mitigation, the impact can be reduced to low as impacts are temporary, localized, and largely reversible.

Mitigation Measures

- Need to avoid unnecessary vegetation clearance; retain green cover wherever possible.
- Replantation of native species post-construction along the RoW should be done.
- Implementation of noise and dust control measures should be ensured.
- Night-time construction near waterbodies or vegetated areas should be avoided.
- Workers should be trained on ecological sensitivity and waste management.

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		Adverse				
Impact Type		Direct				
Impact Scale		Local (depending on density of vegetation and ecological sensitivity)				
Impact Magnitude (Without Mitigation)		Low-Medium				
Aspect	**Scenario**	**Spread**	**Duration**	**Intensity**	**Likelihood**	**Overall**
Impact on Ecology and Biodiversity	Without Mitigation	Medium	Medium	Moderate	Moderate	Moderate
	With Mitigation	Medium	Short	Low	Low	Minor

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)		Negative-Low				
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 35.459 km natural gas pipeline and CGS 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 in confined spaces (especially during CGS construction),
- 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 and CGS area),
- **Duration**: Medium (construction phase may last up to 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 at CGS.
- 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 site)				
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 operation will 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		Adverse				
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		Adverse				
Impact Type		Direct				
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)
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	Minor	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.

a) The Petroleum and Natural Gas Regulatory Board (PNGRB) was constituted under The Petroleum and Natural Gas Regulatory Board Act, 2006 (NO. 19 OF 2006) notified via Gazette Notification dated 31st March 2006. The Act provides for the establishment of Petroleum and Natural Gas Regulatory Board to protect the interests of consumers and entities engaged in specified activities relating to petroleum, petroleum products and natural gas and to promote competitive markets and for matters connected therewith or incidental thereto.

b) Further as enshrined in the act, the board has also been mandated to regulate the refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas excluding production of crude oil so as to ensure uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country. Hence the project was acquired through the bidding process and the area, number of customers, total CNG stations were already mentioned in it. So, the route selection was done within the allotted area.

Since all the requirements in the projects were predefined, scope for alternate analysis was quite slim, as to which the route passes through mix and heavily populated area, forest areas, and mostly through the

RoW of the road where the movement of heavy traffic is being observed and hence depending upon the technical and economic feasibility the proposed pipeline routes were selected.

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 to Head-Solar Vertical.

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 activities. As part of GRM.	Low	• Open Meetings, • Interactions with community at Gram Panchayat,	• As and when required

Stakeholder	Stakeholder Category	Objective of Engagement	Stakeholder Influence	Methods of Consultation and Engagement	Frequency of Consultations and Engagement
				• 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*[6]" 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.

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.

[6] 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

- 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 Bhandara is prone to natural and man-made disasters. The study area falls in Low Damage Risk Zone II (MSK VI or less) in accordance with the Earthquake Hazard map of India, Vulnerability Atlas of, 3rd edition, 2019 prepared by BMTPC.

During the construction of the site the site will at times consist of loose and/or un-compacted soil and removed or destroyed vegetative cover. During this phase temporary drainage system will have to be installed. This will consist of landforms, both trenches, and deep pits to collect and dissipate water. The temporary drainage will either be converted into permanent drainage with masonry (where co-located) or closed off after completion of the planned system.

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**.

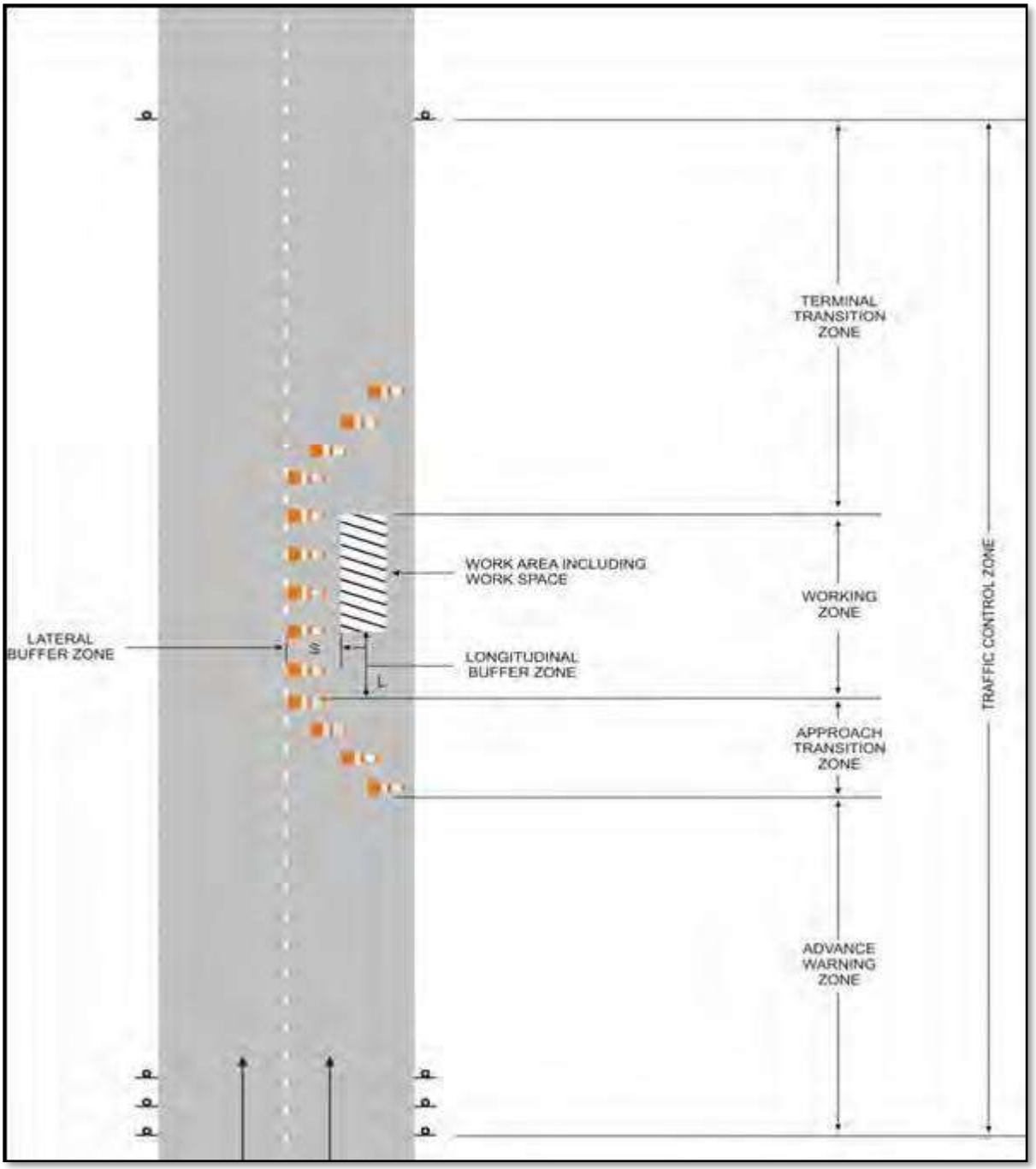


Figure 9-1: Recommended length for Construction Zones as per IRC: SP:55-2001

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 seven 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 seven stretches and its proposed diversions

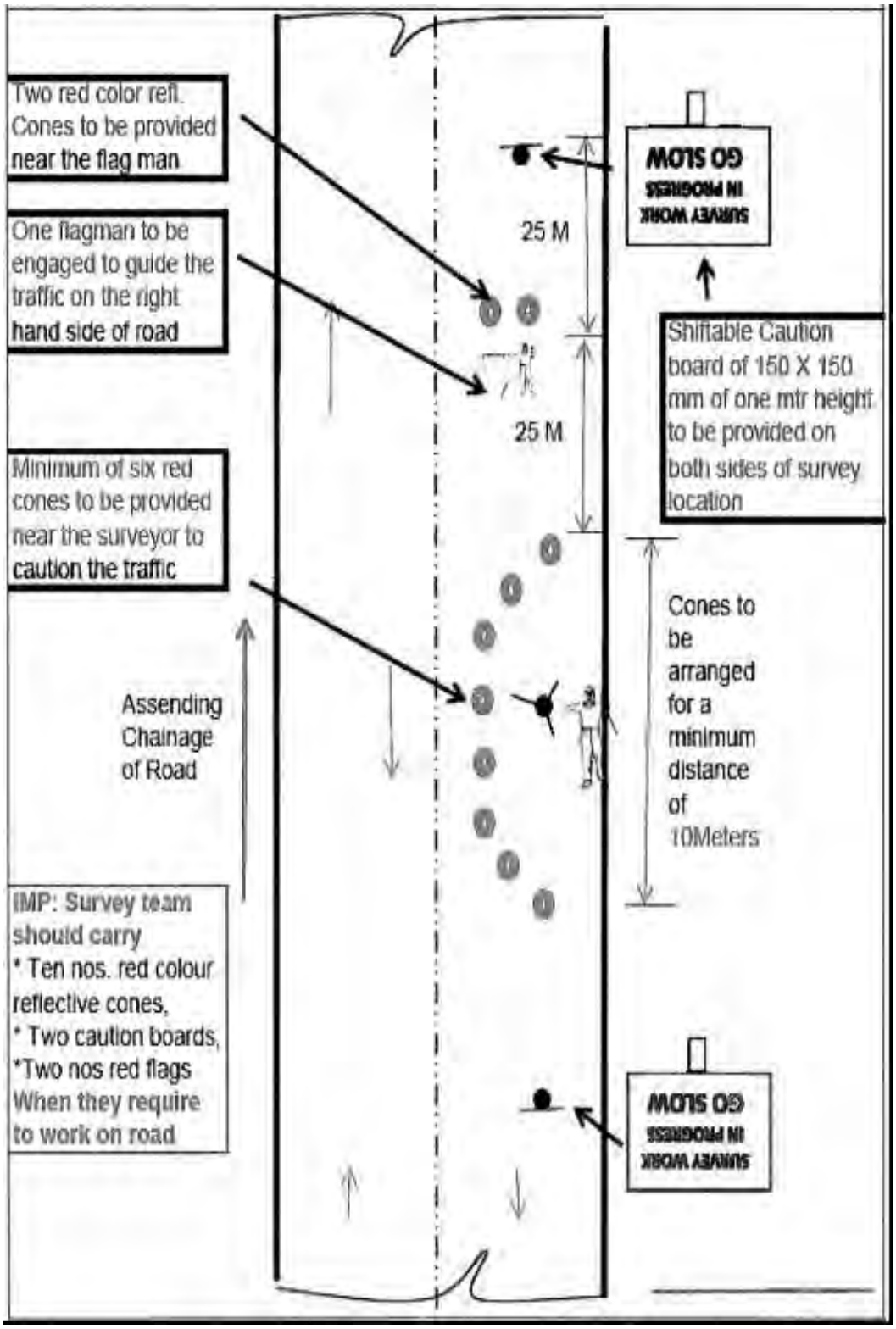


Figure 9-3: Traffic Management Plan for doing Survey

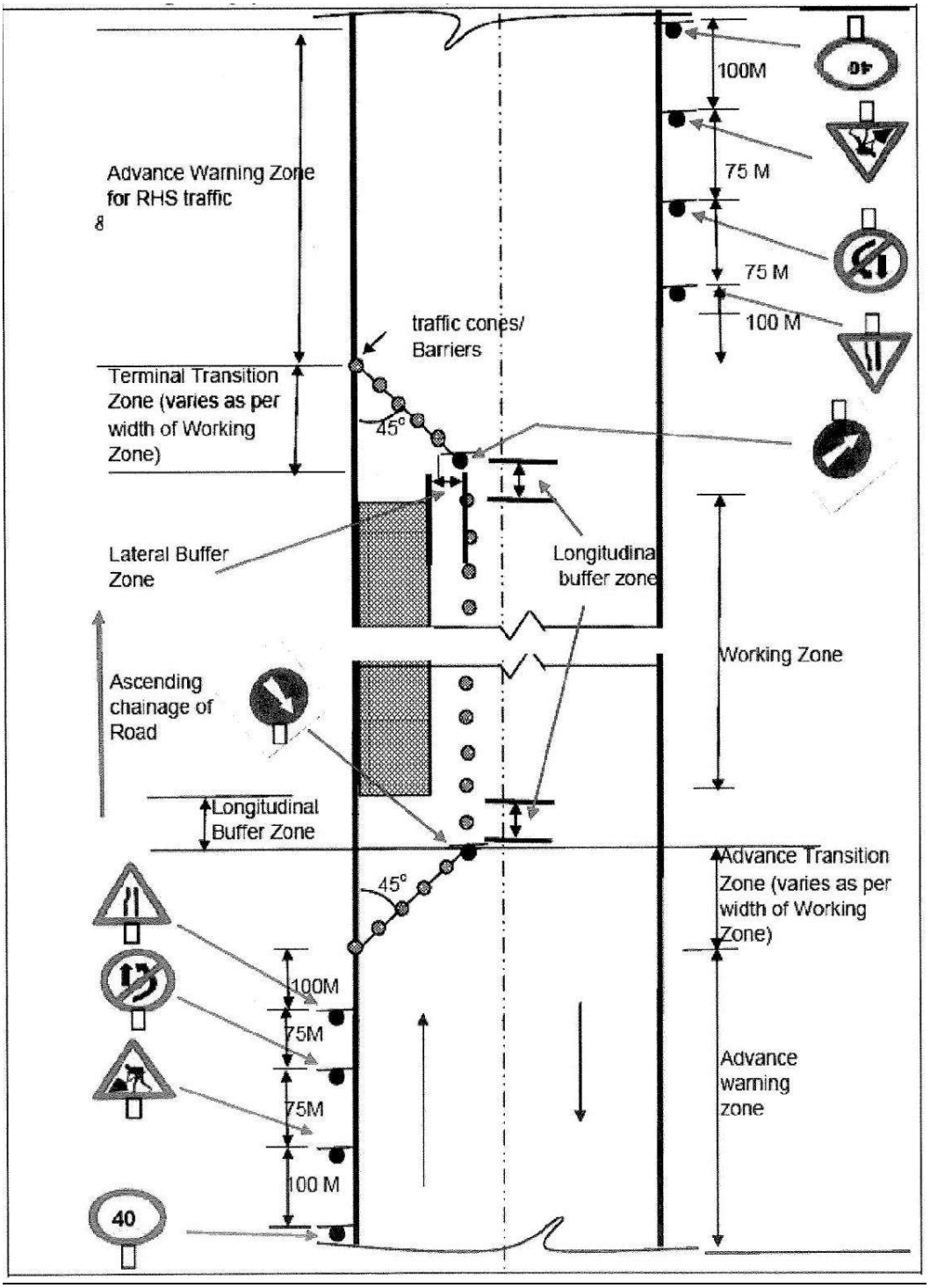


Figure 9-4: Traffic Management Plan for Working Zone

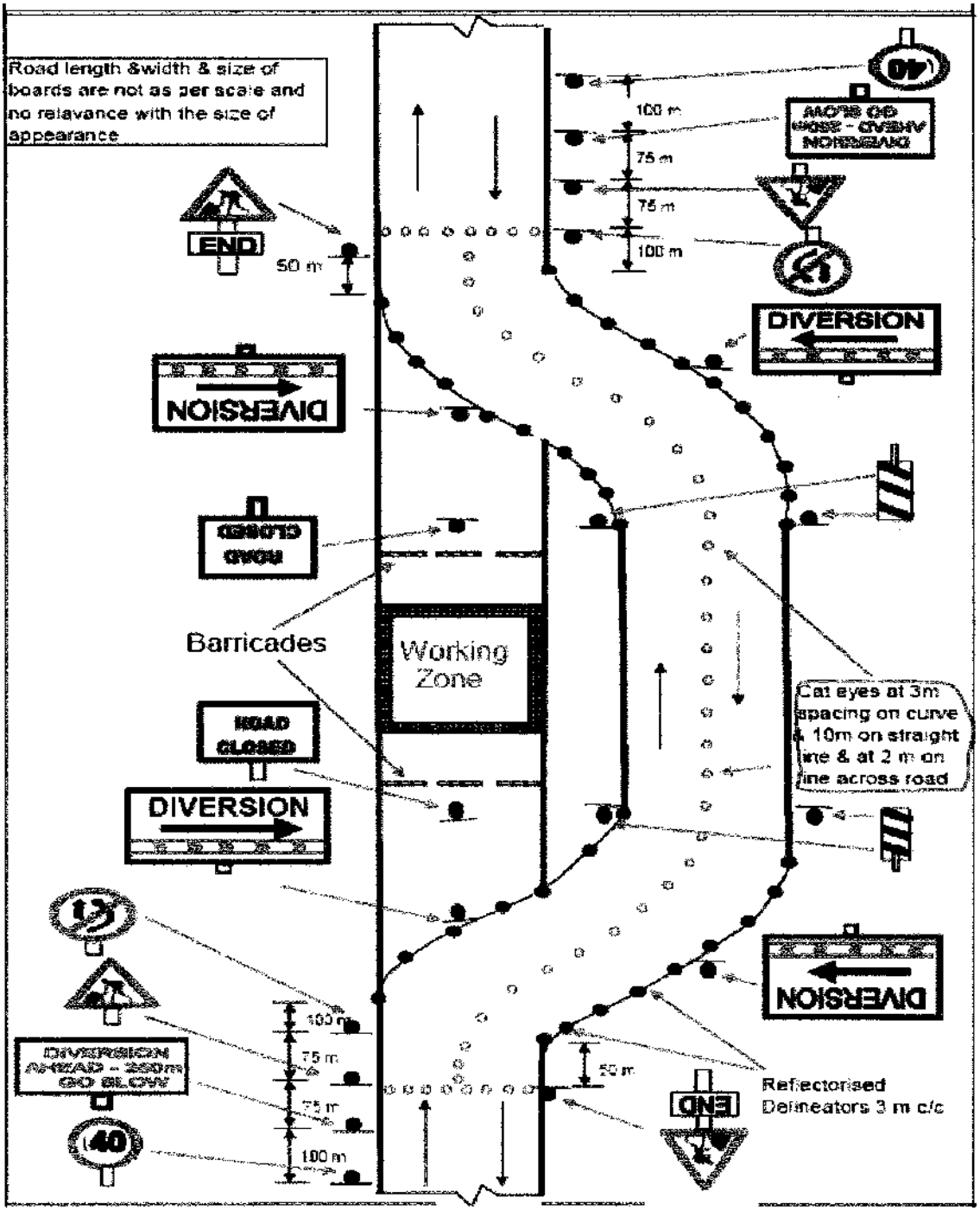


Figure 9-5: Traffic Management Plan for Diverting the Traffic

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
Planning Phase				
• Land Acquisition	• Land procured for the project is prominently in RoW of government land. Permission must be obtained from the respective government or private authorities wherever the pipeline route crosses their jurisdiction.	• As per land acquisition policy	• **ATGL**	• Pre-Construction
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.	• 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.	• **ATGL** representative should brief specific needs as per country's requirement for further execution, as and when required.	• Contractors will be abided with Hazardous Waste (Management, Handling and Transboundary	• Should be incorporated as part of project budget, no additional cost is envisaged.

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
• Hazardous waste from machinery, generators etc. • Soil and land contamination due to accidental leakage. • Run off into rainwater channels.	• 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. • 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.	• Workers should be instructed to maintain neat, clean & hygiene at facilities. • Contractors should be briefed about need for proper storage and disposal of construction waste.	Movement) Rules, 2023. • Site Engineer to make observations and convey it to the contractors. • Monthly report of EHS Officer to include the compliance and observations if any.	• During Construction Phase
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				

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
• Clearance of vegetation	• Tree cutting or shrub clearance should be limited to those patches directly affecting solar panel exposure. • 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
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.	• Awareness should be developed among the site workers for fugitive dust management.	• Project Director should regularly coordinate and supervise work.	Water sprinkling will be done throughout construction phase.

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
	• 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. • Vehicle speed should be restricted to 30km/hour at site to minimize potential for dust emission in the surroundings.	• Air Quality monitoring specifically for particulate matter in nearby settlement areas once during construction for compliance to NAAQ Standards.	• Monitoring agency should take out the monitoring work. • Should be incorporated in the contract with contractor	
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				

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
• 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. • Arrangement for fire control measures • Display of Emergency phone numbers at site.	• 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. • 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.	• Project Director should ensure compliance of safety guidelines. • Safety Officer of contractor should be responsible for implementation of safety guidelines. • To form part of the contractor's contract	Training of workers shall mostly be given by internal resources during Construction phase
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

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
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
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.	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
	• Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors. • 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				

Impact Identified	Suggested Mitigation	Monitoring/ Training	Management Responsibility	Timeline
• 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. • High-visibility safety jackets, hard hats, safety boots, gloves, Protective Eye Wear.	• 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	-
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 preparation plan is for what to do and what not during an emergency. The following aspects shall be included in the emergency preparedness plan: -

- To assess what dangers could arise to people on and offsite as a result of these foreseeable emergencies and what 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. 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 the 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 a yearly basis during operation phase only. However, other mitigation measures suggested for the 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
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 35.459 km Natural Gas Pipeline Project in Bhandara have 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 IMPACT DUE TO PIPELINE ROUTE SELECTION

The pipeline route has been carefully selected to minimize environmental and social impacts while ensuring technical and economic feasibility. Key considerations include:

- Shortest and most efficient routing between source and destination points
- Avoidance of sensitive areas such as national parks, sanctuaries, and wildlife corridors
- Minimum impact to reserve forests and other sensitive areas.
- Minimization of water crossings and disruption to aquatic ecosystems.
- Accessibility for construction and maintenance, reducing the need for additional infrastructure.
- Reduced impact on land use and local communities through alignment along existing roads and utility corridors where feasible.

10.3 IMPACTS DUE TO THE CONSTRUCTION OF PIPELINE

- The proposed pipeline project is located within Bhandara District, Maharashtra, consisting of laying of the city gas distribution of natural gas pipeline project covering a total length of 35.459 km. The pipeline is divided into two routes Route 01 Tudka Village to Bhandara Bus Depot of 32.091 km and Route 02 Razvi Petrol Pump to Tumsar Bus Depot of 3.368 km

- The pipeline traverses a mix of urban, peri-urban, and rural landscapes, including national highways, state highways, PWD roads, Bhandara Municipal corporation roads, railway lines, rivers, canals, and drains. The details of major environmental and infrastructural crossings are such that:

    i. **Roads and Highways:** the proposed gas pipeline route traverses along the NH-247, NH-53, NH-753 and NH 543, SH-355, DR-21, PWD Road and Municipal Corporation Road and village roads. The permissions for the roads and road crossings are partially secured and enclosed in the Annexure of this report.

    ii. **Railways:** Route 01 passes through three railway crossings, two of which are abandoned, permissions from the Indian Railways have been secured for all the three railway crossings.

    iii. **Rivers, Canals and Drains**: Pipeline crosses two Rivers- Sur River and Gaimukh River, several canals and drains. Permissions from the Water Resources Department is required.

iv. **Sensitive Receptors:** The pipeline passes near schools, colleges, hospitals, banks, police stations, markets, parks, 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.
- Selection of the pipeline route has been done in such a way that eco-sensitive areas which may be affected during the construction of the pipeline are minimized.

10.4 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.

10.5 MITIGATION AND ENVIRONMENTAL MANAGEMENT PLAN

10.5.1 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.

10.5.2 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

10.6 CONCLUSION

The proposed Bhandara Natural Gas Pipeline Project for city gas distribution 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.

ANNEXURES

Annexure 1: Permission for the PMGSY

कार्यालय
कार्यकारी अभियंता (प्रमंग्रासयो)
महाराष्ट्र ग्रामीण रस्ते विकास संस्था, भंडारा
गौरव कॉम्प्लेक्श, पहीला माळा, जिल्हा परिषद परीसर, भंडारा-४४१९०४
ई-मेल-: mh-bha@pmgsy.nic.in, फोन नं. : ०७१८४ /२९९२४०

जा. क्र. ६७९ /काअभं/प्रमंग्रासयो/मग्रारविस/२०२४ दि. ०८ /१० /२०२४

प्रति,

योगेशकुमार पारधी
सिनियर मॅनेजर
अदानी टोटल गॅस लिमिटेड
अहमदाबाद (गुजरात)

विषय- भंडारा जिल्हयातील भंडारा शहर आणि आसपासच्या परीसरात गॅस वितरण नेटवर्क उभारण्यासाठी ८" व्यासाची स्टील पाईपलाईन टाकण्यासाठी परवानगी मिळण्याबाबद.

संदर्भ- १) मा प्रधान सचिव, महसुल व नगर विकास विभाग यांचेकडील शासन निर्णय क्र. जमीन-१०/२०० प्र. क्र.९१/ज-१ दि. २७/०४/२०००.
२) आपले पत्र ATGL/Bhandara_GA/PMGSY_RD/Per/२०२४/००४ दि. ०७/०६/२०२४ .
३) या कार्यालयाचे पत्र क्र. ५८६/२०२४ दि. ०४/०९/२०२४ .

उपरोक्त संदर्भीय पत्रानुसार आपण भंडारा जिल्हयातील १) रा.मा. ३५५ ते हसारा हिंगणा काटेबाम्हणी रस्ता, तालुका तुमसर रस्त्यामधून (Cross) नॅचरल गॅस पाईप लाईन करीता स्टील पाईपलाईन टाकण्याची परवानगी मागणी केली आहे. संदर्भीय पत्र क्र. ३ अन्वये रु. ४१,२५०/- ची बॅक गॅरंटी जमा करणेबाबत कळविले होते. त्यानुसार आपण दि. ०७/१०/२०२४ च्या पत्रान्वये सदर रकमेची बॅक गॅरंटी कार्यालयाकडे सादर केली आहे.

सदरचे रस्ते मुख्यमंत्री ग्राम सडक योजना अंतर्गत पुर्ण झालेले असुन खालील अटी व शर्ती नुसार काम करण्यास परवानगी देण्यात येत आहे.

१) खोदकाम करतांना रस्त्याचे पृष्ठभागाचे व बाजुपट्टीचे नुकसान होणार नाही याची दक्षता घ्यावी.
२) काम चालु करण्यापुर्वी या कार्यालयाच्या संबंधित अधिका-यांना समवेत प्रत्यक्ष पाहणी करुन काम चालु करावे.
३) तसेच काम करतांना रस्त्यावर डांबरीपृष्ठभागास व रस्त्यालगत दोनही बाजुस (ROW) राईट ऑफ वे मध्ये कुठल्याही प्रकारचे नुकसान झाल्यास आपण सर्वस्वी जबाबदार रहाल तसेच सदर काम पूर्ववत करुन देवु अशा आशयाचे हमीपत्र रु. ५००/- च्या मुद्रांकावर या विभागास सादर करावे. त्यानंतरच प्रत्यक्ष कामास सुरुवात करावी.
४) सदर रस्ता पुर्ववत करण्याची जबाबदारी आपल्या कंपनीची असेल.
५) रस्ता पुर्ववत न केल्यास कायदेशिर कार्यवाही करण्याचे अधिकार या कार्यालयाकडे असेल.

(प्र. र. केळकर)
कार्यकारी अभियंता
प्रमंग्रासयो,मग्रारविसं भंडारा

कार्यालय

कार्यकारी अभियंता (प्रमंग्रासयो)

महाराष्ट्र ग्रामीण रस्ते विकास संस्था, भंडारा

गौरव कॉम्प्लेक्श, पहीला माळा, जिल्हा परिषद परीसर, भंडारा-४४१९०४

ई-मेल-: mh-bha@pmgsy.nic.in, फोन नं. : ०७१८४ /२९९२४०

जा. क्र. ६७२ /काअभं/प्रमंग्रासयो/मग्रारविसं/२०२४ दि. ०८// १० //२०२४

प्रति,

योगेशकुमार पारधी
सिनियर मॅनेजर
अदानी टोटल गॅस लिमिटेड
अहमदाबाद (गुजरात)

विषय- भंडारा जिल्हयातील भंडारा शहर आणि आसपासच्या परीसरात गॅस वितरण नेटवर्क उभारण्यासाठी ८" व्यासाची स्टील पाईपलाईन टाकण्यासाठी परवानगी मिळण्याबाबद.

संदर्भ- १) मा प्रधान सचिव, महसुल व नगर विकास विभाग यांचेकडील शासन निर्णय क्र. जमीन-१०/२०० प्र. क्र.९१/ज-१ दि. २७/०४/२०००.
२) आपले कार्यालयीन पत्र दि. ०७/०६/२०२४ .
३) या कार्यालयाचे पत्र क्र. ४५५/२०२४ दि. ०९/०७/२०२४ .

उपरोक्त संदर्भीय पत्रानुसार आपण भंडारा जिल्हयातील १) रा.मा. ३५५ ते विहीरगाव रस्ता, २) रा.मा. ३५५ ते पारडी रस्ता, ३) रा.मा. ३५५ ते मोहाडी(चौडेश्वरी) मांडेसर रस्ता तालुका मोहाडी रस्त्यामधून (Cross) नॅचरल गॅस पाईप लाईन करीता ८" व्यासाची स्टील पाईपलाईन टाकण्याची परवानगी मागणी केली आहे. संदर्भीय पत्र क्र. ३ अन्वये रु. १,९२,०००/- ची बॅक गॅरंटी जमा करणेबाबत कळविले होते. त्यानुसार आपण दि. ०६/०९/२०२४ च्या पत्रान्वये सदर रकमेची बॅक गॅरंटी कार्यालयाकडे सादर केली आहे.

सदरचे रस्ते मुख्यमंत्री ग्राम सडक योजना अंतर्गत पुर्ण झालेले असुन खालील अटी व शर्ती नुसार काम करण्यास परवानगी देण्यात येत आहे.

१) खोदकाम करतांना रस्त्याचे पृष्ठभागाचे व बाजुपट्टीचे नुकसान होणार नाही याची दक्षता घ्यावी.
२) काम चालु करण्यापुर्वी या कार्यालयाच्या संबंधित अधिका-यांना समवेत प्रत्यक्ष पाहणी करुन काम चालु करावे.
३) तसेच काम करतांना रस्त्यावर डांबरीपृष्ठभागास व रस्त्यालगत दोनही बाजुस (ROW) राईट ऑफ वे मध्ये कुठल्याही प्रकारचे नुकसान झाल्यास आपण सर्वस्वी जबाबदार रहाल तसेच सदर काम पूर्ववत करुन देवु अशा आशयाचे हमीपत्र रु. ५००/- च्या मुद्रांकावर या विभागास सादर करावे. त्यानंतरच प्रत्यक्ष कामास सुरुवात करावी.
४) सदर रस्ता पुर्ववत करण्याची जबाबदारी आपल्या कंपनीची असेल.
५) रस्ता पुर्ववत न केल्यास कायदेशिर कार्यवाही करण्याचे अधिकार या कार्यालयाकडे असेल.

(प्र. र. कळकर)
कार्यकारी अभियंता
प्रमंग्रासयो,मग्रारविसं भंडारा

Annexure 2: Permission Letter from PWD

कार्यकारी अभियंता यांचे कार्यालय
सार्वजनिक बांधकाम विभाग, भंडारा

Web Site :- www.mahapwd.com	E-mail:- bhandara.ee@mahapwd.com	दु.क्र . ०७१८४-२५२४१२
जावक क्रमांक :- साबांविभं/ 9998	/तांवि/आरे/गॅस पाईप लाईन/२०२५	दिनांक 28/02 /२०२५

प्रति,

व्यवस्थापक,
अदानी टोटल गॅस लि.अहमदाबाद,
केस्ट-४-५ इनस्पायर बिजनेस पार्क शांतीग्राम,
वैष्णवदेवी सर्कल एस.जी.हायवे,
अहमदाबाद-३८२४२२ (गुजरात राज्य)

विषय:- अदानी टोटल गॅस लिमिटेड, मार्फत ४" व ८" व्यसाची सरळ व डांबरी रोड क्रासिंग स्टील गॅस पाईप लाईन टाकण्यास परवानगी प्रदान करण्याबाबत.

संदर्भ :- १) आपले अर्ज पत्र क्र. ATGL/Bhandara GA/PWD Road/Per/२०२४/००१, दि.०७/०६/२०२४
२) उपविभागीय अभियंता सा.बां.उपविभाग ,भंडारा यांचे मौका चौकशी अहवाल पत्र क्र.सा.बांउपविभो/१५९०/ तां/२०२४, दि.२०/०८/२०२४
३) कार्यासन अधिकारी, सार्वजनिक बांधकाम विभाग, महाराष्ट्र शासन, मंत्रालय, मुंबई यांचे शासन निर्णय क्र.ओएफसी-२०२३/प्र.क्र.१६५/रस्ते-७, दि.१५/०९/२०२३

०००

उपरोक्त संदर्भिय पत्र क्र १ अन्वये, **अदानी टोटल गॅस लिमिटेड, मार्फत ४" व ८" व्यसाची सरळ व डांबरी रोड क्रासिंग स्टील गॅस पाईप लाईन टाकण्यास** खालील दर्शविल्या प्रमाणे रस्त्याच्या साखळी क्रमांकामध्ये गॅस पाईप लाईन टाकणे प्रस्तावित आहे.

अ.क्र.	रस्त्याचे नांव व दर्जा	साखळी क्रमांक	रस्त्याची हद्द मीटर मध्ये	रस्ता मध्यापासून प्रस्तावित केबल चे अंतर	परवानगीचा कालावधी
१	**डांबरी क्रासिंग (सा.क्र.१/५७० मध्ये)** नागपूर नाका ते राजीव गांधी चौक **प्र.जि.मा.क्र.२१** रस्त्यावर **सा.क्र.१/५७०** मध्ये **एका** ठिकाणी डांबरी क्रासिंग पृष्ठभागातून गॅस पाईप टाकणे	१/५७०० **मध्ये**	१८.००	**एका** ठिकाणी रस्ता १०.०० मी. डांबरी क्रासिंग करणे	१ वर्ष
२	**डांबरी क्रासिंग** बेला पांढराबोडी जमनी रस्ता **रा.मा.३५९** मध्ये **एका** ठिकाणी डांबरी क्रासिंग पृष्ठभागातून गॅस पाईप टाकणे	१०.०० **मीटर**	२४.००	**एका** ठिकाणी रस्ता १०.०० मी. डांबरी क्रासिंग करणे	१ वर्ष
३	**रस्त्याच्या बाजूच्या मुरुमी जागेतून गॅस पाईप टाकणे** बहिरंगेश्वर मंदिर ते शास्त्री चौक पर्यंत भंडारा **रा.मा.३५५ B** रस्त्यावर **९०५.०० मीटर** लांबी मध्ये सरळ मुरुम पृष्ठभागातून गॅस पाईप टाकणे	९०५.०० **मीटर**	२४.००	सरळ मुरुम पृष्ठभागातून गॅस पाईप टाकणे	१ वर्ष

सदर प्रकरणी संदर्भिय पत्र क्र.३ अन्वये शासन निर्णय क्र.ओएफसी-२०२३/प्र.क्र.१६५/रस्ते-७, दि.१५/०९/२०२३ अन्वये कार्यकारी अभियंता यांना प्रदान केलेल्या अधिकाराचे अधिन राहून व Restoration शुल्क D.D.द्वारा प्राप्त झालेला असल्यामुळे प्रस्तावानुसार प्रस्तावित केल्यानुसार अर्जदाराकडुन काम करतांना रस्त्याला कुठलीही हानी होऊ नये, या अटीसह व संबधित उपविभागीय अभियंता यांचे जबाबदारीवर खालील अटीसह प्रस्तावास परवानगी देण्यात येत आहे.

त्यानुषंगाने उक्त नमूद ठिकाणी गॅस पाईप लाईन टाकणे व तद्नंतर रस्ता पूर्ववत करण्याकरीता अटी व शर्ती खालील प्रमाणे राहतील.

१) काम सुरु करण्यापूर्वी अर्जदार कंपनीने स्वखर्चाने प्रस्तावित लांबीतील रस्त्याच्या कडेच्या भागाचे पूर्ण सर्वेक्षण करावे. या सर्वेक्षणानुसार अस्तित्वातील सेवावाहिन्यांचे (Utilities) मार्ग निश्चित होईल, जेणेकरुन प्रत्यक्षात काम करतांना अस्तित्वातील युटिलिटीज डॅमेज होणार नाहीत याची दक्षता घ्यावी.

२) प्रत्यक्षात काम सुरु करण्यापूर्वी मोक्यावर माहिती फलक व धोक्याची सूचना देण्याकरीता Retroreflective lights लावावेत.

वाहतूकीस कुठलिही अडचण होऊ नये, याबाबत आवश्यक ती दखल घेण्यात यावी. अपघात व काही दुर्घटना होऊ नये यासाठी अर्जदार कंपनीला कामाचे ठिकाणी सुरक्षा बोर्ड लावणे, रिफलेकटर बोर्ड लावणे, बॅरिकेड्स लावणे, रात्रीचे वेळेस लाल दिवा लावणे व इतर सुरक्षेची सर्व उपाययोजना करणे बंधनकारक राहील. जर अपघात किंवा दुर्घटना घडल्यास अर्जदार कंपनी जबाबदार राहील.

३) प्रस्तावित मार्गातील काही लांबी मध्ये अस्तित्वातील डक्ट असल्यास त्यामधून गॅस पाईप लाईन टाकण्यात यावा.

४) रस्त्यावर अतिक्रमण असल्यास किंवा इतर कारणांमुळे केबल टाकण्यास अडचणी येत असतील तर गॅस पाईप लाईन अतिक्रमण किंवा कुंपण भितीच्या लगत बाजूने टाकण्यात यावी.

५) परवानगीचा कालावधी तात्पुरत्या स्वरुपात १ वर्ष इतका राहील.

६) सदर केबल लाईन परवानगीचा कालावधी संपूष्टात येण्याअगोदर किंवा सा.बां. विभागाकडून गॅस पाईप काढून टाकण्यासाठी नोटीस दिल्यानंतर ३० दिवसाच्या आंत अर्जदाराने पर्यायी व्यवस्था करुन स्वखर्चाने केबल इतरत्र हलविणे बंधनकारक राहील. विहित कालावधीत याची पुर्तता न केल्यामुळे सा.बां. विभागाला हे काम करावे लागल्यास खर्चाच्या दुप्पट रकमेची वसुली करण्यात येईल. व कंपनी विरुध्द अन्य कार्यवाही सुध्दा करण्यात येईल. याबाबत शासनाकडून कोणतीही नुकसान भरपाई देय होणार नाही.

७)प्रस्तावित कामामुळे कुठल्याही प्रकारचा अपघात झाल्यास सदर अपघातास व त्यामुळे होणा-या नुकसान भरपाईस संबंधीत अर्जदार/कंपनी सर्वस्वी जबाबदार राहील.

८)प्रस्तावित कामामध्ये नव्याने लावलेली झाडे व अस्तितवातील झाडे यांना हानी पोहचणार नाही याची दक्षता बाळगावी. अन्यथा संबंधीत कंपनीला नुकसान भरपाई व दंड भरावा लागेल.

९) हायब्रीड अॅन्युटी कार्यक्रमाअंतर्गत येत असलेल्या लांबीमध्ये संबंधीत concessioner च्या सहमतीने काम करावे. सामान्य प्रशासन विभाग, महाराष्ट्र शासन निर्णय क्र.सीओएम २००१/सिआर १०५/०१/३९ दिनांक २२/११/२००१ व सामान्य प्रशासन विभाग, महाराष्ट्र शासन निर्णय क्र. मातसं/०३/३३६ दिनांक १/४/२००६ अन्वये २ एम.बी. बॅण्ड विड्थ संबंधीत अर्जदार संस्थेने पुरविणे बंधनकारक राहील.

१०) गॅस पाईप लाईन ही रस्ता पृष्ठभागापासून २.०० मीटर खोलीवर टाकणे बंधनकारक राहील.

११) सदर परवानगी ही प्रस्तावित फक्त एकाच कंपनीची एका गॅस पाईप लाईन टाकणेकरीता मर्यादीत राहील.

१२) गॅस पाईप लाईन टाकतांना नागरिकांना कुठलाही त्रास होणार नाही याची दक्षता घ्यावी. खोदकामानंतर उर्वरित साहीत्य तात्काळ इतरत्र हलविण्यात यावे. कामाचे ठिकाणी व रस्त्यावर अनावश्यक साहितय Debries ठेवण्यात येऊ नये.

१३) काम सुरु करण्यापूर्वी व काम पूर्ण झाल्यावर खोदकाम भराई आणि दबाई करुन रस्ता पूर्ववत त्याच पृष्ठभागाचा करण्यात आला किंवा कसे ? याकरीता केलेल्या कामाच्या लांबीचे कामापूर्वीचे तसेच काम पूर्ण झाल्यावर जागा पाण्याने धुवून स्वच्छ करावी व त्याचे फोटोग्राफ्स घेण्यात यावे. व या कार्यालयास सादर करावे. फोटोग्राफ्स सादर न केल्यास, सुरक्षा ठेव रक्कम परत करण्यात येणार नाही, याची नोंद घ्यावी.

१४) प्रत्यक्षात काम सुरु करण्यापूर्वी कामास लागणा-या कालावधीचे तारिखवार कामाचा सविस्तर तपशिल अर्जदाराने आखुन तो लेखी स्वरुपात उप अभियंता यांना सादर करावा. उप अभियंता यांचे लेखी परवानगीनंतरच त्या भागाचे काम सुरु करावे.

१५) कामाचे ठिकाणी अर्जदाराने खालील माहिती फलक लावणे बंधनकारक आहे.

A)Name of Agency Contact Person with Mobile number.

B)Name of Vendor

C)Contact person with Mobile number vendor

त्याचप्रमाणे कामाचे ठिकाणी रस्त्याचे कडेला खालील माहिती फलक लावण्यात यावा.

१)Name of Agency/Applicant

२)Approximmate duration of work

३)Nature of work :-

a) Laying of Optical Fiber Cable

b) From Ch. ..... to Ch.

c) Applicant co. shall submit the details of executing agency appointed by them for this purpose (Name of Vendor) mentioning route as per permission letter in the following proforma.

Sr.No.	Name of Vendor/ Contractor	Details of route for cable laying works			Total Route length (Vendor/contractor wise)
		Sr. no. on permission letter	Route name/ Location	Length of route	

d) Applicant co shall submit weekly report to the Sub Divisional Enginner in the following proforma.

Sr.No.	Details of route for	Status of Work	Name of executing

	cable laying	Work completed from .... To	Work on progress from .. to .	Work balance	Agency

c) खोदकामाची भरपाई करतांना तसेच इंनस्पेक्शन चेंबरच्या सभोवताल २०० मी.मी. चा भाग M-३० कॉंक्रिटने भरण्यात यावा किंवा खोदकामाचे ठिकाणी टाईल्स, पेव्हर ब्लॉक लावण्यात यावे.

f) खोदकामाची भराई १०० टक्के स्पेसिफिकेशन प्रमाणे असावी, अन्यथा सुरक्षा ठेव रक्कम मधून याची वसूली करण्यांत येईल.

g) सिमेंट रस्त्याचे भागात केबल टाकतांना संबंधीत कार्यकारी अभियंता/उपअभियंता यांचे सहमतीने काम करावे.

h) रस्ता क्रॉसिंगचे काम २४ तासांचे आत पूर्ण करावे, तसेच काम करतांना वाहतुकीस अडचण होणार नाही याची दक्षता बाळगावी. अन्यथा उद्भवणा-या अडचणीस अर्जदार जबाबदार राहील.

i) ग्रामिण भागातील कामाकरीता संबंधीत ग्राम पंचायतीची परवानगी घेणे अर्जदारास बंधनकारक राहील. गावातील रस्ते डॅमेज होणार नाहीत याची दक्षता बाळगावी.

j) गॅस पाईप लाईन ज्याठिकाणी रस्त्यांना छेदून टाकण्याचे प्रस्तावित आहे, त्या ठिकाणी Horizontal बोअरिंग करुन R.C.C. Conduit pipes टाकून काम करण्यात यावे.

k) रस्त्याच्या बाजूला डक्ट उपलब्ध असल्यास खोदकाम न करता त्या डक्ट मधून गॅस पाईप लाईन टाकण्यात यावी.

l) पूल, मो-या, स्लॅब ड्रेन असलेल्या भागात ऑप्टीकल फायबर केबल पुलाच्या पॅरापेट/रेलिंगच्या बाहेरच्या बाजूने लोखंडी क्लॅम्पच्या सहाय्याने टाकण्यात यावी.

m) सदर परवानगी ही सा.बां. विभागाचे अधिपत्याखालील जागेपुरतीच मर्यादीत असून इतर विभागाच्या अधिपत्याखालील जागेसाठी सदर विभागाची परवानगी घेणे अर्जदारास बंधनकारक राहील. उदा. रेल्वे/ इलेक्ट्रिक/सिंचन खाते/महसूल विभाग/वन विभाग/संरक्षण खाते/जिल्हा परिषद व इतर.

n) रस्त्याच्या कडेने गॅस पाईप लाईन टाकतांना इतर विभागाचे न्यायालयीन प्रकरण उद्भवल्यास सा.बां. विभागाची जबाबदारी राहणार नाही. गॅस पाईप लाईन टाकण्यासाठी खोदकाम करतांना उपयुक्त असे मुरुम, खडी, दगड यासारखे खनीज सापडल्यास त्यावर सा.बां. विभागाची मालकी असेल. असे गौण खनिज योग्य प्रकारे साठवून ते संबंधीत उपअभियंता यांचेकडे सुर्पूद करण्याची जबाबदारी अनुज्ञप्ती धारक कंपनीची राहील.

o) सदर भरपाई चार्जेस या विभागाचे जागेसंबंधी आहेत. खोदकामात इलेक्ट्रिक केबल/टेलिफोन केबल/पाण्याची पाईप लाईन अशा प्रकारच्या सुविधांना हानी पोहचत असल्यास संबंधीत विभागाची परवानगी घेणे व त्यासाठी लागणारी आवश्यक भरपाई रक्कम भरणे अर्जदारास बंधनकारक राहील.

p)खोदकाम सुरु असतांना रस्त्याच्या कडेची झाडे तोडणे आनिवार्य असल्यास अनुज्ञप्ती धारक कंपनीने संबंधीत प्राधिकरणाची पूर्व परवानगी मिळवावी.

q)संबंधीत उपअभियंता यांचे मार्गदर्शनाखाली केबल टाकण्याचे काम करण्यात यावे व खोदकामाची भरपाई व रस्ता पूर्ववत करण्याची जबाबदारी संबंधीत एजेन्सीची राहील.

r) महाराष्ट्र शासनाने भविष्यात नविन नियम, अटी व शर्ती प्रस्तूत केल्यास त्या अनुज्ञप्तीधारक कंपनीस बंधनकारक राहतील.

s) गॅस पाईप लाईन इतरत्र हलविणे, पाईप लाईनचे दुरुस्ती करीता पुन्हा खोदकाम करणे यासाठी अर्जदारास पुन:श्च नव्याने भरपाई रक्कम भरुन परवानगी घ्यावी लागेल.

t) भविष्यात खोदकाम करतांना गॅस पाईपला हानी पोहचल्यास सा.बां. विभाग जबाबदार राहणार नाही.

u) भविष्यात रस्ता दर्जोन्नत झाल्यास अथवा रस्त्याचे आवश्यकतेनुसार रुंदीकरण झाल्यास, रस्त्याच्या कडेने अथवा क्रासिंग टाकलेले गॅस पाईप लाईन कंपनीच्या/अर्जदाराच्या स्वखर्चाने इतरत्र स्थानांतरीत करावे लागेल. याबाबत शासनाकडून कोणतीही नुकसान भरपाई देय होणार नाही.

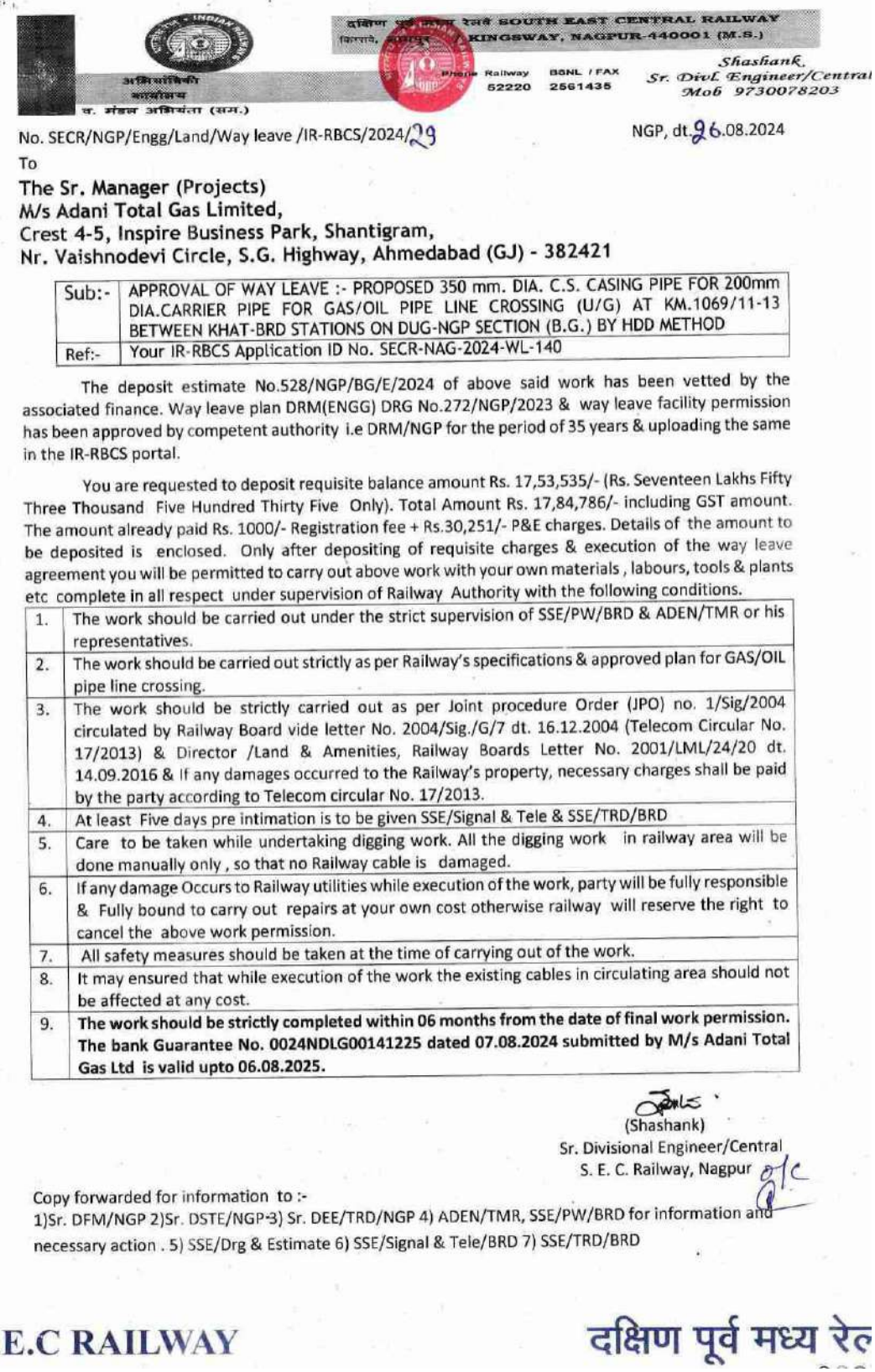
सहपत्र:- निरंक

कार्यकारी अभियंता,
सार्वजनिक बांधकाम विभाग
भंडारा.

प्रतिलीपी,

१) मा. मुख्य अभियंता, सा.बां. प्रादेशिक विभाग, नागपूर यांना माहितीस सविनय सादर.
२) मा. अधीक्षक अभियंता, सा.बां. मंडळ, नागपुर माहिती करीता सविनय सादर.
३) उपविभागीय अभियंता सा.बां.उपविभाग भंडारा यांना माहिती व आवश्यक कार्यवाहीस्तव अग्रेषित.

Annexure 3: Permission Letter of the Railway Crossing from the South-East Central Railways



दक्षिण पूर्व मध्य रेलवे SOUTH EAST CENTRAL RAILWAY
KINGSWAY, NAGPUR-440001 (M.S.)

अधिशाषिकी कार्यालय
व. मंडल अभियंता (सम.)

Phone Railway 52220 BSNL / FAX 2561435

Shashank,
Sr. DivL Engineer/Central
Mob 9730078203

No. SECR/NGP/Engg/Land/Way leave /IR-RBCS/2024/29 NGP, dt. 26.08.2024

To

The Sr. Manager (Projects)
M/s Adani Total Gas Limited,
Crest 4-5, Inspire Business Park, Shantigram,
Nr. Vaishnodevi Circle, S.G. Highway, Ahmedabad (GJ) - 382421

Sub:-	APPROVAL OF WAY LEAVE :- PROPOSED 350 mm. DIA. C.S. CASING PIPE FOR 200mm DIA.CARRIER PIPE FOR GAS/OIL PIPE LINE CROSSING (U/G) AT KM.1069/11-13 BETWEEN KHAT-BRD STATIONS ON DUG-NGP SECTION (B.G.) BY HDD METHOD
Ref:-	Your IR-RBCS Application ID No. SECR-NAG-2024-WL-140

The deposit estimate No.528/NGP/BG/E/2024 of above said work has been vetted by the associated finance. Way leave plan DRM(ENGG) DRG No.272/NGP/2023 & way leave facility permission has been approved by competent authority i.e DRM/NGP for the period of 35 years & uploading the same in the IR-RBCS portal.

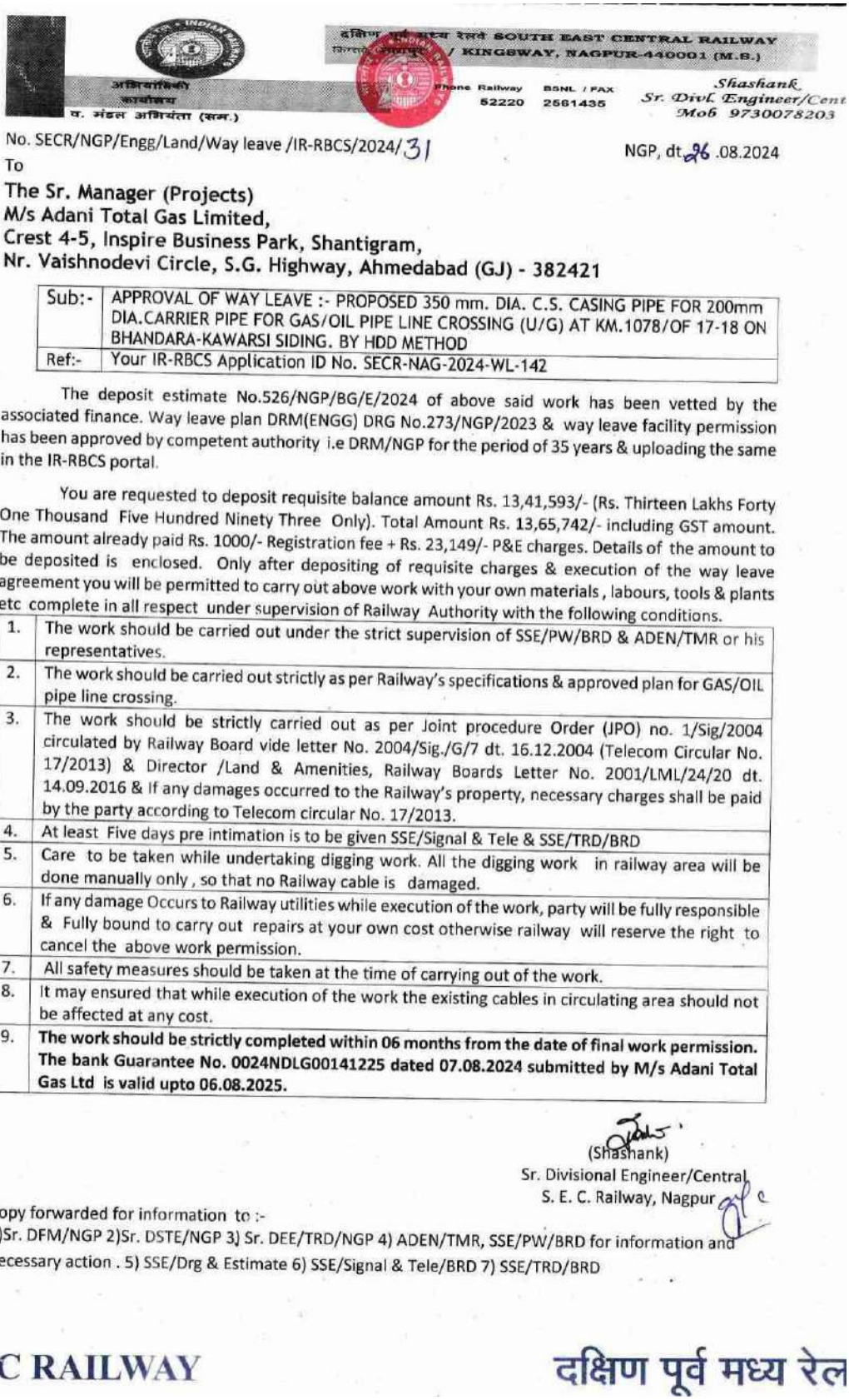
You are requested to deposit requisite balance amount Rs. 17,53,535/- (Rs. Seventeen Lakhs Fifty Three Thousand Five Hundred Thirty Five Only). Total Amount Rs. 17,84,786/- including GST amount. The amount already paid Rs. 1000/- Registration fee + Rs.30,251/- P&E charges. Details of the amount to be deposited is enclosed. Only after depositing of requisite charges & execution of the way leave agreement you will be permitted to carry out above work with your own materials , labours, tools & plants etc complete in all respect under supervision of Railway Authority with the following conditions.

1.	The work should be carried out under the strict supervision of SSE/PW/BRD & ADEN/TMR or his representatives.
2.	The work should be carried out strictly as per Railway's specifications & approved plan for GAS/OIL pipe line crossing.
3.	The work should be strictly carried out as per Joint procedure Order (JPO) no. 1/Sig/2004 circulated by Railway Board vide letter No. 2004/Sig./G/7 dt. 16.12.2004 (Telecom Circular No. 17/2013) & Director /Land & Amenities, Railway Boards Letter No. 2001/LML/24/20 dt. 14.09.2016 & If any damages occurred to the Railway's property, necessary charges shall be paid by the party according to Telecom circular No. 17/2013.
4.	At least Five days pre intimation is to be given SSE/Signal & Tele & SSE/TRD/BRD
5.	Care to be taken while undertaking digging work. All the digging work in railway area will be done manually only , so that no Railway cable is damaged.
6.	If any damage Occurs to Railway utilities while execution of the work, party will be fully responsible & Fully bound to carry out repairs at your own cost otherwise railway will reserve the right to cancel the above work permission.
7.	All safety measures should be taken at the time of carrying out of the work.
8.	It may ensured that while execution of the work the existing cables in circulating area should not be affected at any cost.
9.	**The work should be strictly completed within 06 months from the date of final work permission. The bank Guarantee No. 0024NDLG00141225 dated 07.08.2024 submitted by M/s Adani Total Gas Ltd is valid upto 06.08.2025.**

(Shashank)
Sr. Divisional Engineer/Central
S. E. C. Railway, Nagpur

Copy forwarded for information to :-
1)Sr. DFM/NGP 2)Sr. DSTE/NGP 3) Sr. DEE/TRD/NGP 4) ADEN/TMR, SSE/PW/BRD for information and necessary action . 5) SSE/Drg & Estimate 6) SSE/Signal & Tele/BRD 7) SSE/TRD/BRD

S.E.C RAILWAY दक्षिण पूर्व मध्य रेल



दक्षिण पूर्व मध्य रेलवे SOUTH EAST CENTRAL RAILWAY
KINGSWAY, NAGPUR-440001 (M.S.)

अभियांत्रिकी कार्यालय
व. मंडल अभियंता (सम.)

Phone Railway 52220 BSNL / FAX 2561435

Shashank
Sr. Divl. Engineer/Cent
Mob 9730078203

No. SECR/NGP/Engg/Land/Way leave /IR-RBCS/2024/31 NGP, dt. 26 .08.2024

To

The Sr. Manager (Projects)
M/s Adani Total Gas Limited,
Crest 4-5, Inspire Business Park, Shantigram,
Nr. Vaishnodevi Circle, S.G. Highway, Ahmedabad (GJ) - 382421

Sub:-	APPROVAL OF WAY LEAVE :- PROPOSED 350 mm. DIA. C.S. CASING PIPE FOR 200mm DIA.CARRIER PIPE FOR GAS/OIL PIPE LINE CROSSING (U/G) AT KM.1078/OF 17-18 ON BHANDARA-KAWARSI SIDING. BY HDD METHOD
Ref:-	Your IR-RBCS Application ID No. SECR-NAG-2024-WL-142

The deposit estimate No.526/NGP/BG/E/2024 of above said work has been vetted by the associated finance. Way leave plan DRM(ENGG) DRG No.273/NGP/2023 & way leave facility permission has been approved by competent authority i.e DRM/NGP for the period of 35 years & uploading the same in the IR-RBCS portal.

You are requested to deposit requisite balance amount Rs. 13,41,593/- (Rs. Thirteen Lakhs Forty One Thousand Five Hundred Ninety Three Only). Total Amount Rs. 13,65,742/- including GST amount. The amount already paid Rs. 1000/- Registration fee + Rs. 23,149/- P&E charges. Details of the amount to be deposited is enclosed. Only after depositing of requisite charges & execution of the way leave agreement you will be permitted to carry out above work with your own materials, labours, tools & plants etc complete in all respect under supervision of Railway Authority with the following conditions.

1.	The work should be carried out under the strict supervision of SSE/PW/BRD & ADEN/TMR or his representatives.
2.	The work should be carried out strictly as per Railway's specifications & approved plan for GAS/OIL pipe line crossing.
3.	The work should be strictly carried out as per Joint procedure Order (JPO) no. 1/Sig/2004 circulated by Railway Board vide letter No. 2004/Sig./G/7 dt. 16.12.2004 (Telecom Circular No. 17/2013) & Director /Land & Amenities, Railway Boards Letter No. 2001/LML/24/20 dt. 14.09.2016 & If any damages occurred to the Railway's property, necessary charges shall be paid by the party according to Telecom circular No. 17/2013.
4.	At least Five days pre intimation is to be given SSE/Signal & Tele & SSE/TRD/BRD
5.	Care to be taken while undertaking digging work. All the digging work in railway area will be done manually only, so that no Railway cable is damaged.
6.	If any damage Occurs to Railway utilities while execution of the work, party will be fully responsible & Fully bound to carry out repairs at your own cost otherwise railway will reserve the right to cancel the above work permission.
7.	All safety measures should be taken at the time of carrying out of the work.
8.	It may ensured that while execution of the work the existing cables in circulating area should not be affected at any cost.
9.	**The work should be strictly completed within 06 months from the date of final work permission. The bank Guarantee No. 0024NDLG00141225 dated 07.08.2024 submitted by M/s Adani Total Gas Ltd is valid upto 06.08.2025.**

(Shashank)
Sr. Divisional Engineer/Central
S. E. C. Railway, Nagpur

Copy forwarded for information to :-
1)Sr. DFM/NGP 2)Sr. DSTE/NGP 3) Sr. DEE/TRD/NGP 4) ADEN/TMR, SSE/PW/BRD for information and necessary action . 5) SSE/Drg & Estimate 6) SSE/Signal & Tele/BRD 7) SSE/TRD/BRD

S.E.C RAILWAY दक्षिण पूर्व मध्य रेल

दक्षिण पूर्व मध्य रेलवे SOUTH EAST CENTRAL RAILWAY
KINGSWAY, NAGPUR-440001 (M.S.)

अभियांत्रिकी कार्यालय
व. मंडल अभियंता (सम.)

Phone Railway 52220 BSNL / FAX 2561435

Shashank
Sr. Divl. Engineer/Centra
Mob 9730078203

No. SECR/NGP/Engg/Land/Way leave /IR-RBCS/2024/30 NGP, dt. 21.08.2024

To

The Sr. Manager (Projects)
M/s Adani Total Gas Limited,
Crest 4-5, Inspire Business Park, Shantigram,
Nr. Vaishnodevi Circle, S.G. Highway, Ahmedabad (GJ) - 382421

Sub:-	APPROVAL OF WAY LEAVE :- PROPOSED 350 mm. DIA. C.S. CASING PIPE FOR 200mm DIA.CARRIER PIPE FOR GAS/OIL PIPE LINE CROSSING (U/G) AT KM.1071/OF 12-13 ON BHANDARA-KAWARSI SIDING. BY HDD METHOD
Ref:-	Your IR-RBCS Application ID No. SECR-NAG-2024-WL-141

The deposit estimate No.527/NGP/BG/E/2024 of above said work has been vetted by the associated finance. Way leave plan DRM(ENGG) DRG No.274/NGP/2023 & way leave facility permission has been approved by competent authority i.e DRM/NGP for the period of 35 years & uploading the same in the IR-RBCS portal.

You are requested to deposit requisite balance amount Rs. 12,70,502/- (Rs. Twelve Lakhs Seventy Thousand Five Hundred Two Only). Total Amount Rs. 12,93,425/- including GST amount. The amount already paid Rs. 1000/- Registration fee + Rs. 21,923/- P&E charges. Details of the amount to be deposited is enclosed. Only after depositing of requisite charges & execution of the way leave agreement you will be permitted to carry out above work with your own materials , labours, tools & plants etc complete in all respect under supervision of Railway Authority with the following conditions.

1.	The work should be carried out under the strict supervision of SSE/PW/BRD & ADEN/TMR or his representatives.
2.	The work should be carried out strictly as per Railway's specifications & approved plan for GAS/OIL pipe line crossing.
3.	The work should be strictly carried out as per Joint procedure Order (JPO) no. 1/Sig/2004 circulated by Railway Board vide letter No. 2004/Sig./G/7 dt. 16.12.2004 (Telecom Circular No. 17/2013) & Director /Land & Amenities, Railway Boards Letter No. 2001/LML/24/20 dt. 14.09.2016 & If any damages occurred to the Railway's property, necessary charges shall be paid by the party according to Telecom circular No. 17/2013.
4.	At least Five days pre intimation is to be given SSE/Signal & Tele & SSE/TRD/BRD
5.	Care to be taken while undertaking digging work. All the digging work in railway area will be done manually only , so that no Railway cable is damaged.
6.	If any damage Occurs to Railway utilities while execution of the work, party will be fully responsible & Fully bound to carry out repairs at your own cost otherwise railway will reserve the right to cancel the above work permission.
7.	All safety measures should be taken at the time of carrying out of the work.
8.	It may ensured that while execution of the work the existing cables in circulating area should not be affected at any cost.
9.	**The work should be strictly completed within 06 months from the date of final work permission. The bank Guarantee No. 0024NDLG00141225 dated 07.08.2024 submitted by M/s Adani Total Gas Ltd is valid upto 06.08.2025.**

(Shashank)
Sr. Divisional Engineer/Central
S. E. C. Railway, Nagpur

Copy forwarded for information to :-
1)Sr. DFM/NGP 2)Sr. DSTE/NGP 3) Sr. DEE/TRD/NGP 4) ADEN/TMR, SSE/PW/BRD for information and necessary action . 5) SSE/Drg & Estimate 6) SSE/Signal & Tele/BRD 7) SSE/TRD/BRD

S.E.C RAILWAY दक्षिण पूर्व मध्य रेल

Annexure 4: Permission Letter for National Highway (NH-753 and NH-543K)

Government of Maharashtra
Office of the Executive Engineer,
National Highway Division, Public Works Department, Bunglow No.39/1, Civil Lines,
Nagpur-440001.
☎: 0712-2524829 , Email - eenhnagpur@gmail.com , nhnagpur.ee@mahapwd.com

No.: - DB/Dman - 2025/GP/NH - 543K/057/229	Date:- 15.01.2025

To,
M/s. Adani Total Gas Limited,
Crest 4 - 5, Inspire Business Park,
Shantigram, Nr Vaishno Devi Circle,
SG Highway, Ahemdabad - 382421

Subject :- **"Permission of laying underground Gas pipeline (GP), 4" dia. Steel Natural Gas Pipeline on Bapera - Sihora - Tumsar - Mohadi - Bhandara road section of NH 543-K, along/across from Chainage In Km, 80/065 (Khapa Village) to 83/407 (Tumsar Bus Depot in Tumsar city in Dist: Bhandara) and across crosses at 01 location from Chainage in Km, 106/700, on Kohamara - Gondia Tirora Ramtek road section of NH 753, Taluka Bhandara Dist: Bhandara, in the state of Maharashtra."**

Reference :-

1. M/s Adani Total Gas Ltd. Ahmedabad's Proposal letter No - ATGL/Bhandara GA/NH/Per - 2024/02 Date - 07.06.2024,
2. The Sub Divisional Engineer, National Highway Sub Division, Bhandara's letter No - 221/Tech/2024 Date - 23.07.2024,
3. This Office Letter No :-DB/DMan-2024/GP-B/NH-543K/3544 Date:- 09.08.2024,
4. M/s Adani Total Gas Ltd. Ahmedabad's letter No:-ATGL/Bhandara /Nagpur/ NH-Division/Pay/2024/ Date:-21.11.2024
5. The Superintending Engineer, National Highway Circle, Nagpur letter No. SENH / HDM / 2024 /GP - 2/Bhandara - Kohmara/ Nag / 2852 Dated - 20.12.2024
6. The Regional Officer & Chief Engineer, Ministry of Road Transport & Highway, Kokan Bhavan, Navi Mumbai letter No, RW/MUM/Laying Utility Services/MAH - 2023 - 24 / 2024 - GP / P - 401/312/1376 Date - 30.12.2024.

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The proposal for permission of laying underground Gas pipeline (GP), 4" dia. Steel Natural Gas Pipeline on Bapera - Sihora - Tumsar - Mohadi - Bhandara road section of NH 543-K, along/across from Chainage In Km, 80/065 (Khapa Village) to 83/407 (Tumsar Bus Depot in Tumsar city in Dist: Bhandara) and across crosses at 01 location from Chainage in Km, 106/700, on Kohamara - Gondia Tirora Ramtek road section of NH 753, Taluka Bhandara Dist: Bhandara, in the state of Maharashtra was submitted to this office vide letter under reference at Sr. No.1.

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The proposal was submitted to the Regional Officer & Chief Engineer Ministry of Road Transport & Highways, Kokan Bhawan, Navi Mumbai vide The Superintending Engineer, National Highway Circle, Nagpur's letter under ref No. (5).

The Regional Officer & Chief Engineer, Ministry of Road Transport & Highway, Kokan Bhavan, Navi Mumbai had granted in principle approval vide letter No - RW/MUM/Laying Utility Services/MAH - 2023 - 24 / 2024 - GP / P - 401/312/1376 Date - 30.12.2024.

The following applicable charges were deposited by you with regards to the said proposal.

a)	Restoration Charges (Refundable) (In form of Bank Guarantee)	= Rs. 4,34,200/- (Rupees Four Lakh Thirty Four Thousand Two Hundred Only) B.G. No - 0024NDLG00202325 Date - 01.10.2024 ICICI Bank Ltd Vadodara Gujrat - 390007
b)	License Fee (Non Refundable) In Bharat Kosh.Gov.in & Receipt submitted to this office	= Rs. 13,94,046/- (Rupees Thirteen Lakh Ninety Four Thousand Fourty Six Only) Transaction Ref No - 0810240084224 Date - 08.10.2024
c)	G.S.T. 18% In Reverse charge Account & Receipt submitted to this office	= Rs. 2,50,928/- (Rupees Two Lakh Fifty Five Thousand Nine Hundred Twenty Eight Only) CPIN - 24112700053281 Date - 08.11.2024

In view of aforementioned fact, The permission is granted on following conditions.

1. The Steel Natural Gas Pipeline shall be laid at the extreme edge of ROW as shown in Route map.
2. The depth of underground Steel Natural Gas Pipeline Top shall be at least 1.65 Mtr below the ground level by open cut method Chainage in Km, 80/065 (Khapa Village) to 83/407 (Tumsar Bus Depot in Tumsar city in Dist: Bhandara) and across crosses at 01 location from Chainage in Km, 106/700, on Kohamara - Gondia Tirora Ramtek road section of NH 753, and route marker shall be installed on the trench after completion of work to identify to avoid the damage to utility & accident in future.
3. All the instruction contained in MORTH letter No - RW/NH-33044/29/2015/S&R (R) dated 22.11.2016 shall be scrupulously followed with.
4. The applicant shall ensure safely security other utility services of any other authority & be solely responsible for compensation to concerned authority for damage if any.
5. The crossing by Horizontal drilling method shall be strictly followed as per guideline given in MORT&H circular dated 19.11.1976 without disturbing the ROW.
6. If it is felt necessary in future to shift/relocate utility lines due any improvement or repair to road, it will be carried out as desired by Highway Authority at your own cost with in reasonable time.
7. The permission would be granted valid for 5 years there after will be consider on payment of additional fee at the time of renewal.
8. The work shall be executed in consultation with the Sub Divisional Engineer, National Highway Sub Division, Bhandara.

9. During the laying of underground Steel Natural Gas Pipeline no disturbance shall be caused to the National Highway traffic plying on the road & the Residents residing in built up area.
10. The work completion report as per good for construction & as per route plan shall be submitted through the Sub Divisional Engineer, National Highway Sub Division, Bhandara Bank Guarantee shall not be returned to you until such completion report is submitted to this office.

An Agreement executed on behalf of the Chief Engineer, National Highway (P.W) Konkan Bhawan Navi Mumbai with M/s. Adani Total Gas Limited, Ahemdabad for laying underground Gas pipeline (GP), 4" dia. Steel Natural Gas Pipeline on Bapera - Sihora - Tumsar - Mohadi - Bhandara road section of NH 543-K, along/across from Ch. In Km, 80/065 (Khapa Village) to 83/407 (Tumsar Bus Depot in Tumsar city in Dist: Bhandara) and across crosses at 01 location from Ch.in Km, 106/700, on Kohamara - Gondia Tirora Ramtek road section of NH 753, Taluka Bhandara Dist: Bhandara, in the state of Maharashtra on dated 15.01.2025 valid for 5 year expire on dated 14.01.2030.

For your information & further necessary action in the matter.

15/01/2025

Encl :- 'Copy of Agreement'

(Sanjeev S. Jagtap)
Executive Engineer,
National Highway Division,
Nagpur

1. Copy submitted to The Regional Officer & Chief Engineer, Ministry of Road Transport & Highways, Konkan Bhawan, Navi Mumbai for information please.
2. Copy submitted to The Chief Engineer, National Highway (P.W), Konkan Bhawan, Navi Mumbai for information please.
3. Copy submitted to The Superintending Engineer National Highway Circle, Nagpur for information please.
4. Copy forwarded The Sub Divisional Engineer, National Highway Sub Division, Bhandara for information and necessary action in the matter. You are hereby directed to supervise the steel pipe line laying work well within Right of way a said National Highway's and ensure that no disturbance is caused to Road user & Residence residing in the area, Monthly report of laying shall be submitted to this office.

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Annexure 5: Permission Letter for National Highway (NH-247)

Government of Maharashtra
Office of the Executive Engineer,
National Highway Division, Public Works Department, Bunglow No.39/1, Civil Lines,
Nagpur-440001.
☎: 0712-2524829, Email - eenhnagpur@gmail.com , nhnagpur.ee@mahapwd.com

No.: - DB/Dman - 2025/GP/NH247 & 753/058/228	Date:-15.01.2025

To,
M/s. Adani Total Gas Limited,
Crest 4 - 5, Inspire Business Park,
Shantigram, Nr Vaishno Devi Circle,
SG Highway, Ahemdabad - 382421

Subject :- "Permission of laying underground Gas Pipeline (GP) 8" dia Steel Natural Gas Pipeline on Bhandara - Khat - Ghotitok road Section of NH - 247 along from Chainage in Km. 166/640 (Bhandara ZP Sq) to 168/504 (Kham Talav Sq) & across crosses at 01 location from Ch. In Km 168/504 (Bhandara ZP Sq - Kham Talav Sq) in Taluka Bhandara in District Bhandara 2) Proposal for permission of laying underground Gas Pipeline (GP) 8" dia Steel Natural Gas Pipeline on Kohmara - Gondia - Tirora - Ramtek - Mansar Road Section of NH - 753 along from Chainage in Km. 104/597 to 106/684 and Nagpur - Raipur section of NH - 53 along from Chainage in Km 493/150 to 493/565 & also on Bapera - Tumsar - Mohadi - Bhandara Road section on NH - 543 K along from Chainage in Km 83/493 to 109/691 & across at 01 location from Ch. Km 83/433 Taluka Bhandara, District Bhandara in in the State of Maharashtra."

Reference :-
1. M/s Adani Total Gas Ltd. Ahmedabad's Proposal letter No - ATGL/Bhandara GA/NH/Per - 2024/01 Date - 13.06.2024,
2. The Sub Divisional Engineer, National Highway Sub Division, Bhandara's letter No - 222/Tech/2024 Date - 22.07.2024,
3. The Sub Divisional Engineer, National Highway Sub Division No 2, Nagpur's letter No - Tech/NH-247/NOC - Gas Pipeline/ATGL/2024/586 Date - 18.09.2024
4. This Office Letter No :-DB/DMan-2024/GP-B/NH-543K,NH-247/4651 Date:- 23.10.2024
5. M/s Adani Total Gas Ltd. Ahmedabad's letter No:-ATGL/Bhandara /Nagpur/ NH-Division/Pay_Sub/2024/6 Date:-13.11.2024
6. The Superintending Engineer, National Highway Circle, Nagpur letter No. SENH / HDM / 2024 / GP - 3 / Bhandara Zp Sq - Kham Talav Sq./Nagpur/2024/2851 Dated - 20.12.2024
7. The Regional Officer & Chief Engineer, Ministry of Road Transport & Highway, Konkan Bhawan, Navi Mumbai letter No - RW/MUM/Laying Utility Services/MAH - 2023 - 24 / 2024 - GP / P - 400/311/1375 Date - 30.12.2024.

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The proposal for permission of laying underground Gas Pipeline (GP) 8" dia Steel Natural Gas Pipeline on Bhandara - Khat - Ghotitok road Section of NH - 247 along from Chainage in Km. 166/640 (Bhandara ZP Sq) to 168/504 (Kham Talav Sq) & across crosses at 01 location from Ch. In Km 168/504 (Bhandara ZP Sq - Kham Talav Sq) in Taluka Bhandara in District Bhandara 2) Proposal for permission of laying underground Gas Pipeline (GP) 8" dia Steel Natural Gas

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Pipeline on Kohmara - Gondia - Tirora - Ramtek - Mansar Road Section of NH - 753 along from Chainage in Km. 104/597 to 106/684 and Nagpur - Raipur section of NH - 53 along from Chainage in Km 493/150 to 493/565 & also on Bapera - Tumsar - Mohadi - Bhandara Road section on NH - 543 K along from Chainage in Km 83/493 to 109/691 & across at 01 location from Ch. Km 83/433 Taluka Bhandara, District Bhandara in the State of Maharashtra was submitted to this office vide letter under reference at Sr. No.1.

The proposal was submitted to the Regional Officer & Chief Engineer Ministry of Road Transport & Highways, Kokan Bhawan, Navi Mumbai vide The Superintending Engineer, National Highway Circle, Nagpur's letter under ref No. (6).

The Regional Officer & Chief Engineer, Ministry of Road Transport & Highways, Kokan Bhavan, Navi Mumbai had granted in principle approval vide letter No - RO/MUM/Laying Utility Services/MAH - 2023-24/OFC-P-359/270/1261 Date - 07.10.2024.

The following applicable charges were deposited by you with regards to the said proposal.

a)	Restoration Charges (Refundable) (In form of Bank Guarantee)	= Rs. **32,63,000/-** (Rupees Thirty Two Lakh Sixty Three Thousand Only) B.G. No - 0024NDLG00251425 Date - 06.11.2024 ICICI Bank Ltd Vadodara, Gujrat - 39007
b)	License Fee (Non Refundable) In Bharat Kosh.Gov.in & Receipt submitted to this office	= Rs. **99,92,048/-** (Rupees Ninety Nine Lakh Ninety Two Thousand Fourty Eight Only) Transaction Ref No - 0511240040298 Date - 05.11.2024
c)	G.S.T. 18% In Reverse charge Account & Receipt submitted to this office	= Rs. **17,98,568/-** (Rupees Seventeen Lakh Ninety Eight Thousand Five Hundred Sixty Eight Only) CPIN - 24112700056574 Date - 08.11.2024

In view of aforementioned fact, The permission is granted on following conditions.

1. The Steel Natural Gas Pipeline shall be laid at the extreme edge of ROW as shown in Route map.
2. a) The depth of underground Steel Natural Gas Pipeline shall be laid at least 2.50 Mtr below the ground level BY HDD method Chainage in Km. 166/640 (Bhandara ZP Sq) to 168/504 (Kham Talav Sq) & across crosses at 01 location from Ch. In Km 168/504 (Bhandara ZP Sq - Kham Talav Sq) on Bhandara - Khat - Ghotitok road Section of NH - 247 and route marker shall be installed on the trench after completion of work to identify to avoid the damage to utility & accident in future.
   b) Further underground Steel Natural Gas Pipe Line Top shall be laid at least 1.65 Mtr below the ground level by open cut method Chainage in Km. 104/597 to 106/684 on Kohmara - Gondia - Tirora - Ramtek - Mansar Road Section of NH - 753 & Chainage in Km 493/150 to 493/565 on Nagpur - Raipur Section on NH - 7 & also Chainage in Km 83/493 to 109/691 & across at 01 location Chainage Km 83/433 on Bapera - Tumsar - Mohadi - Bhandara Road section on NH - 543 K and route marker shall be installed on the trench after completion of work to identify to avoid the damage to utility & accident in future.
3. All the instruction contained in MORTH letter No - RW/NH-33044/29/2015/S&R (R) dated 22.11.2016 shall be scrupulously followed with.
4. The applicant shall ensure safely security of any other utility services other authority & be solely responsible for compensation to concerned authority for damage if any.

5. The crossing by Horizontal drilling method shall be strictly followed as per guideline given in MORT&H circular dated 19.11.1976 without disturbing the ROW.
6. If it is felt necessary in future to shift/relocate utility lines due any improvement or repair to road, it will be carried out as desired by Highway Authority at your own cost with in reasonable time.
7. The permission would be granted valid for 5 years there after will be consider on payment of additional fee at the time of renewal.
8. The work shall be executed in consultation with the Sub Divisional Engineer, National Highway Sub Division, Bhandara & Sub Divisional Engineer, National Highway Sub Division No.2, Nagpur.
9. During the laying of underground Steel Natural Gas Pipeline no disturbance shall be caused to the National Highway traffic plying on the road and the residents residing in built up area.
10. The work completion report as per good for construction & as per route plan shall be submitted through the Sub Divisional Engineer, National Highway Sub Division, Bhandara & Sub Divisional Engineer, National Highway Sub Division No.2, Nagpur. Bank Guarantee shall not be returned to you until such completion report is submitted to this office.

An Agreement executed on behalf of the Chief Engineer, National Highway (P.W) Konkan Bhawan Navi Mumbai with M/s. Adani Total Gas Limited, Ahemdabad for laying underground Steel Natural Gas Pipeline on Proposal for permission of laying underground Gas Pipeline (GP) 8" dia Steel Natural Gas Pipeline on Bhandara - Khat - Ghotitok road Section of NH - 247 along from Chainage in Km. 166/640 (Bhandara ZP Sq) to 168/504 (Kham Talav Sq) & across crosses at 01 location from Ch. In Km 168/504 (Bhandara ZP Sq - Kham Talav Sq) in Taluka Bhandara in District Bhandara 2) Proposal for permission of laying underground Gas Pipeline (GP) 8" dia Steel Natural Gas Pipeline on Kohmara - Gondia - Tirora - Ramtek - Mansar Road Section of NH - 753 along from Chainage in Km. 104/597 to 106/684 and Nagpur - Raipur section of NH - 53 along from Chainage in Km 493/150 to 493/565 & also on Bapera - Tumsar - Mohadi - Bhandara Road section on NH - 543 K along from Chainage in Km 83/493 to 109/691 & across at 01 location from Ch. Km 83/433 Taluka Bhandara, District Bhandara in the State of Maharashtra on dated 15.01.2025 valid for 5 year expire on dated 14.01.2030.

For your information & further necessary action in the matter.

Encl :- Copy of Agreement.

15/01/2025.
(Sanjeev S. Jagtap)
Executive Engineer,
National Highway Division,
Nagpur

1. Copy submitted to The Regional Officer & Chief Engineer, Ministry of Road Transport & Highways, Konkan Bhawan, Navi Mumbai for information please.
2. Copy submitted to The Chief Engineer, National Highway (P.W), Konkan Bhawan, Navi Mumbai for information please.
3. Copy submitted to The Superintending Engineer National Highway Circle, Nagpur for information please.
4. Copy forwarded The Sub Divisional Engineer, National Highway Sub Division, Bhandara & Sub Divisional Engineer, National Highway Sub Division No.2, Nagpur for information and necessary action in the matter. You are hereby directed to supervise the steel pipe line laying work well within Right of way a said National Highway's and ensure that no disturbance is caused to Road user & Residence residing in the area, Monthly report of laying shall be submitted to this office.

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Annexure 6: Application Letter for the permission for the Gram Panchayat Khapa

adani
Gas

Ref.: ATGL/Bhandara GA/GP_Khapa/Per/2024/006 Date: 07.06.2024

To,
Sarpanch Shri,
Gram Panchayat,
Village Khapa, District-Bhandara,
Maharashtra State.

Sub.: **Bhandara & Tumsar Connectivity (GAIL SV-27 Tudka Village to Bhandara Bus Depot & Razvi Petrol Pump, Khapa(Tumsar) Village to Tumsar Bus Depot):** Request for granting permission for laying 8" & 4"dia steel pipeline to set up a Gas Distribution Network in Bhandara City and surrounding area in District Bhandara - **Pipeline laying across to various RCC Roads along the pipeline route in Khapa (Tumsar) Village of Bhandara District.**

Dear Sir,

Petroleum and Natural Gas Regulatory Board ("PNGRB") statutory body of Government of India is engaged in regulation of refining, transportation, distribution, storage, marketing, supply, and sale of petroleum products and natural gas so as to protect the interests of consumers and to ensure uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country.

PNGRB, has authorized Adani Total Gas (ATGL) having its registered office at Ahmedabad, Gujarat, via letter no. **PNGRB/Auth/CGD (47)/2021/11.34, dated 09/03/2022** for development of City Gas Distribution Network in the Geographical area of Bhandara, Gondiya & Garchiroli Districts. Based on the Authorisation granted by PNGRB, we are presently constructing and developing the CNG Station at various locations of Bhandara, Gondiya & Garchiroli District and in future we are providing pipe natural gas to Domestic, industrial and commercial establishments in the district.

This project is being implemented as per the directives of PNGRB (**Under Ministry of Petroleum & Natural Gas**) with primary objective is to reduce the pollution level and penetrate the usage of green fuel in authorized GA and to participate Central Governments objective to minimize the carbon emissions by 2030 by using natural gas as fuel against all other fuel.

Adani Total Gas Limited (ATGL) proposes to lay Pipeline for transportation of natural gas to various CNG stations and other consumers for city gas distribution in the Bhandara GA. The proposed pipeline route starts from existing Gail NJPL (SV-27) Station near village Tudka, Tehsil-Tumsar, Dist-Bhandara and terminated at Bhandara Bus Depot and from Razvi Petrol Pump near village Khapa (Tumsar), Tehsil-Bhandara, Dist- Bhandara to terminated at Tumsar Bus Depot in Tumsar City, Tehsil/District-Bhandara, in Maharashtra State.

The diameter of proposed two pipelines will be of 8" & 4" diameter Steel. The proposed pipeline network will be laid along and within the ROW of various Roads (Aphalted Roads/SH/NH) at a depth of at least 1.2 meter below the finished ground level. Company shall follow all the best standards of safety as prevailing in Gas distribution industries.

Adani Total Gas Limited
(Formerly known as Adani Gas Ltd)
Crest 4-5, Inspire Business Park
Shantigram, Nr. Vaishnodevi Circle
S.G.Highway, Ahmedabad – 382 421
Gujarat, India
CIN: L40100GJ2005PLC046612
Tel : +91 79 6624 3200
Fax: +91 79 2754 2088
customercare.gas@adani.com
www.adanigas.com

14/06/24

ADANI TOTAL GAS LIMITED AMRAVATI

The details of pipeline across to various Roads are furnished in **Annexure-A** (Page 1).

All the relevant drawings of the above said pipeline including the location of roads crossing are enclosed herewith for your reference. ATGL is ready to pay the necessary fee/ charges as per the norms (if any) as and when intimated by your good office.

Considering the fact that this is a project of National importance Infrastructure development its timely completion is utmost important and so we request you to grant permission at the earliest possible.

In case you need any further information/ clarification, please feel free to contact Yogeshkumar Pardhi (M: 70424997555/ *Email:* Yogeshkumar.Pardhi@adani.com) Or Brajesh Kumar (M: 9924143723/ brajesh.kumar@secon.in).

For extending timely support you may communicate to Mr. Balaji Power (Team Leader), Mo. 9145430362 at our Amravati office.

Your early response in this matter will be highly appreciated.

Thanking You,

Yours sincerely,

For Adani Total Gas Limited,

Yogeshkumar Pardhi
Sr. Manager - Projects
Encl.: As above

ADANI TOTAL GAS LIMITED AMRAVATI

Annexure – A

Statement showing the details of pipeline parallel & across to various Roads in Bhandara District under Khapa Gram Panchayat, Bhandara.

Sr. No	Name of Road	ATGL Pipeline Chainage in Km.	Location of Parallel/Crossing
Line-1 (GAIL SV-27 Tudka Village to Bhandara Bus Depot)			
1	Across to RCC Road (Mangali to NH-753)	2/216.53	Near Khapa (Tumsar) Village
Line-2 (Razvi Petrol Pump, Khapa (Tumsar) Village to Tumsar Bus Depot)			
2	Across to RCC Road (Khapa to SH-355)	0/401.74	Near Khapa (Tumsar) Village
3	Across to RCC Road (Khapa to SH-355)	0/462.46	Near Khapa (Tumsar) Village
4	Across to RCC Road (Khapa to SH-355)	0/551.93	Near Khapa (Tumsar) Village
5	Across Rcc Road (Khapa to SH-355)	689.37	
6	Across to RCC Road (Khapa to SH-355)	0/872.81	Near Khapa (Tumsar) Village
7	Across to Mahakali Mandir RCC Road (Khapa to SH-355)	0/996.61	Near Khapa (Tumsar) Village

Page 1 of 1

Annexure 7: Permission Letter from the Gram Panchayat Kharabi

ISO प्रमाणित 9001:2015

स्मार्ट ग्राम पुरस्कृत सन 2021-22

ग्रामपंचायत कार्यालय खरबी

पंचायत समिती तुमसर जि.प. भंडारा

kharbi.gram@gmail.com

जावक क्र. 749/24

दि. 17/12/2024

ग्रामपंचायत कार्यालय खरबी प.स.तुमसर,जि.भंडारा

नाहरकत प्रमाणपत्र

प्रती,
योगेशकुमार पारधी
सिनियर मॅनेजर
अदानी टोटल गॅस लिमीटेड
अहमदाबाद पिन- ३८२४२१ (गुजरात)

विषय- (GAIL SV-27 at village Tudka Tehsil Tumsar to Bhandara Bus Depot) स्टील गॅस पाईप लाईन टाकणे बाबद,
संदर्भ- आपले पत्र क्र. ATGL/Bhandara GA/GP_Kharabi/Per/2024/012

महोदय,

शहर आणि जिल्हातील परिसरात गॅस वितरण नेटवर्क उभारण्यासाठी ८'' व्यासाची स्टील पाईपलाईन टाकण्याचा प्रस्ताव सादर केला आहे. गॅस पाईपलाईन विविध आर, सी, सी, रोड अथवा डांबरी रोड ला क्रॉस करते.

वरील दृष्टीने खाली नमूद केलेल्या क्रॉसिंग च्या ठिकाणी मेसर्स अदाणी गॅसचे सदस्य आणि सरपंच खरबी यांनी दि. 17/12/2024 रोजी संयुक्त साईट परीक्षण केले.

संदर्भ क्र. १ अंतर्गत पत्रात नमूद केलेल्या वरील माहितीनुसार या कार्यालयाला खालील दर्शिवलेल्या अटी व शर्तीच्या आधीन वरील विषयात दर्शिवलेल्या कामास कोणतीच अडचण नाही.

पाईप लाईन क्रॉस करून जात असलेल्या रस्त्याची माहिती खालील प्रमाणे दिली आहे.

Sr. No.	Description	ATGL Pipeline Chainage in Km.	Location Of Crossing
1	Across to RCC Road (SH-355 to Kharbi)	6/194.82	Near Kharbi Village
2	Across to RCC Road (SH-355 to Kharbi)	6/257.10	Near Kharbi Village
3	Across to RCC Road (SH-355 to Kharbi)	6/347.76	Near Kharbi Village
4	Across to RCC Road (SH-355 to Kharbi)	6/527.33	Near Kharbi Village
5	Across to RCC Road (SH-355 to Kharbi)	6/579.70	Near Kharbi Village
6	Across to RCC Road (towards SH-355)	6/627.75	Near Kharbi Village
7	Across to RCC Road (towards SH-355)	7/572.50	Near Kharbi Village

नियम व अटी

१) वरील दर्शिवलेल्या कामासंबंधी अभियंता व सरपंच खरबी यांच्या देखरेखीखाली केले जावे
२) पाईपलाईन जमिनीच्या पातळी पासून १.२ मीटर इतकी खाली टाकावी.
३) कामाच्या दरम्यान नादुरस्त झालेल्या पाण्याच्या पाईप लाईन व इतर मालमत्ता रस्त्याची/स्तिथी मूळ स्थिती सारखी करून देणे अनिवार्य राहील.
४) पाईप लाईन बांधकामाच्या दरम्यान कोणताही अपघात किंवा जीवित हानी झाल्यास ग्रामपंचायत खरबी जबाबदार राहणार नाही.
५) सदर पाईप लाईन भविष्यात गळणी झाल्यास व काही अनुचित घटना घडल्यास त्यास अदणी टोटल गॅस लिमीटेड जबाबदार राहील.

सदर अटी व शर्ती च्या अधीन राहून ग्रामपंचायत खरबी ठराव क्र. 7/5 दिनांक 22/07/2024 नुसार गस पाईप लाईन नकाशा प्रमाणे नाहरकत प्रमाणपत्र देण्यात येत आहे.

ग्रामपंचायत अधिकारी
ग्रामपंचायत क्र. खरबी
तालुका तुमसर जि.भंडारा

सरपंच
ग्रामपंचायत खरबी

Annexure 8: Permission Letter from the Bhandara Municipal Council

ऑफीस :- ०७१८४-२५५०९३, मु.अ.:- ०७१८४-२५२०८८, अध्यक्ष :- ०७१८४-२५१७२०.

कार्यालय नगरपरिषद, भंडारा

Email-bhandaranagarpalika@gmail.com

क्रमांक :- नपभं/मु.अ./न.र.वि./भूमिगत गॅ.पा./६३१ /२०२५ दि. ४१ /०२ /२०२५

प्रती,
अडानी टोटल गॅस लिमिटेड
अमरावती.

विषय :- Bhandara connectivity (GAIL SV-२७ Tudka Village to Bhandara Bus Depot) Request for granting permission for laying ८" dia steel pipeline to set up a Gas Distribution Network in Bhandara City and surrounding area in District Bhandara- **Pipeline laying across to various Utilities within the Municipal Council limit along the pipeline route in Bhandara District.**

संदर्भ :- १) आपले या कार्यालयास प्राप्त पत्र ATGL/BhandaraGA/MC_Roads/Per/२०२४/०१८ दि. ०७/०६/२०२४.
२) शासन परीपत्रक क्रमांक ओएफसी-२०१२/प्र.क. २०९/रस्ते-६ दि. ०७/०४/२०१४
३) या कार्यालयाचे मागणी पत्र जा.क्र./नपभं./नरवि/पाइपलाइन/शुल्क(सुधारित)/४३/२०२५ दि. ०३/०१/२०२५.
४)आपले या कार्यालयास प्राप्त डिमांड ड्राफ्ट व बँक ग्यारंटी बाबत पत्र ATGL/BhandaraGA/NP_Roads/PAY/२०२५/०११ दि. १०/०२/२०२५.

उपरोक्त विषयान्वये व संदर्भिय पत्रान्वये आपण (**अडानी टोटल गॅस लिमिटेड**) नगर परिषद भंडारा क्षेत्रामध्ये अंतर्गत हद्दीमधील जिल्हा परिषद चौक ते राजीव गांधी चौक ते खांब तलाव चौक ते शास्त्री चौक ते टाकळी नाल्या पर्यंत रस्त्याच्या डाव्या बाजूला ८ इंच भुमिगत गॅस पाईपलाईन टाकण्याबाबत परवानगीसाठी अर्ज केलेला होता व त्यानुसार उपरोक्त संदर्भ क्र. ३ अन्वये मागणी पत्र देण्यात आलेले आहे त्यानुशंघाने सदर मागणी पत्र नुसार रु. २,५२,१७५/- चे ICICI बँकेचे डिमांड ड्राफ्ट व रस्ता पूर्ववत करण्यासाठीची रु. ६३,०४५/- किमतीची ICICI बँकेची बँक हमी (bank guarantee no: 0024NDLG00350725) या कार्यालयात सादर केलेली आहे. विषयांकीत प्रकरणाचे अनुषंगाने आपण सादर केलेल्या नकाशाप्रमाणे व पुढील तक्त्या मध्ये दर्शविलेले रस्त्याजवळ आपणास भुमिगत गॅस पाईपलाईन टाकण्याकरिता रस्ता खोदाई कामासाठी खालील अटी व शर्तींवर नाहरकत प्रमाणपत्र देण्यात येत आहे.

अ. क्र.	रस्त्याचे नाव	लांबी मी.	Pipline Chainage (km)
१	Asphalted Road (SH-३५५-Baras City)	५.९	२७/८०२.९९
२	Asphalted Road (SH-३५५ to Bras City)	३.९९	२८/०९६.८८
३	Across to RCC Road (Asphalted Road to MS ९ E११EEVEN Café & Restro-	४.९	२८/३७६.८४

४	Asphalted Road (Asphalted Road To Sahkar Nagar Bhandara)	५.९६	२८/८९२.९२
५	Across to RCC Road (Asphalted Road to Shivaji Ward (Bhandara)	५.१	२८/६९३.०७
६	Across to RCC Road (Ring Road to Bhandara)	६.०१	२९/०३३.२४
७	Across to RCC Road (Ring Road to Bhandara)	७.०३	२९/३१७.२२
८	Across to RCC Road (Ring Road to Bhandara)	७.०१	२९/३७८.५६
एकूण लांबी		**४५.९**	--

अटी व शर्ती:

१) नकाशाप्रमाणे रस्त्याचे कडेला खोदकाम करावे. सदर काम तांत्रिक व्यक्तीच्या देखरेखीखालील सुरु करावे.

२) अंदाजपत्रकापेक्षा जास्त प्रमाणात रस्ता खोदकाम करु नये.

३) खोदकाम करतांना आवश्यक वाहतुक तसेच रस्त्यावरुन वर्दळ करण्या-या नागरीकांचे सुरक्षिततेची संपूर्ण जवाबदारी आपली राहील.

४) वाहतुकीच्या व आरोग्याच्या दृष्टीकोनातुन रस्ता सुव्यवस्थीत करुन देण्याची जवाबदारी आपली राहील.

५) खोदकाम करतांना नळाची पाईपलाईन, सार्वजनिक नाल्या व केबल इत्यादीचे नुकसान झाल्यास त्याचा नुकसान आपणाला सोसावा लागेल व नव्याने दुरुस्ती करुन देण्याची ही आपली राहील. तसे न केल्यास बँकेची हमी या कार्यालयातून परत दिली जाणार नाही याची नोंद घ्यावी.

६) सदर खोदकाम करतांना रस्त्याचे हददीवरुन सरळ रेषेत रस्त्याच्या समांतर करावे.

७) खोदकाम करतांना रस्त्याच्या कडेला असलेल्या संमांतर नाल्या बुजविण्यात येवू नये किंवा सदर रस्त्याच्या कडेला खोदलेली माती टाकू नये.

८) काम करतांना दिलेली नाहरकत प्रमाणपत्र हे मौक्यावर अधिका-यांचे निरिक्षणासाठी ठेवण्यात यावेत.

९) कामाचेही एका रस्त्याचे खोदकाम पुर्ण झाल्याशिवाय दुसऱ्या रस्त्याचे खोदकाम काम करु नये.

१०) कामासंबंधाने कोणतीही तक्रार प्राप्त झाल्यास दिलेली परवानगी रदद करण्यात येईल.

११) सदर नाहरकत प्रमाणपत्राची मुदत ही बारा महिन्याची राहील

(करणकुमार चव्हाण) (म.श.प्र.से.)
मुख्याधिकारी
नगर परिषद भंडारा

प्रतिलिपी: नगर अभियंता नगर परिषद भंडारा यांना माहितीस्तव सविनय सादर

Annexure 9: Permission Letter from Mohadi Nagar panchayat

नगर पंचायत कार्यालय,मोहाडी

npmohadi@gmail.com मोहाडी ता.मोहाडी, जि.भंडारा

जावक क्रमांक नपमो/मु.अ./बांध .वि./५१/२०२५ दिनांक ०८/०७ /२०२५

प्रति,

M/S Adani Total Gas Limited
Crest 4-5 Inspire Business Park
Shantigram Nr. Vaishnodevi Circle
S.G. Highway Ahmwdabad -382421

विषय :- मोहाडी नगर पंचायत क्षेत्रात GAIL-SV-27 At Vilage Tudka Tehsil Tumsar To Bhandara Bus Depot Gas Pipeline वितरण करिता ना-हरकत मिळण्याबाबत.

संदर्भ :- १. आपले अर्ज दि. ०७/०६/२०२४
२. महाराष्ट्र शासन सामान्य प्रशासन विभाग शासन निर्णय क्र. मा. त.स./०६५/प्र.क्र.७/२०२२ से ४/३९ दि. ०४/११/२०२२
३. या कार्यालयाचे पत्र क्र.नपमो/बा.वी/३५३६/ २०२४ दि. ०७/११/२०२४

महोदय,

उपरोक्त विषयाच्या अनुषंगाने आपणास कळविण्यात येते कि, संदर्भ क्रमांक ०१ अन्वये आपण मोहाडी नगर पंचायत क्षेत्रात GAIL-SV-27 At Vilage Tudka Tehsil Tumsar To Bhandara Bus Depot Gas Pipeline वितरण करिता ना-हरकत मिळण्याबाबत अर्ज सादर केले आहे. संदर्भ क्रमांक ०३ अन्वये अर्जदार यांनी या कार्यालयास रु.१,५४,५००/- इतक्या रक्कमेचा Bank Guarantee No. Date Of Issue No.0024NDLG00356825 dt.20-01-2025 भरणा या कार्यालयास सादर केलेला आहे. आपण सादर केलेल्या नकाशा प्रमाणे MIDC ते पुलिस स्टेशन मोहाडी एकूण १७ रोड क्रोसिंग होत असून आपणास भूमिगत गॅस पाईप लाईन टाकण्याकरिता रस्ता खोदाई कामासाठी खालील अटी व शर्तीवर नाहरकत प्रमाणपत्र देण्यात येत आहे.

अटी व शर्ती:

१) नकाशाप्रमाणे रस्त्याचे कडेला खोदकाम करावे. सदर काम तांत्रिक व्यक्तीच्या देखरेखी खालील सुरु करावे.

२) अंदाजपत्रकापेक्षा जास्त प्रमाणात रस्ता खोदकाम करु नये.

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३) खोदकाम करतांना आवश्यक वाहतुक तसेच रस्त्यावरुन वर्दळ करण्याऱ्या नागरीकांचे सुरक्षिततेची संपूर्ण जवाबदारी आपली राहील.

४) वाहतुकीच्या व आरोग्याच्या दृष्टीकोनातुन रस्ता सुव्यवस्थीत करुन देण्याची जवाबदारी आपली राहील.

५) खोदकाम करतांना नळाची पाईपलाईन, सार्वजनिक नाल्या व केबल इत्यादीचे नुकसान झाल्यास त्याचा नुकसान आपणाला सोसावा लागेल व नव्याने दुरुस्ती करुन देण्याची ही आपली राहील. तसे न केल्यास बँकेची हमी या कार्यालयातून परत दिली जाणार नाही याची नोंद घ्यावी.

६) सदर खोदकाम करतांना रस्त्याचे हददीवरुन सरळ रेषेत रस्त्याच्या समांतर करावे.

७) खोदकाम करतांना रस्त्याच्या कडेला असलेल्या संमांतर नाल्या बुजविण्यात येवू नये किंवा सदर रस्त्याच्या कडेला खोदलेली माती टाकू नये.

८) काम करतांना दिलेली नाहरकत प्रमाणपत्र हे मौक्यावर अधिकाऱ्यांचे निरिक्षणासाठी ठेवण्यात यावेत.

९) कामाचेही एका रस्त्याचे खोदकाम पूर्ण झाल्याशिवाय दुसऱ्या रस्त्याचे खोदकाम काम करु नये.

१०) कामासंबंधाने कोणतीही तक्रार प्राप्त झाल्यास दिलेली परवानगी रदद करण्यात येईल.

११) सदर नाहरकत प्रमाणपत्राची मुदत ही बारा महिन्याची राहील.

नगर पंचायत कार्यालय

निलेश इंगोले
मुख्याधिकारी
नगर पंचायत मोहाडी

Annexure 10: Permission Letter for the District Road-21 from the Zila Parishad Bhandara

कार्यालय, कार्यकारी अभियंता

सार्वजनिक बांधकाम विभाग, जिल्हा परिषद, भंडारा

E-Mail :- zpbhandara.ee@mahapwd.com eepwdzpbhandara@gmail.com दुरध्वनीक्रं :- (०७१८४) २५२५७४	पत्रक्रं. भंजिप/साबांवि/स्थाअस/ ३७५९ /२०२४ दिनांक :-९२/१२/२०२४

प्रति,

व्यवस्थापक

अदानी टोटल गॅस लिमिटेड अहमदाबाद

फेस्ट – फेस्ट -४-५ इन्सपायर बिजनेस पार्क शांतीग्रास

वैष्णवदेवी सर्कल एस.जी.हायवे अहमदाबाद – ३३२४२२

गुजरात भारत.

विषय : मौजा तुडका इतर जिल्हा मार्ग क्र.२१ सा.०/०० ते ०/४४९ (लांबी ०.४४९ कि.मी.) मध्ये रस्त्यास समांतर गॅस पाईप लाईन टाकण्याकरीता परवानगी मिळणेबाबत.

संदर्भ : १. आपले पत्र Adani Total Gas Limited Letter by ATGL/Bhandara GA/ZP_Road/Per/2024/002 Date 07.06.2024.

२. उपविभागीय अभियंता, सा. बां. (जि.प.) उपविभाग तुमसर यांचे पत्र क्रं. ४६०/उपवि/साबांजिप/तुमसर, दि. २८/०८/२०२४

३. या कार्यालयाचे पत्र क्र. भंजिप/साबांवि/स्थाअस/२५६९/२०२४ दि.०४.०९.२०२४

४. अदानी टोटल गॅस लिमिटेड यांनी परसवाडी,धर्मापुरी,पारडी,मोहगाव,वरठी रोड कटींग शुल्क रु.२६२९६९/ धनादेश क्र.००९७४६ दि.०४.११.२०२४ अन्वये चलनाव्दारे जमा.

उपरोक्त संदर्भीय पत्राचे अनुषंगाने कळविण्यात येते की, अदानी टोटल गॅस लिमिटेड अहमदाबाद यांचे द्वारे **तुमसर तालुक्यातील मौजा तुडका इतर जिल्हा मार्ग क्र.२१ सा.०/०० ते ०/४४९ (लांबी ०.४४९ कि.मी.) मध्ये रस्त्यास समांतर गॅस पाईप लाईन टाकण्याकरीता परवानगी मिळणेबाबत** संदर्भीय पत्र क्रं. १ अन्वये प्रस्ताव या कार्यालयास प्राप्त असून त्या अनुषंगाने संदर्भीय पत्र क्रं. २ अन्वये आमचे क्षेत्रिय अधिकारी यांनी प्रत्यक्ष मौका पाहणी करुन सुचविलल्या मानांकनानुसार अदानी टोटल गॅस लिमिटेड अहमदाबाद यांना संदर्भिय पत्र क्र.३ अन्वये Demand Note पाठविण्यात आली होती. त्यानुसार अदानी टोटल गॅस लिमिटेड अहमदाबाद यांनी त्यांचे संदर्भीय पत्र क्रं. ४ अन्वये **रु. २,६२,९६९/- रकमेचा** डी.डी. (डी. डी. क्रं.००९७४६ , दि. ०४.११.२०२४) या कार्यालयास सादर केलेला आहे.

करिता अदानी टोटल गॅस लिमिटेड अहमदाबाद यांचेव्दारे तुमसर तालुक्यातील मौजा तुडका इतर जिल्हा मार्ग क्र.२१ सा.०/०० ते ०/४४९ (लांबी ०.४४९ कि.मी.) मध्ये रस्त्यास समांतर गॅस पाईप लाईन टाकण्यास खालीलप्रमाणे नमूद अटींचे अधीन राहून या कार्यालयाव्दारे नाहरकत परवानगी देण्यात येत आहे.

अटी व शर्थी :-

१) गॅस पाईप लाईन रस्त्याच्या कमीत कमी १.५० मीटर खोलीवर असावी.

२) गॅस पाईप लाईन रस्त्याच्या सीमारेषेला लागून टाकावी. खोदकामातून निघालेली माती/मुरुम रस्त्यावर येणार नाही व वाहतुकीस अडथळा होणार नाही. तसेच रस्त्यालगतच्या नाल्या बुजणार नाही याची कंपनीने दक्षता घ्यावी. खोदकामातून निघालेली माती/मुरुम याची योग्य विल्हेवाट लावावी.

Optical Fibre Cable Page 14

३) खोदकामातील माती/मुरुमामुळे रस्ते नादुरुस्त झाल्यास तसेच खोदकामासाठी वापरण्यात आलेल्या अवजड वाहनामुळे जि.प. अखत्यारीतील रस्ते नादुरुस्त झाल्यास आपल्या कंपनीव्दारे रस्त्याची दुरुस्ती करण्यात यावी.

४) रस्ता खोदून गॅस पाईप लाईन टाकतांना अपघात झाल्यास त्याची संपूर्ण जबाबदारी कंपनीची राहील.

५) गॅस पाईप लाईन इतर जिल्हा मार्ग दर्जाच्या मध्यापासून ५.५० मीटर दूरवर टाकावी तसेच यासंबंधी सार्वजनिक बांधकाम नियमावलीतील परिशिष्ट २३ व परिच्छेद ३२१ येथिल सर्व तरतुदी लागू राहतील.

६) गॅस पाईप लाईन टाकण्याकरिता शासनाने विहीत केलेले शुल्क अदा करावे लागेल.

७) प्रत्यक्षात काम करतांना मंजूरी दिलेल्या लांबीपेक्षा जास्त लांबीचे केबल टाकण्याचे काम केल्यास त्यासाठीचे अतिरिक्त शुल्क भरावे लागेल.

८) रस्ता खोदण्याची तथा गॅस पाईप लाईन टाकण्याची पूर्व सुचना जि.प. बांधकाम उपविभाग.तुमसर यांना देण्यात यावी.

९) आपल्या कंपनीने विहीत शुल्क जमा केल्यानंतर कंपनीस केबल लाईन टाकण्याकरिता परवानगी देण्यात येईल. काम पूर्ण करावयाचा कालावधी ६ महिण्यापर्यंत वैध राहील व त्यानंतर देण्यात आलेली परवानगी आपोआप रदद होईल.

१०) परवानगी देण्यात आलेल्या रस्त्याचे रुंदीकरण वा इतर काही कामासाठी भविष्यात केबल लाईन हलवायची झाल्यास आपल्या कंपनीने स्वखर्चाने हलविणे बंधनकारक राहील. त्याची कोणतीही परिपुर्ती जि. प. भंडारा करणार नाही.

११) आर्थीक व्यवहारात कमी जास्त झाल्यास आपण सर्वस्वी जबाबदार राहाल.

१२) वरील शर्ती व अटींचे, नियमांचे उल्लंघन झाल्यास देण्यात आलेली परवानगी रदद करण्याचे अधिकार हे कार्यकारी अभियंता, सा.बां. वि., जि.प., भंडारा यांना राहील.

कार्यकारी अभियंता
सार्वजनिक बांधकाम विभाग
जिल्हा परिषद, भंडारा

प्रतिलीपी :- उपविभागीय अभियंता, सार्वजनिक बांधकाम (जि. प.). उपविभाग तुमसर यांना माहिती तथा उचित कार्यवाहीस्तव अग्रेषित.

कार्यकारी अभियंता
सार्वजनिक बांधकाम विभाग
जिल्हा परिषद, भंडारा

Annexure 11: Result of Secondary Baseline Monitoring

SHRI OM TESTING & RESEARCH LABORATORY

Plot No. 296, 1st FNG Road, Sector-121, Ghari Chaukhandi, Noida-201301
Mob.: 9821154906, 8076937396
E-mail.: shriomlab@gmail.com, **Web.:** www.shriomlab.com, www.shriomlab.in
GSTIN: 09ADHFS2444J1ZS

N.A.B.L. Accredited, ISO 9001, ISO 14001 & ISO 45001 Certified Laboratory.

TEST REPORT

Report No : STRLA- 2507202504-01 Issue Date. 25.07.2025
Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Bhandara, Maharashtra, India

RESULTS
(Ambient Air Quality Analysis)

SAMPLING DETAILS

Sample Identification No	:	STRLA 1801202502-01
Sample Description	:	Ambient Air
Sample Collection by	:	STRL Staff
Selection Method	:	STRL/LAB/AIR/STP/01
Sampling Duration	:	24 Hours
Flow Rate of Gases	:	1.0 LPM
Sample Condition	:	OK
Analysis Duration	:	21.07.2025 to 25.07.2025

S. No.	Parameters	Unit	AAQ-01 Near Bhandara Bus Depot at Chainage Ch-31.959 21°9'26.12"N and 79°38'38.98"E	AAQ-02 Road Crossing Near 29.599 21°10'22.38"N and 79°39'3.93"E	AAQ-03 Near Mohadi Village at Chainage Ch-9.719 21°18'39.33"N and 79°40'31.84"E	AAQ-04 Near Tumsar Bus stand at Chainage Ch-3.368 21°22'42.96"N and 79°44'30.11"E	NAAQ Standards
1.	Particulate Matter (PM-10)	µg/m³	23.3	26.2	24.2	23.8	100
2.	Particulate Matter (PM-2.5)	µg/m³	7.0	7.4	7.6	8.2	60
3.	Sulphur Dioxide (SO_2)	µg/m³	7.9	7.8	7.1	7.50	80
4.	Nitrogen Dioxide (NO_2)	µg/m³	8.55	8.30	8.43	8.64	80
5.	Ozone (O_3) -8Hr.	µg/m³	12.9	14.7	4.4	13.9	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	0.15	0.18	0.14	0.17	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	0.17	0.11	0.19	0.14	20

End of Report (Page No 01 of 01)

Shri Om Testing & Research Laboratory
Ravinder Kumar Sharma
25/7/25
Technical Manager

Authorised Signatory
(Name, Designation & Signature with Seal)

STRL/LAB/QF/058 Rev.:00

Note: 1. The results indicated only refer to the tested samples and listed parameters and do not endorse any product. The customer asked for the above tests only.
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3. This certificate shall not be used in any advertising media or as evidence in the court of Law without prior written consent of the laboratory.
4. The samples received shall be destroyed after 30 days from the date of issue of the certificate unless specified otherwise and sample for biological testing will be destroyed after 7 days of testing.

SHRI OM TESTING & RESEARCH LABORATORY

Plot No. 296, 1st FNG Road, Sector-121, Ghari Chaukhandi, Noida-201301
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GSTIN: 09ADHFS2444J1ZS

N.A.B.L. Accredited, ISO 9001, ISO 14001 & ISO 45001 Certified Laboratory.

TEST REPORT

Report No : STRLN- 2507202504-02 **Issue Date.** 25.07.2025
Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Bhandara, Maharashtra, India

RESULTS
(AMBIENT NOISE QUALITY ANALYSIS)

SAMPLING DETAILS

Sample Identification No	:	STRLA 1801202502-02
Sample Description	:	**Ambient Noise**
Sample Collection by	:	**STRL Staff**
Sampling Method	:	**IS- 9989: 1981**
Sampling Duration	:	**24 Hours**
Sample Condition	:	**OK**
Analysis Duration	:	21.07.2025 to 25.07.2025

Sl. No.	Location	Location Code	Results in Db(A) Leq	
			Average Day Noise Level	Average Night Noise Level
1	ANQ-01 Near Bhandara Bus Depot at Chainage Ch- 31.959 21° 9'26.12"N and 79°38'38.98"E	ANQ-01	49.3	38.8
2	ANQ-02 Road Crossing Near 29.599 21°10'22.38"N and 79°39'3.93"E	ANQ-02	50.1	39.3
3	ANQ-03 Near Mohadi Village at Chainage Ch-9.719 21°18'39.33"N and 79°40'31.84"E	ANQ-03	49.9	40.4
4	ANQ-04 Near Tumsar Bus stand at Chainage Ch-3.368 21°22'42.96"N and 79°44'30.11"E	ANQ-04	51.4	41.1

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 Laboratory
Ravinder Kumar Sharma
25/7/25
Technical Manager

Authorised Signatory
(Name, Designation & Signature with Seal)

STRL/LAB/QF/058 Rev.:00

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GSTIN: 09ADHFS2444J1ZS

N.A.B.L. Accredited, ISO 9001, ISO 14001 & ISO 45001 Certified Laboratory.

TEST REPORT

Report No : STRLGW-2507202504-03 Issue Date. 25.07.2025
Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Bhandara, Maharashtra, India

RESULTS
(WATER QUALITY ANALYSIS)

SAMPLE DETAILS

Sample Identification No	:	STRLA 1801202502-03
Sample Description	:	Ground Water
Sample Collection by	:	STRL Staff
Sampling Method	:	IS-3025(P-1)1987
Date of Sampling	:	19.07.2025
Sample Quantity	:	5L+500 ml
Sample Condition	:	OK
Analysis Duration	:	21.07.2025 to 25.07.2025

S. No.	Parameters	Limits (as per IS:10500-2012)		Results GW-01 Near Tumsar Bus stand at Chainage Ch-3.368 21°22'42.96"N and 79°44'30.11"E	Results GW-02 Road Crossing Near 29.599 21°10'22.38"N and 79°39'3.93"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	-	-	22.6	22.5	IS: 3025(Pt-9)1984 Reaff 2002
5	pH	6.5-8.5	No Relaxation	7.34	7.38	IS : 3025(Pt-11)1983, Reaff. 2017
6	Electric Conductivity	-	-	880	945	IS : 3025 (Pt-14)-2013
7	Total Hardness (as $CaCO_3$)	200	600	248.8	318	IS : 3025(Pt-21)1983, Reaff. 2014
8	Iron (as Fe)	0.3	No Relaxation	0.18	0.18	APHA 22nd Ed., 3120B (3111B (AAS),
9	Chlorides (as Cl)	250	1000	146.3	156.7	IS : 3025(Pt-32)1988, Reaff. 2014
10	Fluoride (as F)	1	1.5	0.12	0.08	APHA 22nd Ed., 4500F(D)
11	TDS	500	2000	528	567	IS: 3025(Pt-16)1984, Reaff. 2017
12	Calcium (as Ca^{2+})	75	200	46.8	50.7	IS :3025(Pt-40)1991, Reaff. 2014
13	Magnesium (as Mg^{2+})	30	100	32.2	32.1	APHA 22nd Ed., 3500-Mg (B)
14	Sulphate (as SO_4)	200	400	35.3	38.8	IS : 3025(Pt-24)1986, Reaff. 2014
15	Nitrate(as NO_3)	45	No Relaxation	26.9	26.9	IS : 3025(Pt-34)1988, Reaff. 2014
16	Alkalinity (as $CaCO_3$	200	600	322.1	334.1	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

STRL/LAB/QF/058 Rev.:00

Note: 1. The results indicated only refer to the tested samples and listed parameters and do not endorse any product. The customer asked for the above tests only.
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SHRI OM TESTING & RESEARCH LABORATORY

Plot No. 296, 1st FNG Road, Sector-121, Ghari Chaukhandi, Noida-201301
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GSTIN: 09ADHFS2444J1ZS

N.A.B.L. Accredited, ISO 9001, ISO 14001 & ISO 45001 Certified Laboratory.

TEST REPORT

Report No : STRLSW-2507202504-04 **Issue Date.** 25.07.2025
Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Bhandara, Maharashtra, India

RESULTS
(WATER QUALITY ANALYSIS)

SAMPING DETAILS

Sample Identification No	:	STRLA 1801202502-04
Sample Description	:	*Surface Water*
Sample Collection by	:	STRL Staff
Sampling Method	:	IS-3025(P-1)1987
Date of Sampling	:	19.07.2025
Sample Quantity	:	5L+500 ml
Sample Condition	:	OK
Analysis Duration	:	21.07.2025 to 25.07.2025

S.NO	Parameter	Unit	Result SW-01 Sur River Near Ch-13.59 21°16'38.61"N 79°40'24.59"E	Result SW-02 Lined Canal near Chainage Ch-1.8 km 21°21'31.54"N 79°43'22.90"E
1	Turbidity	NTU	4.4	4.0
2	pH (at 25°C)	-	7.26	7.29
3	EC	µS/cm	578	694
4	Total Dissolve Solids	mg/l	345	415
5	Total Hardness as $CaCO_3$	mg/l	222	234.8
6	Calcium as Ca	mg/l	45.7	44.7
7	Magnesium as Mg	mg/l	26.3	29.8
8	Sodium as Na	mg/l	98.8	94.6
9	Potassium as K	mg/l	59.8	62.4
10	Chloride as Cl	mg/l	188.0	189.9
11	Sulphate as SO_4	mg/l	44.5	76.2
12	Nitrate as NO_3	mg/l	36.0	37.7
13	Total Alaklinity as $CaCO_3$	mg/l	267	268.8
14	Fluoride	mg/l	0.10	0.09

Page (01 of 02)

Shri Om Testing & Research Laboratory
Ravinder Kumar Sharma
25/7/25
Technical Manager
Authorised Signatory
(Name, Designation & Signature with Seal)

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GSTIN: 09ADHFS2444J1ZS

N.A.B.L. Accredited, ISO 9001, ISO 14001 & ISO 45001 Certified Laboratory.

TEST REPORT

Report No : STRLSW-2507202504-04 **Issue Date.** 25.07.2025
Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Bhandara, Maharashtra, India

RESULTS
(WATER QUALITY ANALYSIS)

SAMPING DETAILS

Sample Identification No	:	STRLA 1801202502-04
Sample Description	:	*Surface Water*
Sample Collection by	:	STRL Staff
Sampling Method	:	IS-3025(P-1)1987
Date of Sampling	:	19.07.2025
Sample Quantity	:	5L+500 ml
Sample Condition	:	OK
Analysis Duration	:	21.07.2025 to 25.07.2025

S.NO	Parameter	Unit	Result SW-01 Sur River Near Ch-13.59 21°16'38.61"N 79°40'24.59"E	Result SW-02 Lined Canal near Chainage Ch-1.8 km 21°21'31.54"N 79°43'22.90"E
1	Turbidity	NTU	4.4	4.0
2	pH (at 25°C)	-	7.26	7.29
3	EC	µS/cm	578	694
4	Total Dissolve Solids	mg/l	345	415
5	Total Hardness as $CaCO_3$	mg/l	222	234.8
6	Calcium as Ca	mg/l	45.7	44.7
7	Magnesium as Mg	mg/l	26.3	29.8
8	Sodium as Na	mg/l	98.8	94.6
9	Potassium as K	mg/l	59.8	62.4
10	Chloride as Cl	mg/l	188.0	189.9
11	Sulphate as SO_4	mg/l	44.5	76.2
12	Nitrate as NO_3	mg/l	36.0	37.7
13	Total Alaklinity as $CaCO_3$	mg/l	267	268.8
14	Fluoride	mg/l	0.10	0.09

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TEST REPORT

Report No: STRSW-2507202504-04

S.NO	Parameter	Unit	Result Line Route 2 SWQ-2.1 U/S of Canal near Chainage 16764.06 m (TP 253) 21°55'16.26"N 83°22'6.65"E	Result Line Route 2 SWQ-2.2 D/S of Canal near Chainage 16764.06 m (TP 253) 21°55'12.09"N 83°22'6.12"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	5.65	5.6
28	Total Suspended Solid	mg/l	15.4	27.5
29	Total Solid	mg/l	448.4	454.4
30	Chemical Oxygen Demand as O_2	mg/l	32.4	34
31	BOD, 3 days @27°C as O_2	mg/l	8.9	9.0
32	Oil & Grease	mg/l	<0.01	<0.01
33	Total Coliform	MPN /100 ml	10	08

*** End of Report ***

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TEST REPORT

Report No : STRLS- 2507202504-05 Issue Date. 25.07.2025
Issued To : M/s. Environment & Social Impact Assessment (ESIA) Study for Adani Total Gas Project at Bhandara, Maharashtra, India

RESULTS
(SOIL QUALITY ANALYSIS

SAMPLING DETAILS

Sample Identification No	:	STRLA 1801202502-05
Sample Description	:	*Soil*
Sample Collection by	:	STRL Staff
Sampling Method	:	STRL/STP/SOIL/01
Date of Sampling	:	19.07.2025
Sample Quantity	:	5 kg
Sample Condition	:	OK
Analysis Duration	:	21.07.2025 to 25.07.2025

S.No	PARAMETERS	UNIT	RESULTS	TEST PROTOCOL
			SQ-01 Near Tumsar Bus stand at Chainage Ch-3.368 21°22'42.96"N and 79°44'30.11"E	
1.	Texture		Sandy clay Loam	IS: 2720 (part-4), 1985 Reaff:2015)
2.	Sand	%	44.4	IS: 2720 (part-4), 1985,(Reaff:2015)
3.	Silt		26.2	IS: 2720 (part-4), 1985,(Reaff:2015)
4	Clay		29.4	IS: 2720 (part-4), 1985,(Reaff:2015)
5	Porosity	%	49.9	STRL /STP/SOIL/01,
6.	Bulk Density	g/cc	1.56	STRL /STP/SOIL/01
7.	pH	....	7.59	STRL /STP/SOIL/01
8.	E. Conductivity	µs/cm	0.48	STRL /STP/SOIL/01
9.	Magnesium	mg/kg	46.1	STRL /STP/SOIL/01
10.	Calcium	mg/kg	216.2	STRL /STP/SOIL/01
11.	Chlorides	mg/kg	60.9	STRL /STP/SOIL/01
12.	Sodium	mg/kg	83.9	STRL /STP/SOIL/01
13.	Potassium	mg/kg	66.9	STRL /STP/SOIL/01
14	Organic Carbon	%	0.88	IS : 2720 (Part-24)-1976(R-2015)
15	Organic matter	%	1.53	IS : 2720 (Part-24)-1976(R..2015)
16.	Phosphorous	mg/kg	63.7	IS: 2720 (part-26),1987. (R:2011)
17.	SAR	meq	1.58	STRL /STP/SOIL/01
18.	Nitrogen (as N)	mg/kg	0.19	STRL /STP/SOIL/01
19.	Salinity (as NaCl)	%	0.38	STRL /STP/SOIL/01

***End of Report ***

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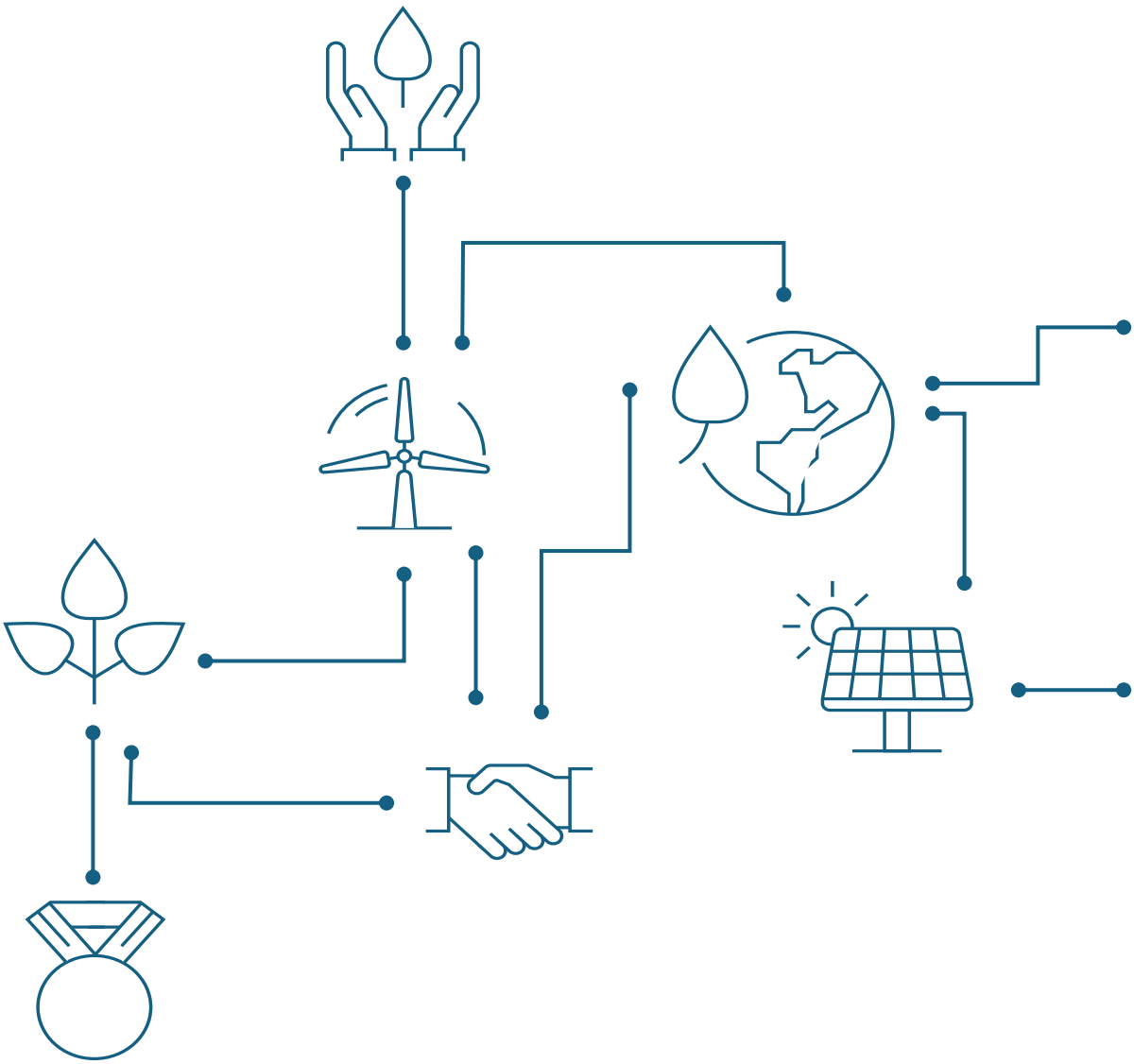

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