অসম চৰকাৰ

GOVERNMENT OF ASSAM

ASOM MALA PROGRAM

Government of Assam

Public Works Roads Department (PWRD)

Project Title: Improvement and Upgradation of Road from Nakachari to Balighat Tiniali via Amguri under Asom Mala [From Ch. 0+000 to Ch. 44+931Km]

DETAILED PROJECT REPORT

Environment Impact Assessment and Environmental & Social Management Plan

December, 2021

ABBREVIATIONS

AADT	-	Annual Average Daily Traffic
AAQM	-	Ambient Air Quality Monitoring
AIIB	-	Asian Infrastructure Investment Bank
BDL	-	Below Detectable Limit
BOD	-	Biological Oxygen Demand
CGWA	-	Central Ground Water Authority
CO	-	Carbon monoxide
CPCB	-	Central Pollution Control Board
CSC	-	Construction Supervision Consultant
DFO	-	Divisional Forest Officer
DG	-	Diesel generating set
DO	-	Dissolved oxygen
DPR	-	Detailed Project Report
EA	-	Executing Agency
EAC	-	Expert Appraisal Committee
EIA	-	Environmental Impact Assessment
EFP	-	Environment Focal Person
EMOP	-	Environmental monitoring plan
ESMP	-	Environmental and Social Management Plan
EPC	-	Engineering Procurement Construction
FHWA	-	Federal Highway Authority
GHG	-	Greenhouse gas
GIS	-	Geographic information system
GOI	-	Government of India
GRC	-	Grievance redress committee
GRM	-	Grievance redress mechanism
IA	-	Implementing Agency
IMD	-	Indian Meteorological Department
IRC	-	Indian Road Congress
IUCN	-	International Union for Conservation of Nature
MDR	-	Major District Road
MOEF&CC	-	Ministry of Environment, Forests and Climate Change
MORTH	-	Ministry of Road Transport and Highways
NH	-	National Highway
NGT	-	National Green Tribunal
NOC	-	No Objection Certificate
NO2	-	Nitrogen Dioxide
PAH	-	Project Affected Households
PAP	-	Project Affected Persons
PAs	-	Protected Areas
PCR	-	Public Community Resources
PCU	-	Passenger Car Units
PD	-	Project Director

PM	-	Particulate Matter
PIU	-	Project Implementation Unit
PMC	-	Project Management Consultant
PMU	-	Project Management Unit
PPM	-	Parts per million
PPTA	-	Project Preparedness Technical Assistance
PUC	-	Pollution under Control
PWRD	-	Public Works Roads Department
R & R	-	Rehabilitation and Resettlement
ROB	-	Road Over Bridge
ROW	-	Right of Way
RSPM	-	Respiratory suspended particulate matter
SEIAA	-	State Environmental Management Unit
SH	-	State Highway
SO2	-	Sulphur Dioxide
SOE	-	Safeguard Officer Environment
SOI	-	Survey of India
SPCB	-	State Pollution Control Board
SPL	-	Sound Pressure Level
SPM	-	Suspended Particulate Matter
TA	-	Technical assistance
TDS	-	Total dissolved solids
TSS	-	Total suspended solids
ZSI	-	Zoological survey of India

WEIGHTS AND MEASURES

dB (A)	-	A-weighted decibel
ha	-	hectare
km	-	kilometer
µg	-	microgram
m	-	meter
MW	-	megawatt
PM 2.5 or 10	-	Particulate Matter of 2.5 micron or 10-micron size

Table of Contents

List of Tables

List of Figures

List of Annexures

Executive Summary

A. Introduction

This report summarizes the findings and results of the Environmental Impact Assessment (EIA) study carried out for the **A20_2 (Nakachari to Balighat Tiniali)** road under Improvement of SH's and MDR's under Asom Mala. The report describes the existing environmental conditions in the project area, anticipated environmental and social impacts and corresponding mitigation measures, the public consultation process, the environmental and social management plan (ESMP), and its monitoring plan.

The program is envisaged to improve the SH & MDR network in the next 15 years for fuelling economic growth and bringing the state road infrastructure at par with Southeast Asian countries; provide quality inter-linkage roads between the National Highways and the rural roads network as well as facilitate seamless multi-modal transportation; interconnect economic growth centers with quality developing quality transportation corridors and improve inter-state connectivity. The proposed project is designed to improve transport connectivity in Assam by rehabilitating and upgrading 1268 Km of State Highways and Major District Roads, out of which 8 project road corridors of length of 245.7 Km is proposed under ASRIP for AIIB financing.

The project road is located in Jorhat and Sivasagar District and proposed for improvement and upgradation by GoA under AIIB funding. It is an important road connecting Macsahowa, Abhaypuriya village, Hemlai samtal, Gabharu tiniali, Koliapani, Rahadhal, Podumani, Dalanghat, Amguri, Lalimchiga, Samaguri, Belimukhiya tiniali, Dikshu mout village, Ksankar, Namti Charali, Abhaypura gaon, Mezenga, Bortal, Nazira and other important towns and settlements. The project road provides connectivity to Golaghat which has good educational and healthcare facilities, market places, and railway stations. The project road is important for the socio-economic development of the region, connectivity with districts Golaghat and Jorhat, and further connectivity to the state of Nagaland. The project road is related to the overall objectives of the Asom Mala Program and AIIB financing. It is proposed for geometric improvements and widening to two lanes. The roads will have a top width of 12m, consisting of a 7m carriageway with a 1.5m paved shoulder on either side, along with 1m earthen shoulders on each side.

This EIA report has been prepared to meet the requirements of the Asian Infrastructure Investment Bank (AIIB) for financing the project road and in compliance with AIIB's Environmental and Social Policy (ESP) and Environmental and Social Standards (ESS).

B. Description of the Sub-Project

A_20_2(Nakachari to Balighat) Road is of historical importance, it starts from Nakachari. This historical road connects Macsahowa, Abhaypuriya village, Hemlai samtal, Gabharu tiniali, Koliapani, Rahadhal, Podumani, Dalanghat, Amguri, Lalimchiga, Samaguri, Belimukhiya tiniali, Dikshu mout village, Ksankar, Namti Charali, Abhaypura gaon, Mezenga, Bortal, Nazira and other important towns and settlements. The project road A_20_2 lies in the district of Jorhat and the total length of the project road is 45.931 Km. Jorhat represents a major part of the

plains of the Brahmaputra valley at an altitude of about 60 m to 140 m above the mean sea level. Some areas at the south and southeast of the district have low hill ranges, which are the continuation of the Naga Hills, and the northern part of the valley is flat to nearly level. The general slope of the area is from southeast to northwest. Sivasagar represents a more or less flat country excepting some low undulating hummocks in the southern part which are generally covered by tea estates or reserved forests. The general slope of the area is from southeast to northwest. The general elevation of the plain area varies from 85 to 100m above mean sea level which gradually rises to 128 to 150 m towards south and southeast.

The project road originates at Nakachari in Jorhat district and ends in Balighat in Sivasagar district. The mighty River Brahmaputra and its tributaries like south Dhansiri, Bhogdoi and Kakodonga drain the district of Jorhat and Disang and Dikhow are two major rivers which originate in Naga Patkai range and drain the district of Sibsagar.

C. Categorization of Project

The Project is categorized as Category "A," in accordance with the Bank's Environmental and Social Policy (ESP) and Environmental and Social Standards (ESS). As per AIIB ESP for Category "A" project an Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) is required. However, in this case an Environmental Impact Assessment (EIA) Report and Environmental and Social Management Plan (ESMP) has been prepared since a separate Social Impact Assessment (SIA) is prepared. The EIA report will examine the Project's potentially negative and positive environmental impacts and recommends any measures needed to avoid, minimize, mitigate, or compensate for adverse impacts and improve environmental performance of the Project.

D. Description of Environment

Meteorological Conditions: The climate in Jorhat is warm and temperate. The summers receive heavy rainfall, while the winters are characterised by little amount of rainfall. The average temperature is about 23.7°C (74.7°F) and annual precipitation is about 2699 mm (106.3 inch). The climate of Sibsagar is mild, and generally warm and temperate. In winter season, there is much less rainfall here than in summer season. The average annual temperature in Sibsagar is 23.8°C (74.8°F) and the rainfall received is approximately 2952 mm (116.2 inch).

Topography: Jorhat represents a major part of the plains of the Brahmaputra valley at an altitude of about 60 m to 140 m above the mean sea level. Some areas at the south and southeast of the district have low hill ranges, which are the continuation of the Naga Hills, and the northern part of the valley is flat to nearly level. The general slope of the area is from southeast to northwest. Sivasagar represents a more or less flat country excepting some low undulating hummocks in the southern part which are generally covered by tea estates or reserved forests. The general slope of the area is from southeast to northwest. The general elevation of the plain area varies from 85 to 100m above mean sea level which gradually rises to 128 to 150 m towards south and southeast.

Air Quality: The maximum concentration of PM_{10} is 89 µg/m^3 found at Balighat, Near Termination Point, whereas the maximum concentration of PM2.5 is 49 µg/m3 found at Balighat, Near Termination Point. Ambient air quality parameters are well within the NAAQ standards prescribed by MoEF&CC for residential areas. The PM_{10} concentration is above the limit prescribed by WHO Ambient Air Quality Guidelines (IFC EHS). Other parameters monitored i.e., NO_X, SO_2, and CO were found within the permissible limits (NAAQS & IFC EHS). Overall, the air quality along the subproject roads is not an issue.

Noise Quality: The maximum recorded day time noise level is 54 dB(A) at **Balighat, Near Termination Point** and the night time noise level is 53.7 dB(A) recorded at Nakachari. The monitored noise levels are well within the permissible limits for residential areas prescribed by CPCB and also by World Bank EHS standards of 55 dB(A) and 45 dB(A) for day time and night time respectively.

Water Quality: The pH of the drinking water in the region is well within permissible limits (6.37 to 6.78). The level of total dissolved solids is found well within permissible limits, which varies from 112 mg/l to 180 mg/l at Nakachari and Nazira respectively. Other parameters analyzed like chloride, sulphate, fluorides are found well within standards. Overall, the groundwater and surface water quality in the project area is good.

Soil: The districts consists of alluvial soil. The soil type in the areas is mainly Black soil. Soil is mostly found as sandy loam soil in the sampling locations and it is loaded with the sand percentage which varies from 40.1% to 42.4%. Nitrogen content varies from 21.4 mg/kg to 22.4 mg/kg and organic carbon content is 4.4%.

Land use: The project road traverses through plain area from the starting point to the end point. The land use pattern for the proposed project road stretch is a mix of Residential, Commercial and Agricultural land. The land-use pattern in the project section has major share of settlements compared to agricultural area. The project road passes through cities like Amguri, Nazira that boosts the economic factors related to the stretch. The business establishment includes petty shops, grocery shops, vegetable shops, hotels, dhabas, tea stalls, petrol pumps, automobile workshops etc. There are no industrial establishments along the project road. Besides, there are schools, colleges, hospitals, statues, and religious structures along the project road.

Water Resources and Hydrology: There is no river crossing along the project road however some seasonal streams are crossing the alignment only during the monsoon season.

Biological Environment: The subproject districts, in general, have a moderate to low percentage of forest cover. Field surveys have been carried out to identify the number and type of trees to be affected by the proposed improvement work. It is envisaged that **8389** trees existing within the proposed formation width of the subproject road. Subproject road sections do not pass through any protected area such as Wildlife Sanctuary, National park, or bio–reserve. The nearest protected area from the project road is the Hoollongapar Gibbon Sanctuary and Panidihing Bird Sanctuary which is at distance of 8Km and 20 Km km (approx.) from the project road.. No rare or endangered species are found in the corridor of impact along the subproject roads.

Socio-economic Environment: The project road traverses through the settlements of Macsahowa, Abhaypuriya village, Hemlai samtal, Gabharu tiniali, Koliapani, Rahadhal, Podumani, Dalanghat, Amguri, Lalimchiga, Samaguri, Belimukhiya tiniali, Dikshu mout village, Ksankar, Namti Charali, Abhaypura gaon, Mezenga, Bortal, Nazira. Agriculture is the mainstay of the people. one archaeological and historical monument is located along the project roads. 43 schools, 1 hospital, 2 colleges and 39 religious structures lie in the vicinity of the project road, however, these structures will not be affected due to proposed improvement activities under the project.

E. Key Environmental and Social Impacts

- It is envisaged that 8389 trees existing within the proposed formation width of the subproject road need to be felled.
- The project road runs along the Puthinadi, Jhanji, Dikhow rivers which may get polluted to some extent during the construction stage.
- The project road passes through settlement areas which may cause minor disturbance to the local public due to construction activities.
- There are several sensitive receptors along the project road which may face minor inconvenience due to increased noise because of construction activities.
- The Proposed road widening activities will have an impact on 562 structures.
- The numbers of projects affected people are 2355 out of which 1224 are male and 1131 are female.

F. Public Consultation and Information Disclosures

In accordance with AIIB's ESP and ESS and Environment Impact Assessment Notification of GoI (2006), public consultations were conducted, as part of the environmental impact assessment study. Public Consultations were carried out at Nakachari Bazar on 26/09/2021, PWD Office, Mariani Tutorial on 27/09/2021, Hemlay on 28/09/2021, Padmalli on 30/09/2021 and Amguri town No. 3 on 01/10/2021 along the proposed road alignment. A total of **73 participants** (**63 Male** and **10 Female)** attended the consultation sessions.

Public consultation has been conducted in the project area during the feasibility study as well as during the detailed design stage details given in Chapter 7. Key issues raised during the consultation are:

- Embankment protection work
- Road widening activities
- Improved road conditions
- Employment opportunities
- Tree cutting & plantation activities
- Provision of bus stops
- Measures for protecting harm to elephants
- Provision of street lights
- Land Acquisition along the road

Most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, boost

economic development, and thereby provide direct, or indirect, benefits to themselves. The Draft EIA will be disclosed publicly and communicated to the communities.

G. Environmental and Social Management Plan

The project road-specific Environment and Social Management Plan has been formulated which consists of mitigation, monitoring measures, and training to effectively execute the management plan. The detailed ESMP is given in **Chapter 9** of this report. An ESMP budget of **INR 18,97,72,416** has been estimated in **Table 79** and **Table 80** for the implementation of the environmental and social management plan. The project will have one grievance redressal mechanism for social and environmental issues. The nodal officer under a project implementation unit will be the key person to coordinate the receiving of complaints and addressing them.

Road aesthetics will be improved after tree plantation, landscaping of embankment slopes, improving the road cross-sections, side drains, installation of safety signage, crash barriers, and road markings. The aesthetics will further be improved due to the enhancement of ponds and a few schools and hospitals along the road.

Environmental Monitoring Programme (EMoP)

A comprehensive monitoring plan has been prepared for all stages of the project. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost, and responsibility for implementation and supervision. Construction Stage Monitoring to be carried out by the contractor under the supervision of the Authority Engineer (AE)/ Construction Supervision Consultant (CSC).

Monitoring will focus on air, water, noise and soil erosion, drainage congestion, and compensatory tree plantation. For tree plantation, the survival rate of re-plantation shall be monitored for one year of the operation phase.

Institutional Arrangement and Capacity Building

The Government of Assam's Public Works Roads Department (PWRD) will be the executing agency. The Chief Engineer (EAP) will be the Project Director (PD) of state-level Project Management Unit (PMU). PD PMU will be assisted by an Assistant Executive Engineer as Nodal Officer of the Asom Mala Program.

The PMU will oversee overall execution and technical supervision, monitoring, and financial control of the project. The PMU will be supported by AE and/ or Program Coordination and Management Consultant (PCMC). The institution Arrangement and Capacity building are discussed in Chapter – 9, Section 9.6.

To enable PWRD officials to implement environmental safeguard requirements effectively, a training program will be conducted for the PWRD Environmental and Social Safeguard expert to improve environmental and Socialawareness, construction practices, legislative compliance requirements, ESMP, and EMoP requirements, and roles and responsibilities.

H. Conclusions and Recommendation

The findings of the EIA show that overall, the project has limited and short-term adverse Environmental Impacts. Effective ESMP implementation will ensure the elimination and minimization of identified adverse impacts. PWRD shall ensure that ESMP and EMoP are included in the Bill of Quantity (BOQ) and will form a part of the bid document and works contract. If there is any change in the project design the ESMP and EMOP will be accordingly modified. PWRD official & shall need capacity building and practical exposure. Adequate training shall be imparted as proposed under the environmental and social management plan to enhance the capability of concerned EA and IA officials.

1. Introduction

1.1 Sub-Project Background and Rationale

Assam is situated in the North-East of India and is the largest northeastern state in terms of population while second in terms of area. Assam covers an area of 78,438 km2 (30,285 sq miles). The state of assam has about 2,530 Km of state highways (SH) and4,379 Km of major district roads (MDR) which are being maintained and managed by Public Works Roads Department (PWRD, Assam), Government of Assam (GOA).

The Government of Assam (GOA) has embarked upon the Asom Mala to objectively develop the SH & MDR network of the State in the next 15 years or so. The Asom Mala is planned to be an umbrella program which would have several projects under it funded from various sources, including those funded from the State Budget, Government of India (GOI), Externally Aided Project (EAP) funded by Multilateral Development Banks (MDB), Asian Infrastructure Investment Bank (AIIB), Asian Development Bank (ADB), and NIDA.

The Public Works Roads Department of Assam (PWRD, Assam) has been entrusted with the assignment of Improvement of SH and MDRs under Asom Mala in the State of Assam and proposals were invited from Technical Consultants for carrying out preparation of Detailed Project Report.

The project road starts at Nakachari and ends at Balighat Tiniali (3-legged junction with NH-702C). the entire road falls under Jorhat and Sivasagar district in Assam. The existing length of the project stretch is 45.022 Km (as per road inventory). After evaluation of Technical and Financial proposal, Public Works Roads Department of Assam has appointed C.E. Testing Company Pvt. Ltd. (CETEST) as consultant for conduct of Environmental Screening Report, Environmental Impact Assessment and development of Environmental and Social Management Plan for this project. The project road is connected with NH-702 c at end point and NH -2 at Amguri. The road network development works will include rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, rehabilitation and widening of existing and/or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis within the given time frame. The main objective of intersection design is to reduce the severity of potential conflicts between motor vehicles, bus, trucks, bicycle, pedestrians and facilities while facilitating the convenience, ease and comfort of people traversing the intersection. The design should be fitted closely to the natural transitional paths and operating characteristics of the user.

The project road corridors proposed under ASRIP for AIIB financing is given in **Table 1**: Project Road Corridors proposed under AIIB Aided ASRIP ASRIP and the location of these project road corridors is shown in **Figure 1-1**.

Table 1: Project Road Corridors proposed under AIIB Aided ASRIP

Sr. No.	Corridor	Road improvement and upgradation works	District Name	Length (km)
1	A31	Balichapori, Majuli to Bhogalmara, Lakhimpur, including 2 RCC bridges over Subansiri and Luit river	Lakhimpur & Majuli	19.2
2	A15	Dhodar Ali (Kamargaon to Kamarbandha)	Golaghat	42.1
3	A07	Sarthebari Rampur Pathsala Raipur Road	Barpeta & Bajali	17.7
4	A22	Dhakuakhana Butikur Tiniali Telijan	Lakhimpur & Dhemaji	32.7
5	A30_1	Moran Naharkatia Road (Moran to Deesang Kinar Bangali)	Dibrugarh	46.6
6	A30_2	Moran Naharkatia Road (Deesang Kinar Bangali to Kathalguri)	Dibrugarh	24.0
7	A20_1	Sivasagar to Chumoni	Sivasagar	18.4
8	**A20_2**	**Nakachari to Balighat Tiniali**	**Sivasagar & Jorhat**	**45.0**
Total (km)				**245.7**

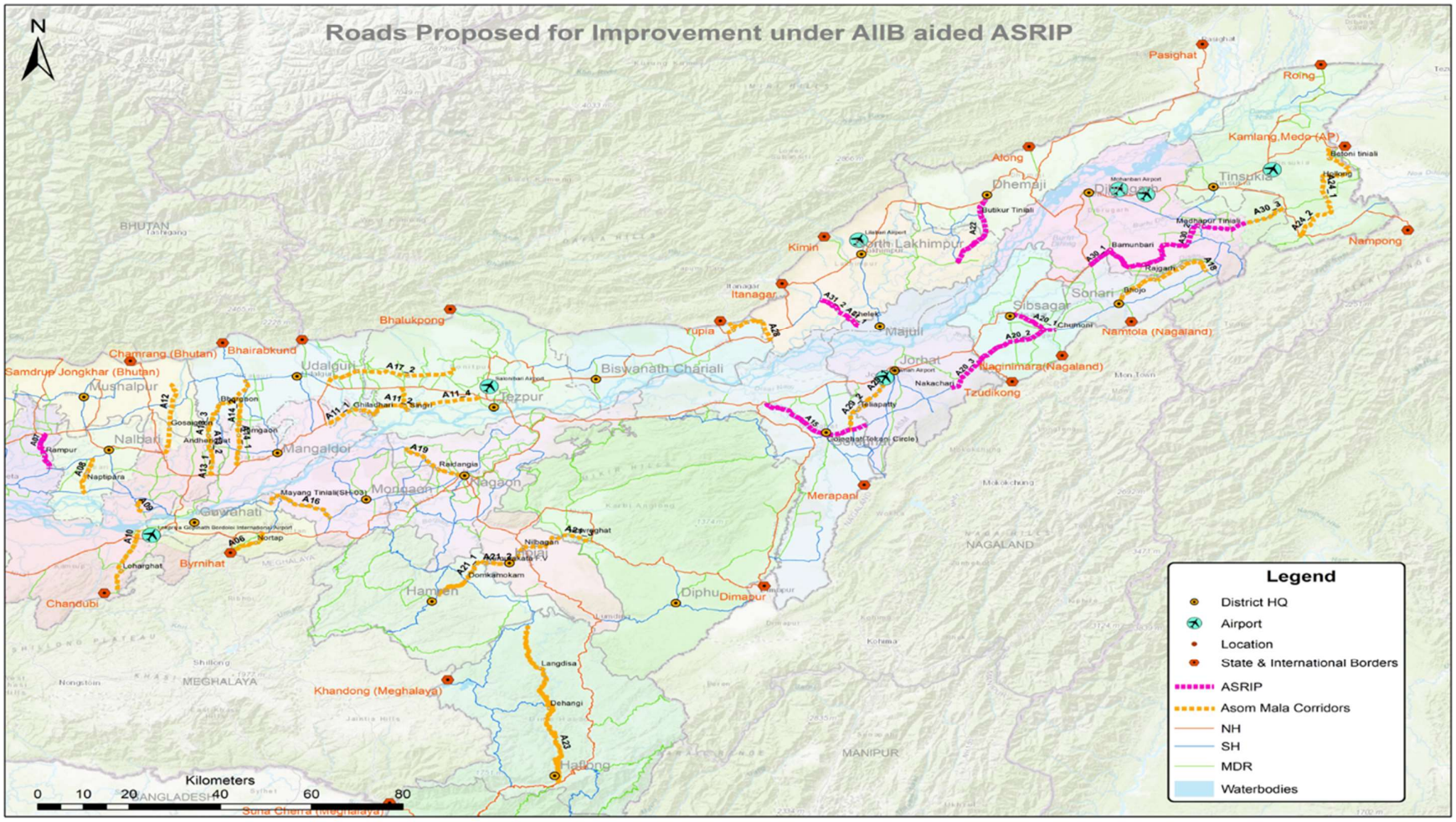


Figure 1-1: Location of Project Road Corridors proposed under ASRIP for AIIB Financing

1.2 Nature, Size and Location of the Project

Nakachari to Balighat Tiniali project road stretch is located in the state of Assam. The entire road falls under Jorhat and Sivasagar district. The existing length of the project stretch is 45.0 Km as per survey and starts from Nakachari at Km 0.00 and ends at Balighat Tiniali at 45.0 Km. The design length of the project road is 35.254 km.

The alignment experiences moderate agricultural activities throughout its stretch. Land use pattern of the project road is Built up and Agricultural type.

The existing carriageway width varies between 3.0 to 7.5 m. the existing RoW varies between 7m to 16m. The proposed carriageway varies between 7 to 12 meters with proposed widening 2-lane with paved shoulder, earthen shoulder.

1.3 Objective and Scope of the Study

Development of any road requires land acquisition, mainly forest or agricultural land needs to be diverted for such projects. Therefore, any such change in land use patterns may result in the deterioration of soil, water, and other environmental aspects. Such projects also cause air and noise pollution especially during the construction stage on account of heavy machinery and haul vehicles. The loss of ecology is an important impact of such projects.

The Environmental Impact Assessment (EIA) Report consists of the study, describing the current status of the environment in the project area (before the commencement of project), identification of potential impacts and its mitigation methods and formulation of an environmental and social management plan to be followed during construction and operation phase of the project. An Environment Impact assessment study is hence an important tool to identify and handle the issues concerned with the environment that would arise due to such projects.

Preparation of EIA reports and implementation of all environment safeguards requirements is in accordance with relevant policies and regulations of the Government of India, Government of Assam, and the AIIB's Environmental and Social Framework.

This EIA addresses the environmental and social management requirements of the Government of India (GOI) and the Asian Infrastructure Investment Bank. Various agendas covered in this study are as follows.

- Provides information about the baseline environmental setting of the subproject;
- Provides information on potential environmental impacts of the proposed subproject activities with their magnitude, distribution, and duration.
- Provides information on required mitigation measures with cost to minimize the impacts.
- Provides details of stakeholder consultations.
- Designs environmental and social management and monitoring plan with institutional measures for effective implementation of mitigation measures proposed and addressing grievances.

The environmental studies have been limited to the situation around the deemed areas of direct influence caused by construction and operational facilities along the proposed road sections. The EIA was based on proposed road alignment and key construction activities such as site clearing, removal of trees, excavation, filling, grading and embankment formation, excavation for utility trenches, subgrade preparation, base course and asphalt overlay, shoulder, and construction of permanent structures like retaining walls, culverts, and drains. The EIA also covered ancillary activities like campsite establishment and maintenance, sourcing of materials, and operation of equipment like rock crusher and hot mix plant. The corridor of impact is taken as 10 meters on either side of the alignment. However, the study area impact zone is considered up to 5 km on both sides of road alignment to allow for coverage of indirect and induced impacts and a larger analysis of land use and other environmental features. Assessment is carried out on the following environmental components: terrestrial and aquatic ecology, soil, water, air, noise, and socio-economic aspects.

1.4 Methodology Adopted for EIA Study

The methodology for EIA adopted complies with the Asian Infrastructure Investment Bank Environmental and Social Framework. The study was carried out using reconnaissance surveys, field visits, consultation with stakeholders, review of existing data, identification of adverse impacts, and preparation of environmental and social management and monitoring plans. The stepwise activities carried out include:

- Review of legal and statutory requirements;
- Review of the feasibility study
- Reconnaissance survey for identification of key issues data requirement and preliminary consultation
- Collection of primary and secondary data.
- Consultations with stakeholders;
- Identify and assess the potential impacts of the subproject on the baseline conditions and recommend mitigative measures to offset the identified adverse impacts;
- Formulate Environmental Management Plan including review of Institutional set up and Capacity Building.

1.4.1 Data Collection

Primary and secondary data of ambient air quality, surface/ground water quality, noise quality, soil quality, tree enumeration, socio-economic data were collected during the field study. Details of existing habitations, infrastructure (education, health and commercial), public utilities (wells, water taps, religious structures) and natural resources (river, stream, drain) were also collected. The type and source of information compiled in this EIA are given in the following **Table 2**: Primary and Secondary Information Sources**.**

Table 2: Primary and Secondary Information Sources

Information	Sources
Technical information on existing road features and proposed Rehabilitation work. Inventory of	PWRD, Design Consultant, Ground physical surveys and graphics Consultants

Information	Sources
road features; viz. water bodies community structures, environmentally sensitive location areas, congested locations, etc.	
Climatic Condition	Indian Meteorological Department, ENVIS Website, NIC, Primary data Collection
Geology, Seismicity, Soil, and Topography	Geological Survey of India, SOI Toposheets, Primary data collection
Land Use/ Land Cover	Survey of India (SoI) Toposheet, Observation during the survey.
Drainage Pattern	Survey of India Topo sheet and field Observation
Status of forest areas, Compensatory afforestation norms, etc.	Divisional Forest Office Sivasagar and Jorhat District
Status of Fishing Activity	District Fisheries Offices at Sivasagar and Jorhat District
Air quality Noise, Soil, and Water	Onsite monitoring and Analysis of Field samples during the field visit
Borrow Areas, Quarries and other construction material source	Observations from site inspection surveys, PWRD
River geomorphology, hydrology, drainage, flood Patterns	Feasibility report, field observations.
Socioeconomic Environment	Primary Census Abstract of Sivasagar and Jorhat District 2011 and Official websites maintained by state Govt.
Social Survey	The Secondary data collected for the project and the project influence area are from reliable secondary sources such as websites of central and state government; published documents from various departments. Initial social screening was conducted to identify the likely impacts and identify the potential impacted families and persons, Common Property Resources, agriculture land, access to services, etc. Using available RoW records with Revenue Department, the social team plotted the

Information	Sources
	boundaries of private properties within the proposed RoW. A structured questionnaire was prepared to carry out the census survey covering all (100%) of the families displaced as a result of development of the project within the proposed RoW/ CoI. To collect the information of socio-economic profile of the affected population, conventional sample of 25 percent of project displaced families was covered. Representativeness of the sample was ensured through random sampling method

1.4.2 Public Consultation

Extensive consultations were held during different stages (reconnaissance, detailed design, and design review) with key stakeholders that includes local and beneficiary population, government departments/agencies, road users, and project-affected persons. These consultations allowed the interaction between the stakeholders and road designers to identify road features and construction methods that will enhance road upgrading and minimize potential impacts. Information gathered was integrated into the project design and formulating mitigation measures and environmental and social management plan. A detailed description of public consultation is presented in Chapter 7.

1.5 Structure of the Report

This EIA report has been prepared as per the requirements of the AIIB's Environmental and Social Framework. The report will be organized into the following ten chapters, a brief of each chapter is described below:

- **Chapter 1 - Introduction**: This section describes the background information about the project and the EIA study.
- **Chapter 2 - Policy, Legal, and Administrative Frameworks**: This chapter reviews applicable environmental regulatory framework and its relevance for Project including AIIB's safeguard policies. It also presents the required clearances and permits pertaining to environmental safeguards at different stages of the project. **Chapter 3 - Project Description**: This Chapter presents the key features and components of the proposed project.
- **Chapter 4 - Description of the Environment**: The chapter describes Baseline Environmental features within the study area in details. It includes detailing of physical environmental resources viz. (Physiography, Geology and Climatology, Water resources, environmental quality with respect to Air, water, noise and soil quality), Ecological and social & cultural resources along the project road corridor and its area of influence.**Chapter 5 - Anticipated Environmental and Social Impacts and Mitigation**

Measures: The Chapter analyses the anticipated environmental impacts (both positive as well as negative) due to the proposed project and provides mitigation measures for all the identified adverse impacts during design and construction phase and operation stage of the project.

- **Chapter 6 – Climate Change Impacts and Risks**: This section presents the impact of project road on climate change and relevant mitigation measures.
- **Chapter 7 – Public Consultation**: This section describes the consultation process undertaken during the environmental examination and its results, their consideration in the project design, and manner of compliance to the AIIB's policy.
- **Chapter 8 - Grievance Redress Mechanism**: This section describing the formal and informal redress procedures for registering, resolving, and reporting complaints.
- **Chapter 9 - Environmental and Social Management Plan**: This section discussing the lessons from the impact assessment and translated into action plans to avoid, reduce, mitigate, or compensate for adverse impacts and reinforces beneficial impacts. This plan is divided into three sub-sections; mitigation, monitoring, and implementation arrangements.
- **Chapter 10 - Conclusion and Recommendation**: This section stating whether there is a need for further detailed environmental studies/assessments and highlights key findings and recommendations to be implemented by the borrower.

2. Policy and Legal Framework

India has developed a fairly comprehensive regulatory framework to address environmental and social concerns in relation to development projects. The legislation covers all components of the environment viz. air, water, soil, terrestrial and aquatic flora, and fauna, natural resources, and sensitive habitats. India is also a signatory to various international conventions and protocols. The environmental legislation in India is framed to protect the valued environmental components and comply with its commitment to the international community under the above conventions and protocols. Asian Infrastructure Investment Bankhas also defined its Environmental and Social Framework. This assessment is about the applicability of the above laws and regulations, conventions, protocols, and frameworks. This section summaries the following:

- National (India) Environmental Legislation and Legal Administrative Framework,
- State Level Environmental Regulatory Framework,
- Social Safeguard Regulatory Requirements,
- AIIB policies and categorization of the project,
- Summary of international treaties and applicability to the project

2.1 National (India) Environmental Policies and regulatory Framework

The Government of India's Environmental Legal Framework comprises a set of comprehensive acts and regulations aimed at conserving various components of the biological and physical environment including environmental assessment procedures and requirements for public consultation. To understand the extent of the environmental and social assessment for the proposed project, applicable laws, legislation, and policies have been reviewed. The policies and requirements which are most relevant in the context of this project are provided in **Table 3**: Summary of Relevant Environmental Legislation**.**

Table 3: Summary of Relevant Environmental Legislation

Sr. No.	Act/ Rules	Objectives/Relevance	Authority	Applicable	Reason for Application
1	Environment (Protection) Act (1986) and Rules (1986)	To protect and improve the overall environment	MoEF&CC	Yes	It is umbrella legislation and notifications, rules and schedules are promulgated under this act.
2	The 14th September 2006 EIA notification, under sub-rule (3) of Rule 5 of the Environment (Protection) Rules, 1986. And amendment made on 22nd August, 2013; S.O. 2559 (E).	Environmental clearance for proposed project prior to starts of construction work	MoEF&CC/ SEIAA/ SEAC	No	The proposed project is an existing road where curve improvement and widening work are anticipated.
3	The 14th September 2006 EIA notification, under sub-rule (3) of Rule 5 of the Environment (Protection) Rules, 1986. Environmental Clearance under EIA notification dated 15th January 2016 issued by MoEF&CC, Letter No. 125, S.O 141E.	Permission will be required for opening new quarry or for extraction of river bed sand	0-5 Ha. Category (B2) – DEAC/DEIAA >5 Ha and <25 Ha (B2) – SEAC/SEIAA ≥25 Ha and <50Ha. Category (B1) – SEAC/SEIAA ≥50 Ha. Category (A) – MoEF&CC	Yes/No	**Yes:** if the contractor open quarries site/ Borrow Earth Mining site to meet the Material Requirement. **No:** If the source of construction material is from an authorized vendor. Environmental Clearance is exempted for sourcing or borrowing of ordinary earth for linear projects as per notification S.O. 1224 (E) dated 28th March 2020
4	Wildlife Protection Act (1972 and amended in 1993)	To restrict project activities within National Park/ Wildlife Sanctuary/ Game Reserve/ Conservation Reserve or within its Eco Sensitive Zone (ESZ) which are declared protected under the WLPA-1972.	SBWL	No	Not Applicable. As per the Map furnished by the PCCF office, the nearest wildlife sanctuary (Hoollongapar Gibbon Sanctuary) is 6.7 km from the proposed alignment.
5	The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988) and Rules 1974	Establishment/Operation of stone crusher, Hot Mix Plant, RCC Plant and D.G sets	Consent to Establish (CtE) and Consent to Operate (CtO) under water Act 1974 from SPCB	Yes	This act will be applicable during construction for establishments of hot mix plants, construction camps, workers' camps, etc. for usage and discharge of water.

Sr. No.	Act/ Rules	Objectives/Relevance	Authority	Applicable	Reason for Application
6	The Air (Prevention and Control of Pollution) Act, 1981(Amended 1987) and Rules 1982	Establishment/Operation of stone crusher, Hot Mix Plant, RCC Plant and D.G sets	Consent to Establish (CtE) and Consent to Operate (CtO) under Air Act 1981.	Yes	To control the emission and air pollutants which might be expected during operation of stone crusher, Hot Mix Plant, RCC Plant and D.G sets
7	Noise Pollution (Regulation and Control) Act, 2000	Establishment/Operation of stone crusher, Hot Mix Plant, RCC Plant and D.G sets	Consent to Establish (CtE) and Consent to Operate (CtO) under Noise Rules, 2000. Authority SPCB	Yes	To control the noise emission generated from operation of D.G sets, Hot Mix Plant, Stone crushers, WMM Plants etc.
8	The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	To protection the general public against improper handling, storage, and disposal of hazardous wastes	SPCB	Yes	Used of Hazardous material and handling for construction of roads
9	The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003)	To protect and manage notifiedforests	MoEF&CC	No	No diversion of forest land is required for proposed project road.
10	Central Motor Vehicle Act (1988) and Rules (1989)	To control vehicular air and noise pollution. To regulate the development of the transport sector, check and control vehicular air and noise pollution.	State Transport Department	Yes	These rules will apply to road users and construction Machinery.
11	The Ancient Monuments and Archaeological Site and Remains (Amendment and Validation) Act, 2010	For construction of road falling within prohibited or regulated area of notified Ancient Monuments and Archaeological Site and Remains Act.	Archaeological Dept. GOI/State	Yes	one number of archaeological sites is found beyond 200 meters (Regulated Zone) from PROW Boundary
12	Building and Other Construction Workers (Regulation and the Employment and conditions of service) Act, 1996	To regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures	Ministry of Labour and Employment	Yes	A large number of construction workers skilled, semiskilled or unskilled will be employed temporarily during Construction Phase of the project

Sr. No.	Act/ Rules	Objectives/Relevance	Authority	Applicable	Reason for Application
13	Child labour (Prohibition and Regulation) Act, 1986	To regulate the employment of children including age limits, type of employment, the timing of work, information disclosure, and health and safety.	Ministry of Labour and Employment	Yes	This act will be applicable to prohibit employment to children below the age of 14.
14	Public Liability & Insurance Act, 1991	Regulate the employment and conditions of construction workers and provide for their safety, health and welfare measure and other matters incidental thereto.	District Collector	Yes	The contractor needs to stock hazardous materials like diesel, Bitumen, Emulsions, etc.
15	Chemical Accidents (Emergency Planning, Preparedness, and Response) Rules, 1996	To prevent the occurrence of a chemical accident involving a fortuitous, or sudden or unintended occurrence while handling any hazardous chemical resulting in continuous, intermittent or repeated exposure to death, or injury to, any person or damage to any property	MoEF&CC	Yes	This law will be applicable as the project will involve transport and storage of hazardous chemicals.
16	Fly Ash Notification, 25th January, 2016.	Use of fly ash for road filling and for other construction works if Thermal Power Plant are located within 300 km from PROW.	MoEF&CC	No	The project road is not located within 300 km from any Coal based Thermal Power Plant.

1. Requirement of Environmental Clearance

As per provisions of Environmental Impact Assessment Notification 2006 amended (2009, 2011 and 2013), and its amendments, vide notification S.O.3067(E), dated 1st December 2009 and S.O. 2559 (E), dated 22nd August 2013; all New State Highway Projects and State Highway expansion projects in hilly terrain (above 1000 m above AMSL) and/or ecologically sensitive areas require Environmental Clearances from MoEF&CC.

Since the project road is neither an existing state highway nor proposed as a New State Highway Environmental Clearance from MoEF&CC is not required.

2. Forest Clearance

As per the Indian Forests Conservation Act (1980), any project requiring diversion of forest land for non-forestry purposes require forest clearance from MoEF&CC for the same.

No diversion of forestland is involved in this projectroad. As per the Assam (Control of Felling and Removal of trees from Non-forest lands) Rules, 2002, the felling of trees from the Non-forest area will require prior approval of the Forest Department.

3. Permission to Withdraw Ground Water

As per the power Granted under Environmental Protection Act, 1986, Permission from Central Ground Water Authority is required for extracting groundwater for construction purposes, from areas declared as critical or semi-critical from groundwater potential prospective point of view.

4. Required Clearances/Permissions

For up-gradation of the project road, required clearances/permissions related to the environment have been summarized in **Table 4**: Permissions/Clearances Required for the Subproject.

Table 4: Permissions/Clearances Required for the Subproject

Sr. No.	Permissions/Clearances	Acts/Rules/Notifications/Guidelines	Concerned Agency	Responsibility	Time required
A. Pre-Construction Stage					
1	Permission for felling of trees in Non- Forest area	The Assam (Control of Felling and removal of trees from non -forest lands) Rules, 2002.	Divisional Forest Officer	Public Works Roads Department, Assam	Approx. 2 months (Application submitted)
B. Implementation Stage					
2	Consent to establish and operate hot mix plant, Crushers, Batching plant	Air (Prevention and Control Pollution) Act of1981	Assam State Pollution Control Board (To be obtained before installation)	Contractor	Approx. 3 months
3	Authorization for disposal of hazardous waste	Hazardous Waste (Management and Handling) Rules 1989	Assam State Pollution Control Board (To be obtained before installation)	Contractor	Approx. 3 months
4	Consent for Disposal of sewage from labor camps	Water (Prevention and Control of Pollution) Act 1974	Assam State Pollution Control Board (Before setting up the camp)	Contractor	Approx. 3 months
5	Pollution Under Control Certificate	Central Motor and Vehicle Act of 1988	Department of Transport, Government of Assam authorized testing centers	Contractor	Can be obtained instantly from verified PUC centers
6	Employing Labour/Workers	The Building and Other Construction Workers (Regulation and Employment Conditions of Service) Act, 1996	District Labour Commissioner	Contractor	Approx. 3 months

2.2 Social Regulatory Requirements of India and State

There are many rules and regulations framed by the Government of India for the protection of workers. Most of these legislations will apply to contractors in charge of construction. The executing agency will ensure compliance with these social legislations through contractual obligations and regular checks & penalties. Applicable Acts and Policies relevant in the context of the project have been reviewed and their relevance to the project are listed down below which will ensure that project activities implemented are consistent with the following regulatory/legal framework.

- Code of Social Security, 2020
- The Occupational Safety, Health and Working Conditions Code, 2020
- Child Labour (Prohibition and Regulation) Act, 1986
- Minimum Wages Act, 1948
- Workmen Compensation Act, 1923
- Payment of Gratuity Act, 1972
- Employee State Insurance Act; Employees P.F. and Miscellaneous Provision Act, 1952
- Maternity Benefit Act, 1951
- Payment of Wages Act, 1936
- Equal Remuneration Act, 1979
- Inter-State Migrant Workmen's (Regulation of Employment & Conditions of Service) Act, 1979
- Equal Remuneration Act, 1979, Factories Act 1948 (including rules for health and safety of workers), etc.
- Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR), 2013, Govt. of India
- RFCTLARR (Removal of Difficulties) Order, 2015
- The Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015
- Scheduled Caste and Scheduled Tribes Orders (Amendment) Act, 2002
- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006
- National Tribal Policy, 2006
- The Assam Panchayat Act, 1994
- The Right to Information Act, 2005

2.3 International Treaties and Relevance to the Sub-Project

India has signed most international treaties, conventions and protocols on environment, pollution control, bio-diversity conservation and climate change, including the RAMSAR Convention, the Rio de Janeiro Convention on Biodiversity Diversity, and the Kyoto Protocol on Climate Change. There are 20 major global Multilateral Environmental Agreements (MEAs) to which India is a signatory. There are three MEA related to Nature Conservation that are applicable to the project as listed in **Table 5**: Applicable MEAs Related to Nature Conservation for the Asom Mala Project.

Table 5: Applicable MEAs Related to Nature Conservation for the Asom Mala Project

Sr. No	NatureConservation	Relevancy to Project
1	Ramsar ConventiononWetlands	Yes, Protectionofsignificant wetland and prevention of draining or filling duringconstruction
2	CBD (Convention onBiologicalDiversity)	Yes, Conservation of biological diversity (or biodiversity) and sustainable use of its components.
3	IUCN (International Union for ConservationofNature)	Yes

2.4 AIIB Environmental & Social Framework Requirements

The Bank determines the Project's category by the category of the Project's component presenting the highest environmental or social risk, including direct, indirect, cumulative and induced impacts, as relevant, in the Project area. The Bank conducts a review of environmental and social risks and impacts associated with the Project, regardless of the categorization being considered. As an element of the categorization process, the Bank may conduct field-based review of the Project to provide for a refined understanding of the environmental and social risks and impacts and support the Client's preparation of a site-specific approach to assessment of these risks and impacts. The Bank may adjust the categorization during the life of the Project, if warranted by changes in the environmental and social risks and impacts.

- **Category A:** A Project is categorized A if it is likely to have significant adverse environmental and social impacts that are irreversible, cumulative, diverse or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works and may be temporary or permanent in nature. The Bank requires the Client to conduct an environmental and social impact assessment (ESIA) or equivalent environmental and social assessment, for each Category A Project and to prepare an ESMP or ESMPF, which is included in the ESIA report for the Project. The ESIA for a Category A Project examines the Project's potentially negative and positive environmental and social impacts, compares them with those of feasible alternatives (including the "without Project" situation), and recommends any measures needed to avoid, minimize, mitigate, or compensate for adverse impacts and improve environmental and social performance of the Project.
- **Category B:** A Project is categorized B when: it has a limited number of potentially adverse environmental and social impacts; the impacts are not unprecedented; few if any of them are irreversible or cumulative; they are limited to the Project area; and can be successfully managed using good practice in an operational setting. The Bank requires the Client to conduct an initial review of the environmental and social implications of the Project. On the basis of this review, the Bank, in consultation with the Client, determines the appropriate instrument for the Client to assess the Project's environmental and social risks and impacts, on a case-by-case basis. The Bank may determine that an environmental and social assessment or another similar instrument is appropriate for the Project. The scope of the assessment may vary from Project to Project, but it is narrower than that of the Category A ESIA. As in the case

of a Category A Project, the assessment examines the Project's potentially negative and positive environmental impacts and recommends any measures needed to avoid, minimize, mitigate, or compensate for adverse impacts and improve environmental performance of the Project.

- **Category C**: A Project is categorized C when it is likely to have minimal or no adverse environmental and social impacts. The Bank does not require an environmental and social assessment, but does require the Client to conduct a review of the environmental and social implications of the Project.
- **Category FI:** A Project is categorized FI if the financing structure involves the provision of funds to or through a financial intermediary (FI) for the Project, whereby the Bank delegates to the FI the decision-making on the use of the Bank funds, including the selection, appraisal, approval and monitoring of Bank-financed subprojects. The Bank requires the FI Client, through the implementation of appropriate environmental and social policies and procedures, to screen and categorize subprojects as Category A, B or C, review, conduct due diligence on, and monitor the environmental and social risks and impacts associated with the Bank-financed subprojects, all in a manner consistent with this ESP. A Project categorized as FI is also subject to: (a) the Environmental and Social Exclusion List and applicable host country national laws for all the Bank-financed subprojects; and (b) the applicable ESSs for the Bank-financed subprojects that are classified as Category A subprojects (and if the Bank so determines, some or all of the Bank-financed subprojects that are classified as Category B subprojects).

2.5 Category of the Project as per AIIB's Framework & MOEF&CC Notification 2006 and amended

As per provisions of Environmental Impact Assessment Notification 2006 amended (2009, 2011 and 2013), and its amendments, vide notification S.O.3067(E), dated 1st December 2009 and S.O. 2559 (E), dated 22nd August 2013; all New State Highway Projects and State Highway expansion projects in hilly terrain (above 1000 m above AMSL) and or ecologically sensitive areas require Environmental Clearance s from MoEF&CC/ SEAC/ SEIAA.

The proposed project is improvement and upgradation of existing road of total length 42.094 km. Based on the contour findings it has been reported that the maximum elevation is 108 meters above Average Mean Sea Level (AMSL).

The project road has been evaluated and categorized as Category "A" project in accordance with the Bank's Environmental and Social Policy (ESP) and Environmental and Social Standards (ESS). This categorization was primarily based on the following considerations:

- Project road is an existing road and upgrading activities are limited to the available RoW with minimum land acquisition at some locations,
- Anticipated impacts from road upgrading on relatively flat terrain along agricultural land are mostly site-specific and easily mitigated through proper design and good construction practices, majority of the activities have short-term duration co-terminus with the construction phase, and

- Project road does not pass through any Critical Habitats (wildlife sanctuary, national park, or any other environmentally sensitive area), Protected Area (Forests), Natural Habitats, impact on land and water resource, etc. The nearest protected area from the project road is the Nambor Doigrung Wildlife Sanctuary which is at a distance of 5.5 km (approx.) from the project road.
- Impact on local and regional biodiversity i.e., habitat fragmentation, degradation and loss, endemic and invasive species, over exploitation of biological resources, hydrological changes, increase in pollution load in water bodies, tree felling involve and induced climate impact.
- Impact involving social issues i.e., involuntary resettlements, loss of livelihoods, impact on indigenous peoples, impact on community and households, Vulnerable groups, etc
- Impact on land and natural resource, change in land-use patterns, Cultural resource, land acquisition, structure affected, etc.

3. Project Description

3.1 The Sub Project

The project road A_20_2 starts from Nakachari and ends at Balighat Tiniali and it's situated in Sivasagar and Jorhat districts. The total design length of the project road is 44.931 Km. Sivasagar district is situated in the North-Eastern part of Assam between 94.25° and 95.25°E longitude and 26.45° to 27.15°N latitude. The district covers an area of 2,668 km². The district is bounded by the Brahmaputra River to the north, Nagaland to the south, the Charaideo district to the east and the Jhanji River to the west.. Jorhat district lies between 92° 24' E and 93° 15' E longitude and 24° 22' N and 25° 8' N latitude. The district covers an area of 3,786 km². The district is bounded by Majuli on north, Nagaland state on the south, Charaideo on the east and Golaghat on the west. On the north of the district, the river Brahmaputra forms the largest riverine island of the world. The Project work for proposed roads consists of improvement of Nakachari to Balighat Tiniali road. The mentioned road stretch pass through major junctions and spreads through remote location of Sivasagar and Jorhat Districts.

The Brahmaputra river which is the main river in Sivasagar and Jorhat district, the road alignment crosses the railway line at many locations.

3.2 Location and Features of the Sub-Project Road

The project road Nakachari to Balighat TinialiRoad via Amguri, begins at Nakachari, and it connects Balighat Tiniali Road (3-legged junction with NH-702C). The project road is connecting with NH-702C at end point. & NH-2 at Amguri. Maximum project length is having intermediate lane with earthen Shoulder however at some locations two lane with earthen shoulder and Paver blocks stretches are observed.

The project Road passess through the Macsahowa, Abhaypuriya village, Hemlai samtal, Gabharu tiniali, Koliapani, Rahadhal, Podumani, Dalanghat, Amguri, Lalimchiga, Samaguri, Belimukhiya tiniali, Dikshu mout village, Ksankar, Namti Charali, Abhaypura gaon, Mezenga, Bortal, Nazira etc villages. At many locations, the proposed road alignment crosses the railway lines. Also, it joins to the railway stations like Many Common Property Resources like schools, colleges, Hospitals, Religious Places, Community places, and others are observed along the project alignment. **Figure 3-1** shows the location map and alignment plotted on Google earth.

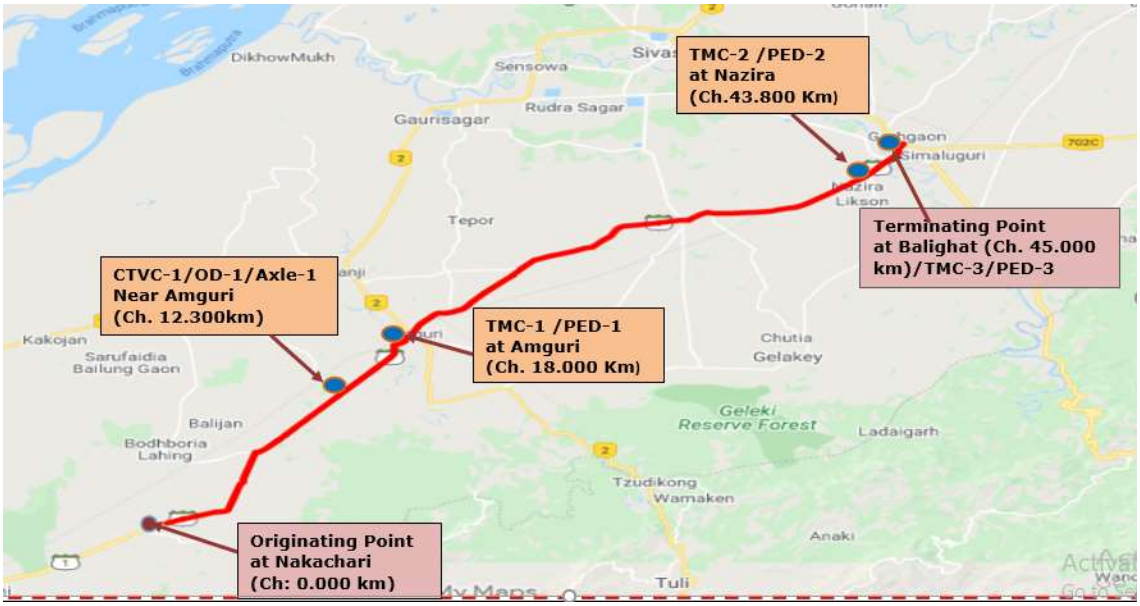


Figure 3-1: Map representing Nakachari to Balighat Tiniali Road

The salient features of the Road are given in **Table 6**: Summary Road Components and Design Standard

Table 6: Summary Road Components and Design Standard

Road Length	44.931 Km.
Alignment	Following the existing road alignment. Except some of the locations where geometric improvements are required.
Junctions	Major Junction-5 Nos Minor Junctio- 168 nos.
Bridges	02- Major Bridges, 10- Minor Bridges
Other Structures	Box Culverts: 51 nos.
Design Standard	As per IRC Codes and MORTH Guidelines.
Speed	65Kmph to 80Kmph.
	Permissible: 80 km/h
Horizontal Curves	As per IRC: 73 -1980
Existing ROW	About 7 m to 16m
Vertical Curves	Grade break of 0.5%, vertical curves will be provided. The length of the vertical curve will be restricted to minimum 50m
Existing Carriageway	Carriageway: 3.0m – 7.5m Total Formation Width: 5.0m – 11.5m
Associated/Linked Facilities	None

3.3 Engineering Surveys and Investigations

Following surveys and investigations had been carried out on the subproject road for collection of data for incorporation in the Detailed project report (DPR) and evolve the design for improvement and up-gradation.

- Topographic surveys;
- Traffic surveys;
- Road and pavement condition survey and inventory;
- Culverts and bridges condition survey and inventories;
- Material surveys;
- Hydrology studies for new bridge structures;
- Geotechnical investigations & subsoil exploration for structures; and
- Existing utility surveys.

These surveys had been carried out in accordance with the guidelines in IRC SP: 19-2001 to fulfill the requirement in the TOR.

3.4 Current and Projected Daily Traffic

Based on the Classified Volume Count (CVC), Turning Movement Count (TMC), Origin-Destination, and Axle Load Surveys conducted for the project and consistent with applicable IRC Guidelines the average annual daily traffic at the monitoring stations is shown in the table below. The Traffic Volume/Day (Base Year 2019-2020) data has been provided in **Table 7**. The present and projected traffic for future years is shown in **Table 8**.

Table 7: Traffic Volume/Day: (Base Year 2019-2020)

ehicle Type	2021	
	Ch. 12.300 Km at Amguri	
	In Number	In PCU
Two-Wheeler	2616	1308
Car/Jeep/Van/Taxi/Auto	1229	1229
Mini Bus	8	12
Standard Bus	25	75
LCV	388	583
2-Axle Truck	154	462
3-Axle Truck	9	28
Multi-Axle	2	10
Tractor with Trailer	1	3
Tractor without Trailer	1	1
Cycle	747	374
Cycle Rickshaw	4	7
Hand Cart	7	20
Bullock Cart	0	0
Horse Cart	0	0
Total Motorized Vehicles (Number)	**4434**	-
Total Non-Motorized Vehicles (Number)	**757**	-
Total Vehicles (Number)	**5191**	-
Total Motorized Vehicles (PCU)	-	**3711**
Total Non-Motorized Vehicles (PCU)	-	**401**
Total PCU per day	-	**4112**
Total Commercial Vehicle per day	**588**	

Source: Traffic Study

Table 8: Present and Projected Traffic in the road section

Year	AADT															Total in Numbers	Total in PCU
	Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 - Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2021	2616	1229	8	25	388	154	9	2	1	1	747	4	7	0	0	5191	4112
2022	2781	1303	9	26	419	162	10	2	1	1	747	4	7	0	0	5470	4344
2023	2956	1381	9	28	451	170	11	3	1	1	747	4	7	0	0	5767	4590
2024	3142	1464	9	29	487	178	11	3	1	1	747	4	7	0	0	6082	4852
2025	3340	1552	10	31	525	187	12	3	1	1	747	4	7	0	0	6418	5131
2026	3537	1639	10	32	563	196	13	3	1	1	747	4	7	0	0	6752	5410
2027	3746	1730	11	34	604	206	14	3	1	1	747	4	7	0	0	7107	5707
2028	3967	1827	12	35	648	217	14	3	1	1	747	4	7	0	0	7482	6020
2029	4201	1930	12	37	695	227	15	4	1	1	747	4	7	0	0	7880	6353
2030	4449	2038	13	39	746	239	16	4	1	1	747	4	7	0	0	8302	6706
2031	4698	2146	13	41	797	251	17	4	1	1	747	4	7	0	0	8726	7061
2032	4961	2259	14	43	851	263	18	4	1	1	747	4	7	0	0	9173	7437
2033	5239	2379	15	45	909	276	19	5	1	1	747	4	7	0	0	9646	7833

Year	AADT															Total in Numbers	Total in PCU
	Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 - Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2034	5532	2505	15	47	971	290	20	5	1	1	747	4	7	0	0	10145	8253
2035	5842	2638	16	50	1037	305	21	5	1	1	747	4	7	0	0	10673	8696
2036	6151	2770	17	52	1103	320	22	5	1	1	747	4	7	0	0	11201	9142
2037	6477	2908	18	55	1174	336	24	6	1	1	747	4	7	0	0	11757	9611
2038	6821	3054	19	58	1249	353	25	6	2	1	747	4	7	0	0	12343	10107
2039	7182	3207	20	60	1329	370	26	6	2	1	747	4	7	0	0	12960	10629
2040	7563	3367	21	63	1414	389	28	7	2	1	747	4	7	0	0	13611	11179
2041	7964	3535	22	67	1504	408	29	7	2	1	747	4	7	0	0	14296	11759
2042	8386	3712	23	70	1600	429	31	7	2	1	747	4	7	0	0	15018	12371

Source: Traffic Study

3.5 Proposed Improvement

The project stretches runs through plain terrain. There is an appreciable deficiency in the horizontal geometry at some locations of the project stretch with respect to design standards. Thus, proper geometric design would play a pivotal role to ensure the proper functioning of the proposed facility. Project Road will receive the following up-gradation under the project:

- Curvature improvement and realignment
- Widening
- Flexible pavement
- Rearrangement of junctions
- Roadside drains
- Bridge and cross drainage structures
- User facilities
- Traffic control and safety measures

3.5.1 Realignment and Curvature Improvement

Based on approved geometric standards the alignment plan of the existing road requires correction of existing sub-standard geometry at various locations. In plain or rolling terrain, a minimum curve radius as per design has been attempted to achieve design speed, however, an absolute minimum radius as per design is used at a location with space constraints like urban areas, structure approach, and other areas.

On sections with substandard geometry, improvements will require merging two or more existing curves resulting in a minor geometric realignment to achieve the desiredgeometric standards. Horizontal will be modified to accommodate the required rate of super-elevation and provide smooth riding quality. However, at locations with space constraints design speed has been restricted as low as 65 km/h.

3.5.2 Proposed Cross Section Details

Carriageway Width: The carriageway configuration of two lanes with a paved and hard shoulder is proposed for the project road having a 7.0 m carriageway width.

Shoulder: Paved Shoulder and Earthen shoulders are proposed to be 1.5m and 1.0m respectively on both sides of the Carriageway.

Footpath: The minimum width of footpath in urban stretches is proposed to be 1.5m. The side drain in such stretches may be accommodated under the footpath.

Utility Corridor: The minimum width of the utility corridor will be 1.0m.

Embankment Slopes: Side slopes shall not be steeper than 2H:1V.

The typical Cross Sections for the proposed project road are shown in the following figures.

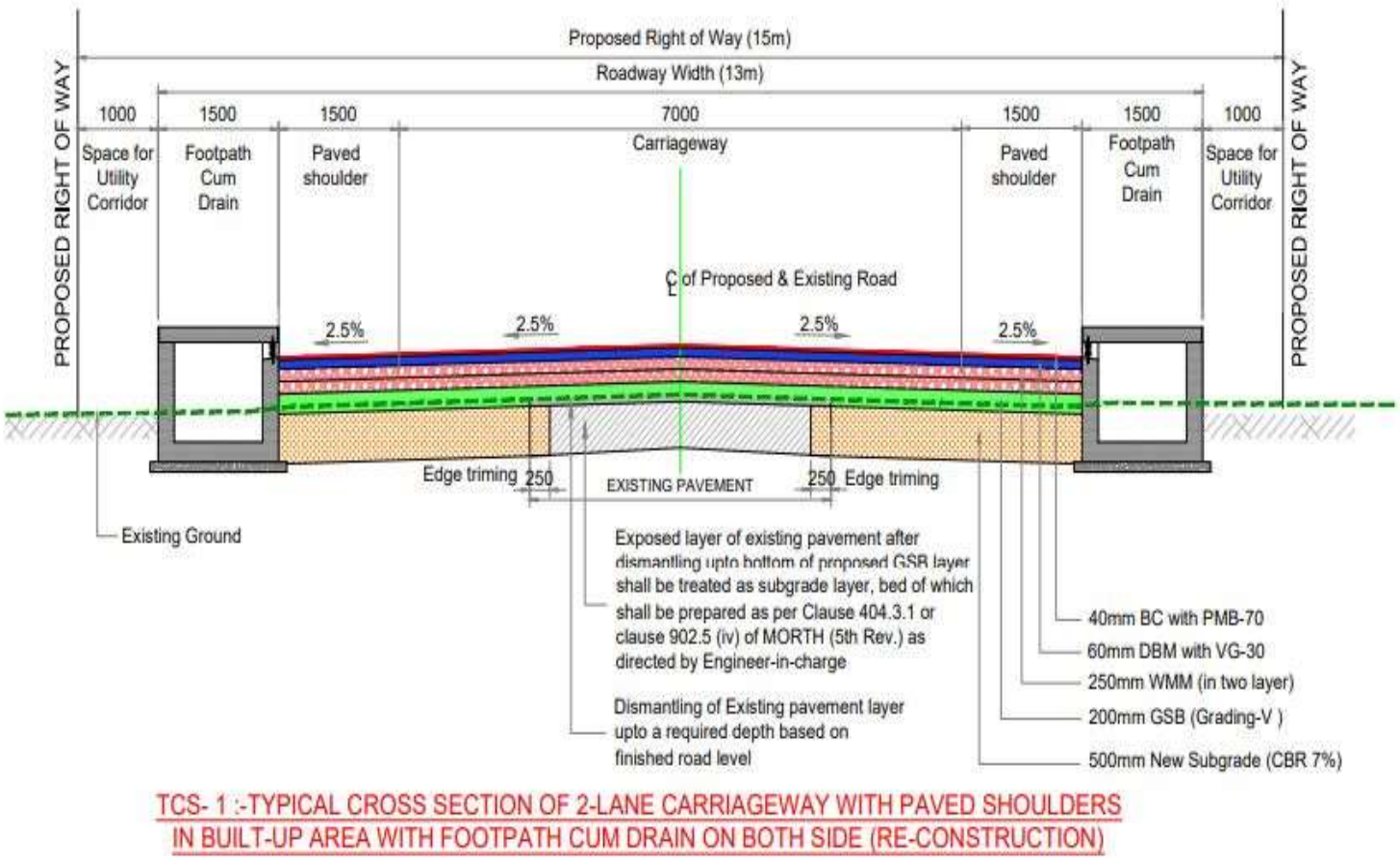


Figure 3-2: Typical Cross Section (Type-I)

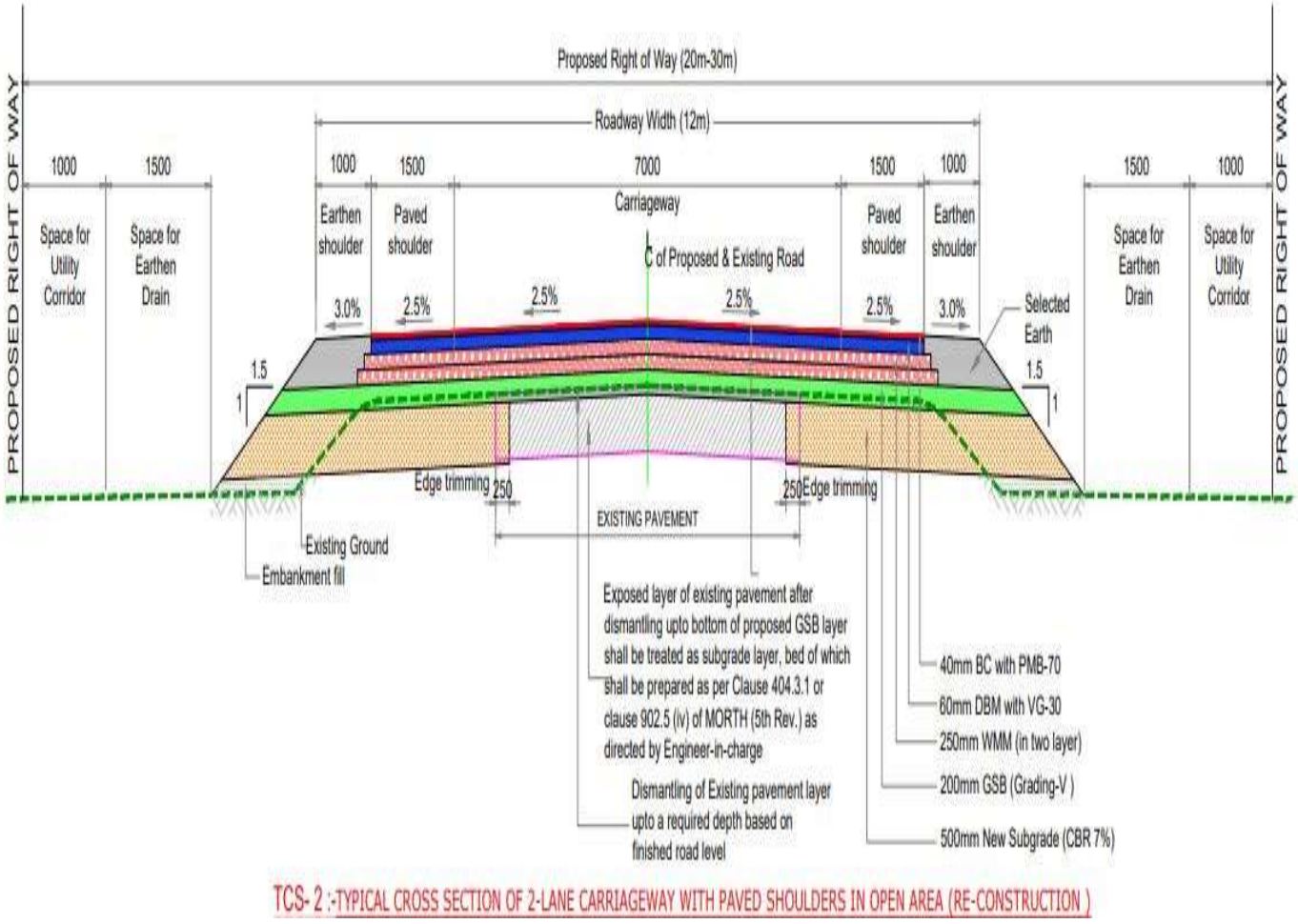


Figure 3-3: Typical Cross Section (Type-II)

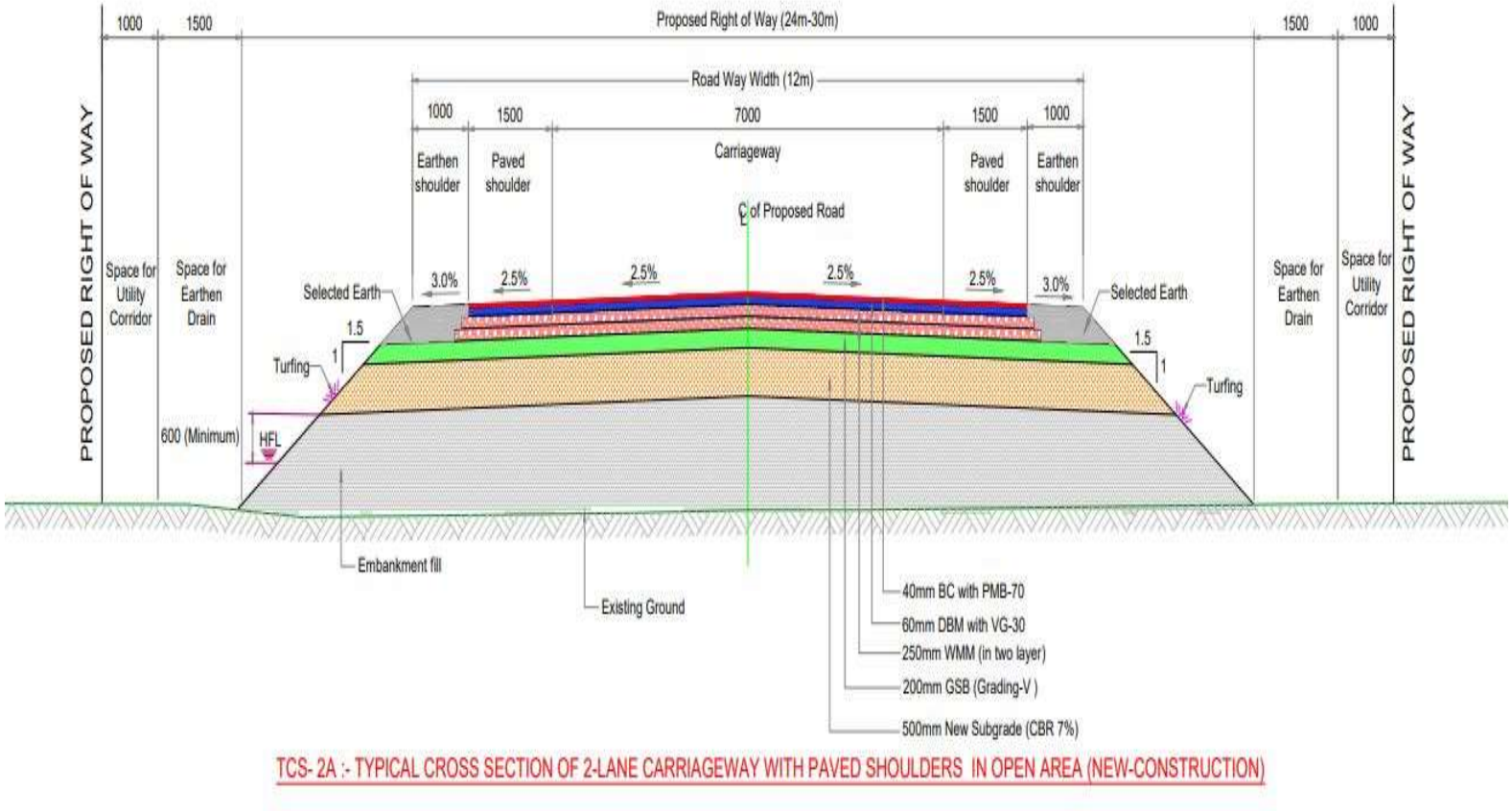


Figure 3-4: Typical Cross Section (Type-2A)

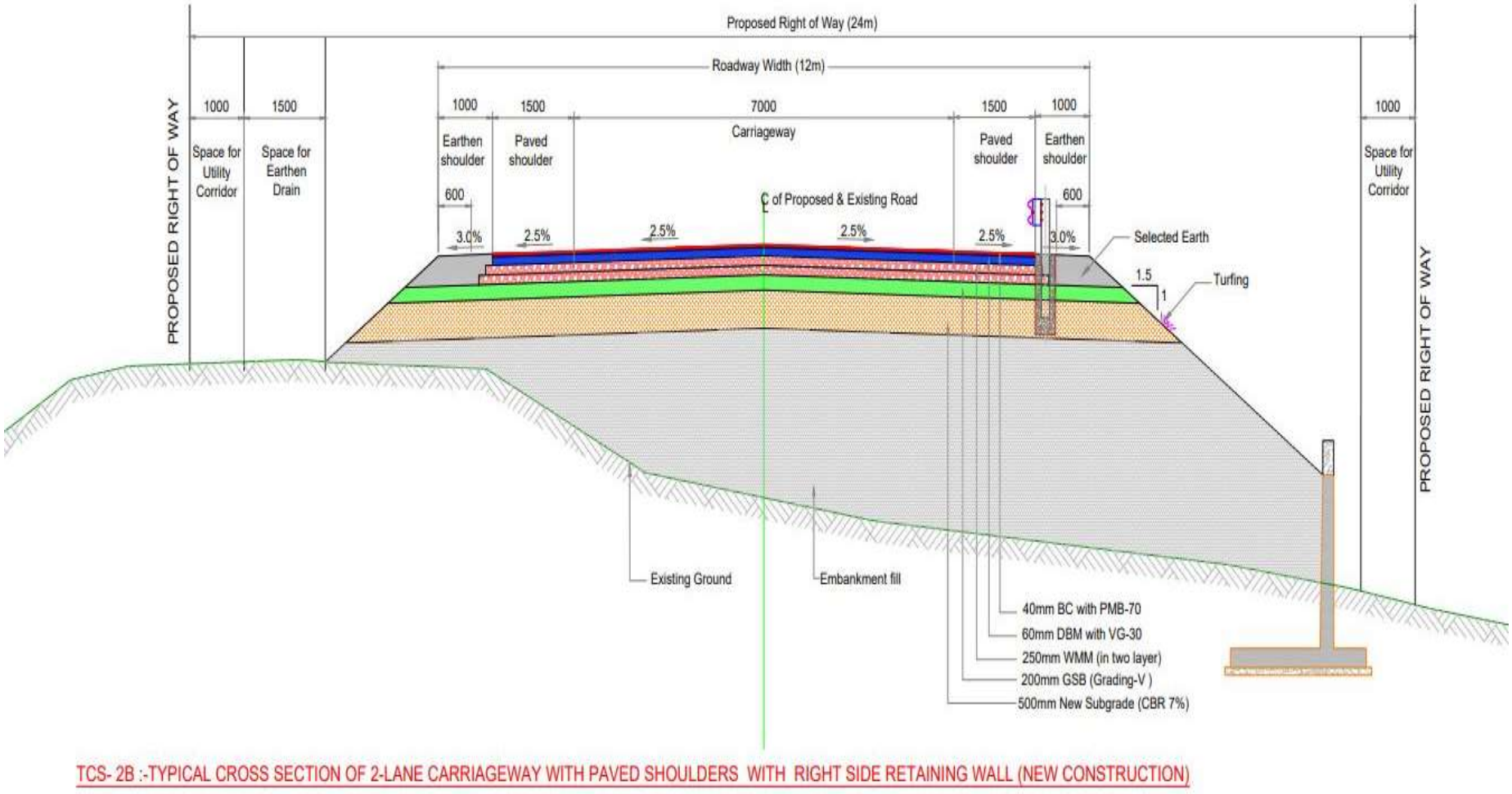


Figure 3-5: Typical Cross Section (Type-2B)

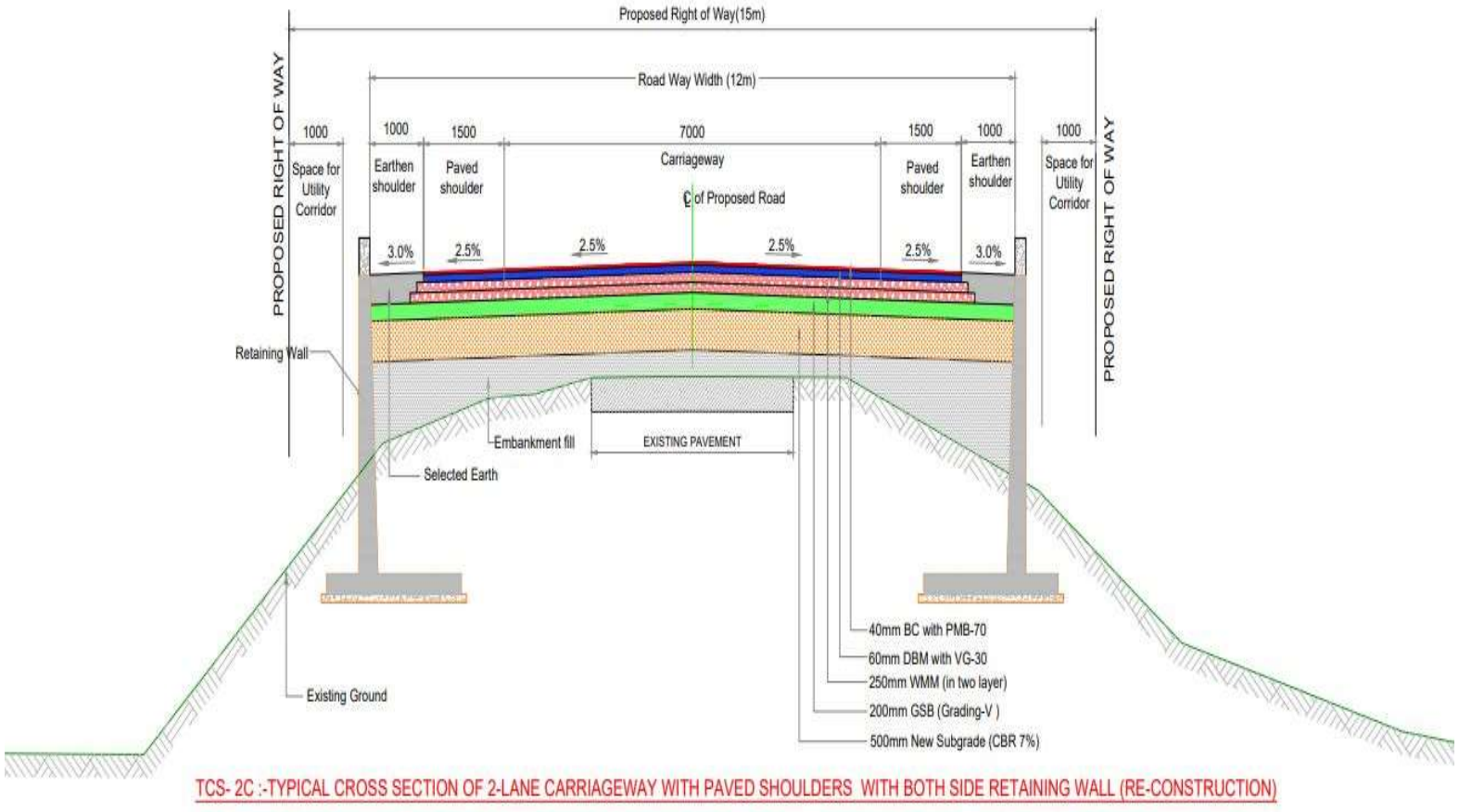


Figure 3-6: Typical Cross Section (2C)

3.5.3 Design of Road Side Drains

Side drains will be suggested between the main carriageway and service roads. In Built-up areas where adequate ROW is not available to provide the service roads, where only footpaths might be accommodated, covered drains will be suggested. Design of Surface drain in built up and semi-urban areas will be donefollowing IRC: SP-421994, "Guidelines on Road Drainage".

- Ch.0.035km to Ch.0.150Km (Right Side)
- Ch.0.100km to Ch.0.205Km (Left Side)
- Ch.0.525km to Ch.0.720Km (Right Side)
- Ch.7.125km to Ch.7.460Km (Left Side)
- Ch.7.510km to Ch.8.010Km (Right Side)
- Ch.7.650km to Ch.7.790Km (Left Side)
- Ch.8.790km to Ch.9.150Km (Left Side)
- Ch.11.410km to Ch.12.220Km (Left Side)
- Ch.12.660km to Ch.12.940Km (Left Side)
- Ch.12.825km to Ch.13.560Km (Right Side)
- Ch.13.750km to Ch.14.050Km (Right Side)
- Ch.17.855km to Ch.18.280Km (Right Side)
- Ch.18.000km to Ch.18.775Km (Left Side)
- Ch.18.410km to Ch.19.060Km (Right Side)
- Ch.24.680km to Ch.24.990Km (Both Side)
- Ch.33.000km to Ch.33.260Km (Left Side)
- Ch.33.130km to Ch.33.260Km (Right Side)
- Ch.38.530km to Ch.38.700Km (Left Side)
- Ch.40.615km to Ch.40.855Km (Left Side)
- Ch.42.400km to Ch.43.780Km (Both Side)
- Ch.43.780km to Ch.43.955Km (Left Side)
- Ch.44.560km to Ch.45.022Km (Left Side)
- Ch.44.780km to Ch.45.022Km (Right Side)

3.5.4 Pavement Design

The project envisages existing Single/Intermediate/2-Lane carriageway to 2-lane Carriageways with overlay & widening or strengthening & widening. The strengthening activities will include the construction of overlays for strengthening of the existing pavement and Reconstruction of the badly damaged/failed pavement section. Combination of flexible and rigid pavement is proposed for the major part of the project road. Guidelines in IRC: 37-2018 together with the latest MORT&H instructions and IRC: 58-2015 and the latest guidelines of MORT&H would be used for the design of flexible and rigid pavement respectively.

3.5.5 Traffic Control and Safety Measures

The geometric design of a highway is influenced significantly by terrain conditions. Economy dictates a sensible choice of different standards for different types of terrain but the guiding principles above will always apply. Where it is necessary to change design standards, this will be done in discrete areas and with a careful eye to consistency and road safety. In general, the geometric standard follows the provisions of 2-lane Manual (IRC: SP-73-2018)

3.5.5.1 Road Signs

Adequate road signs are proposed to be provided for the project road to provide advanced information to regulate/control traffic flow and ensure the safety of operations. All road signs are provided in accordance with IRC: 67-2012.

Appropriate road markings are provided with stop signs, give-way signs, and traffic merging and diverging signs, lane closure signs, compulsory keep left signs, or any other signs as per IRC: 67-2012. Advance cautionary signs will be installed on sharp curves along with chevron signs at the outer edge of the curves. In hilly areas, curve-ahead signs are accompanied by appropriate delineators.

The signs will be of retroreflective sheeting of high-intensity grade with encapsulated lens and fixing details as per clause 801 of MORTH Specifications for Road and Bridge Works, 2013 (5th Revision).

3.5.5.2 Pavement Markings

In project road, the pavement will comply with the IRC: 35-2015, "Code of Practice for Road Marking" with center-line, edge line, continuity line, stop line, give way lines, diagonal/chevron markings and zebra crossings. The pavement marking shall be of hot applied thermoplastic paint with glass beads as per the MORTH specification for Road and Bridge Works, 2013 (5th Revision, latest reprint).

3.5.6 Wayside Amenities

Wayside Amenities like Solar Street Lights are proposed at Major & Minor Junctions. Overhead Gantry is proposed at the start and end of the project road and Cantilever Gantry is proposed at all the Major Junctions. There are 20 bus shelters proposed on this road. Details are given in **Table 9**.

Table 9: Busbay details along the project road

Sl. No	Designed Chainage (Km)	Side	Village Name
1.	0.760	Both	Debarapar
2.	1.500	Both	Debarapar
3.	2.640	Both	Abhaypuria Village
4.	3.590	Both	Abhaypuria Village
5.	5.565	Both	Abhaypuria Village
6.	6.435	Both	Hemlai Samtal
7.	7.700	Both	Hemlai Samtal
8.	8.890	Both	Hemlai Samtal
9.	9.970	Both	Gabharu Tiniali
10.	12.100	Both	Koliapani
11.	14.640	Both	Rahadhal
12.	16.710	Both	Podumani

Sl. No	Designed Chainage (Km)	Side	Village Name
13.	19.265	Both	Amguri
14.	24.360	Both	Samaguri
15.	26.100	Both	Samaguri
16.	29.050	Both	Dikshu Mout Village
17.	31.750	Both	Ksanakar
18.	34.100	Both	Ksanakar
19.	39.600	Both	Bortal
20.	43.900	Both	Nazira

3.6 Analysis of Alternatives

The existing road section has poor riding conditions with poor drainage and poor geometry which are seriously impacting and deteriorating the road surface. The poor road conditions, population growth, increase in traffic volumes and the economic development along the project corridor would continue to occur and will exacerbate the already critical situation. The existing unsafe conditions and the adverse environmental consequences, in terms of the environmental quality along the roads, would continue to worsen in the absence of the proposed improvements.

3.6.1 With Project and Without Project Scenario

With Project Scenario: The "with project" scenario includes the widening of the existing road section to two-lane carriageways with paved and earthen shoulder configuration. The "with project" scenario has been assessed to be economically viable and will alleviate the existing conditions. To avoid the large-scale acquisition of land and properties, the project envisages the widening of the existing road alignment to minimize the loss of properties and livelihood of the PAPs. It would thereby, contribute to the development goals envisaged by the Government of India, and enhance the growth potential of the state as well as the project region.

Without Project Scenario: In the case of "without project" scenario, the existing road with intermediate carriageway width will be considered as it is. Considering the present traffic volume and potential for growth in the near future, the capacity of the present road is insufficient for handling expected traffic volume and calls in for immediate improvements.

The existing road section has poor riding conditions with poor drainage conditions and poor geometry. The poor road conditions, population growth, increase in traffic volumes and the economic development along the project corridor would continue to occur and will exacerbate the already critical situation. The existing unsafe conditions and the adverse environmental consequences, in terms of the environmental quality along the roads, would continue to worsen in the absence of the proposed improvements.

Therefore, the no-action alternative is neither a reasonable nor a prudent course of action for the proposed project, as it would amount to a failure to initiate any further improvements and impede economic development. Hence the "With" project scenario with minor reversible impacts is an acceptable option than the "Without" project scenario. The implementation of the project therefore will be advantageous to achieve the all-around development of the economy and progress of the State.

3.6.2 Bypass and Realignment Proposal

Detailed analyses of the alternatives have been conducted taking into account both with and without project. The project road work involves improvement and up-gradation of the existing road. No alternate alignments were accessed for the Nakachari to Balighat Tiniali road. 13 realignment has been proposed in the entire project stretch. The realignments have been proposed to improve the geometric design of the road and to achieve the design speed. The project road will provide a better level of service in terms of improved riding quality and smooth traffic flow. It will facilitate access to different parts of the region and improve the economic status of the region. The improvement of the existing road section is considered to be the best possible alignment. The proposed strengthening of the road is likely to have a positive impact on the economic value of the region. However, there is a certain environmental and social issue, these need to be mitigated for sustainable development. The details of the Realignment proposals for the project road are presented in **Table 10**.

Table 10: Realignments proposed on the project road

Sr. No.	Start Point Chainage	End point Chainage	Length (m)
1. Realignment No. 1			
Existing Alignment	0+000	2+750	2750
New Alignment	0+000	2+750	2750
2. Realignment No.			
Existing Alignment	2+750	2+970	220
New Alignment	2+750	2+950	200
3. Realignment No.			
Existing Alignment	2+970	4+770	1800
New Alignment	2+950	4+750	1800
4. Realignment No.			
Existing Alignment	4+770	5+150	380
New Alignment	4+750	5+100	350
5. Realignment No.			
Existing Alignment	5+150	6+850	1700
New Alignment	5+100	6+800	1700
6. Realignment No.			
Existing Alignment	6+850	7+435	575
New Alignment	6+800	7+350	550
7. Realignment No.			
Existing Alignment	7+435	16+180	8745
New Alignment	7+350	16+110	8760
8. Realignment No.			
Existing Alignment	16+180	16+300	120
New Alignment	16+110	16+220	110
9. Realignment No.			
Existing Alignment	16+300	17+250	950

Sr. No.	Start Point Chainage	End point Chainage	Length (m)
New Alignment	16+220	17+150	930
10. Realignment No.			
Existing Alignment	17+250	17+450	200
New Alignment	17+150	17+350	200
11. Realignment No.			
Existing Alignment	17+450	27+960	10510
New Alignment	17+350	27+870	10520
12. Realignment No.			
Existing Alignment	27+960	28+360	400
New Alignment	27+870	28+270	400
13. Realignment No.			
Existing Alignment	28+360	30+050	1690
New Alignment	28+270	29+950	1680
14. Realignment No.			
Existing Alignment	30+050	30+420	370
New Alignment	29+950	30+330	380
15. Realignment No.			
Existing Alignment	30+420	38+250	7830
New Alignment	30+330	38+150	7820
16. Realignment No.			
Existing Alignment	38+250	38+450	520
New Alignment	38+150	38+340	190
17. Realignment No.			
Existing Alignment	38+450	39+170	400
New Alignment	38+340	38+670	330
18. Realignment No.			
Existing Alignment	39+170	39+770	4930
New Alignment	38+670	39+070	400
19. Realignment No.			
Existing Alignment	39+770	44+100	4330
New Alignment	39+070	44+000	4930
20. Realignment No.			
Existing Alignment	44+100	44+500	400
New Alignment	44+000	44+410	410
21. Realignment No.			
Existing Alignment	44+500	45+022	522
New Alignment	44+410	45+931	1521

Source: Detailed Project Report

3.7 Construction Camps

Construction camp will be set up by the contractor at a suitable location along the project corridor which will be in consultation with the Project Director and Pollution Control Board Assam. As the Contractor is required to source labour from the local communities along the subproject road, the size of the construction camps will be relatively small. It is the responsibility of the Contractors to maintain a hygienic camp with adequate water and electric supply; toilet facilities should be located away from the water bodies and wells; proper disposability of domestic refuse; temporary medical facilities; pest control; clean and adequate food; and social security.

3.8 Construction Material Requirement

Soil and material investigation for a road project is very essential to assess the availability of suitable construction material in the vicinity of the project road. This includes investigation of suitable borrow area for borrowing earth and quarries for stone/aggregate material and for the other construction materials like cement, steel, bitumen etc. are recommended to be procured directly from reputed manufacturers spread at different locations in the vicinity of the Project. Material investigations have been carried out to explore the availability of suitable construction material and likely extent of usage in embankment and different pavement courses.

- For improvement work as well as for new carriageway / bypass the list of materials includes the following: Granular material for lower sub-base works.
- Crushed stone aggregates for upper sub-base, base, surfacing and cement works.
- Sand for filter material and cement, concrete works, sub-base and filling material.
- Borrow material for embankment, sub grade and retaining wall back filling.
- Manufactured materials like cement, steel, bitumen, primer coat, tack coat, fly Ash etc. for other related works.

3.8.1 Aggregate

Stone quarries have been primarily identified as stone aggregate source for construction of various components of road, namely, Stone metal, Bitumen vg-30, Bitumen_PMB as well as for the cement concrete works. Investigation for the stone quarries has been done based on the existing licensed quarries authorized by government agency.

3.8.2 Borrow Earth

The borrow earth selected for embankment construction comprises primarily classified as CS according to I.S. classification.

Table 11: Details (Source) and Quantity of Borrow earth

Sr. No.	Borrow Area Number	Chainage of Existing Road	Type of Borrow Area	Location/Name of Place	Approx distance from the project site
1	BP-1	13.100 Km	Agricultural Land	Rahadhal	35 m
2	BP-2	28.450 Km	Agricultural Land	Belimukhiya Tiniali	170 m

Source: Material Report

3.8.3 Water Requirement

Total water required for the project road is 2.5x10^5 kl.

3.8.4 Materials Requirement

Total material requirement for this project is given below

Table 12: Meterial requirement for the project road

Material	Quantity	Unit
Aggregate	400000	Cum
Sand (Source-Golaghat (Dhansiri River) Quarry)	25000	Cum
Cement	15000	ton
Steel	3500	ton
Bitumen	5100	ton

3.9 Manpower Required

The proposed project will involve 200 – 220 people comprising Skill, Semi-skill, and unskilled labours.

3.10 Land Requirement

Total land required for the project road is 110Ha.

3.11 Project Cost

Total Project Cost (including all taxes, cess and cost of pre-construction activities) shall be 427.83 Crores. The cost of civil works will be 212.60 crores and per km cost of project works shall be 4.27Crores.

3.12 Implementation Schedule

The project construction period will be **36 months** for the projectroad. The concessionaire will be recruited for the construction and maintenance-related works. The Proposed Work Programme & Construction Schedule is given below:

No.	Deliverables	Months											
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
D-1	**Inception Report**												
	Inception Report including QAP												
D-2	**Preliminary Project Report**												
	Strip Plan												
	Traffic surveys and data												
	Alignment Plans												
	Utility Relocation Plans												
	Land Acquisition Plans and Report												
	Draft Preliminary Project Report												
	Final Preliminary Project Report												
D-3	**Detailed Project Report**												
	Draft DPR and draft bidding documents												
	Final DPR and bidding documents												
	Project clearances												

3.13 Sub-Project Benefits

Following are the expected benefits due to the improvement in the sub-project road:

- Project road will facilitate better access to connecting with NH-702C at end point & NH-2 at Amguri which is a prominent urban area and market place along the project road.
- Better level of service in terms of improved riding quality and smooth traffic flow.
- Faster transportation will ultimately lead to massive savings in the form of reduced wear and tear of vehicles, reduced vehicle operating costs (VOCs), and total reduction in the project road would facilitate better access to the residents of the nearby villages to the railway stations along the project road.
- transportation costs, etc.
- With the improvement of the road surface, the traffic congestion due to obstructed movement of vehicles will be minimized and thus wastage of fuel emissions from the vehicles will be reduced.
- Increased road landscaping and safety features.
- Enhanced connectivity between rural & urban populations which will benefit all sections of the society like the general population, small-medium-large scale industries, farmers, businessmen, etc.
- Improved access to higher education facilities & modern health facilities.
- Strengthening both rural & urban economies which in turn will improve the economic scenario of the state and country.
- Improved road connectivity helps in better implementation and management of government schemes.
- With the improvement in the economy, more generation of employment opportunities.
- Overall Environment and social improvement of the region.

4. Description of the Environment

4.1 Introduction

To assess the impacts of the proposed improvement to the subproject road, field visits were undertaken to understand the environmental profile of the project influence area. This involved field inspections at all the sensitive locations, collection of secondary information for all the environmental components, and discussions with the officials and local populace. The profile presented below comprises of the following:

- Physical environmental components such as meteorology, geology, topography, soil characteristics, ambient air quality, noise levels, surface, and sub-surface water quality.
- Biological environmental components such as aquatic, biotic, and marine flora, fauna and mammals, and
- The land environment in terms of land use, soil composition.
- Socio-economic environment in terms of demography, education, and health infrastructure.

4.2 Data collection and Study area

A study area of 10 km radius from the project road was considered for secondary data collection. Primary data has been collected within 500 meters on both sides of the proposed alignment. Secondary data were collected from published reports, research papers, working plans, and different websites. Primary baseline environment monitoring was carried out for the period of one month from October 2021 to November 2021.

4.3 Physical Environment

4.3.1 Terrain, Geology and Soil Type

Terrain:

Road Corridor No. A20_2 (Nakachari to Balighat Tiniali via Amguri) has a length of 45 km. This 45 km road passes through two districts in Upper Assam – Nakachari is located in Jorhat district, and Balighat Tiniali and Amguri are located in Sibsagar district.

- **Jorhat**

Jorhat represents a major part of the plains of the Brahmaputra valley at an altitude of about 60 m to 140 m above the mean sea level. Some areas at the south and southeast of the district have low hill ranges, which are the continuation of the Naga Hills, and the northern part of the valley is flat to nearly level. The general slope of the area is from southeast to northwest.

- Sibsagar

This district represents a more or less flat country excepting some low undulating hummocks in the southern part which are generally covered by tea estates or reserved forests. The general slope of the area is from southeast to northwest. The general elevation of the plain area varies from 85 to 100m above mean sea level which gradually rises to 128 to 150 m towards south and southeast.

Geology:

- Jorhat

Most part of the district is covered by alluvium depositedby the river Brahmaputra and its tributaries. The older alluvium mainly of the Pleistocene period (less than 1 million years) consists of reddish to brownish sandy clay with coarser particles of sand and newer alluvium consists of sand, silt and clay along the plains of the Brahmaputra River. There is only a thin strip along the eastern boundariesof the district, where rocks belonging to Tipam groups of sedimentary rocks of Tertiary period consists mainly of coarse to gritty, ferruginous sandstones and shales.

- Sivasagar

The geology of almost the entire district is thus, concealed by alluvial deposits. Geological surveys, aided by drilling for oil have shown that under the recent deposits there are many thousands of feet of Tertiary sediment.

Coal is the only mineral, which has so far been commercially exploited in the district. It is mined in Nazira coalfields. Coal is also found on the Jhanji and Disai (Dikhou) rivers. The Jhanji area is only three miles long and stretches into the Nagaland. It lies fifteen miles southeast of Amguri railway station.

Oil is another mineral of considerable economic importance, which has recently been discovered in Sivasagar. The Sivasagar figured in the industrial map of India with the establishment of O.N.G.C. regional Head quarter at Nazira with the exploration of huge stock of Oil in Galeky and Lakwa Oil fields.

So far as clay is concerned, ordinary clay for pottery and brick making is found almost everywhere in the district. Fire clays have been found to occur with the coal seams.

Soil:

- Jorhat

The soils of the district are the resultant product of interaction of different soil forming factors and climate, vegetation and relief seem to have played the dominant role. Due to this complex interaction of these factors, several kinds of soils are developed which differ distinctly in morphological and physical and chemical properties. The soils of the district are developed under humid subtropical climate with mean annual rainfall of 1950 mm and mean annual air temperature of 23.5° C. The area receives well distributed and high rainfall from April to September leading to excessive leaching in hill soils and water stagnation and flooding in valley areas, qualifying for both 'Udic' and 'Aquic' soil moisture regime, respectively. The soil temperature is hyperthermic. Although the parent material does not play significant role in soil formation in alluvial deposits the eastern part of the district has soils like Disai (I), Disai (II), Disai (III) and Murmurya developing on ferruginous sandstones, shales and older alluvial parent materials.

- Sivasagar

The arable soils of the Sivasagar district may broadly be grouped into (1) Old alluvial soils, (2) New alluvial soils of riparian tracts and (3) Hilly soils. The major portions of the arable soils of

the district are however, alluvial soils. The textures of soils of the district vary from sandy loams to sands. There are also some clayey loams or clayed soils. Both old alluvial soils and hills are acid in reaction and deficient in calcium. They are usually deficient in "available" phosphate and potash also. As regards to total nitrogen, it varies from high to low in the case of old alluvial soils, it is medium in most of new alluvial soils. While hill soils are usually comparatively rich in nitrogen apparently due to the virgin nature of the soils. The details of soil sample collection are given in **Table 13** and **Figure 4-1.**

Table 13: Soil sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance	Coordinates	
				Latitude	Longitude
1	14-Oct-2021	Gharphalia Maibela Patia Gaon	150 m	26.704350	94.440923
2	14-Oct-2021	Nazira Gaon	150 m	26.908015	94.72541

Source: Environmental Baseline Monitoring

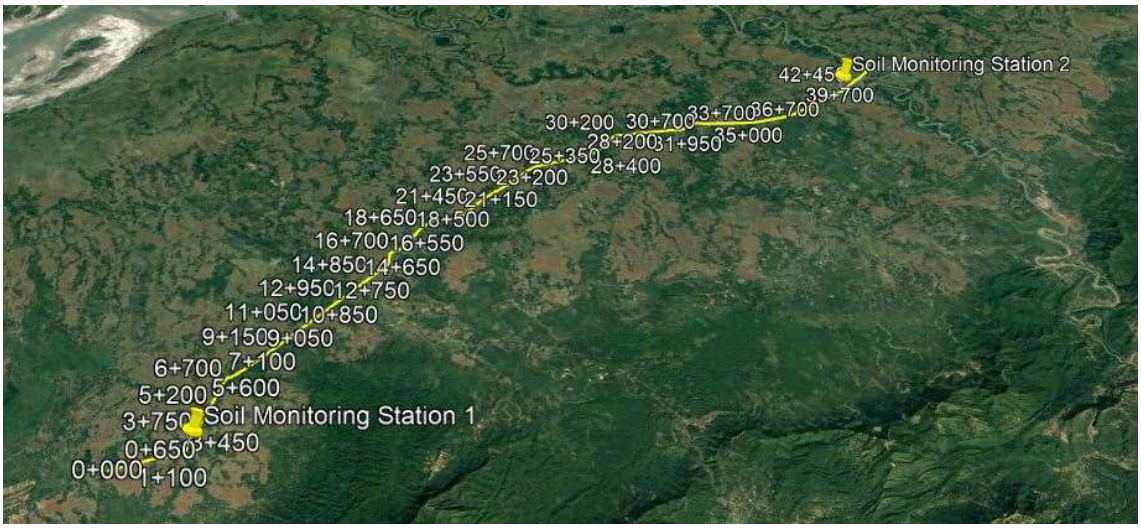


Figure 4-1: Soil sampling locations along the project road

The soil quality along the project road is given in below

Table 14. The soil map of India showing the project road is shown in **Figure 4-4**.

Table 14: Soil Quality along the Project road

Sr. No.	Parameters	Test Method	Unit	Gharphalia Maibela Patia Gaon	Nazira Gaon	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
1.	pH (1:5 suspension)	ITL/SOP/ENV/Soil/01	-	7.68	7.92	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 Moderately acidic 6.01-6.50 Slightly

Sr. No.	Parameters	Test Method	Unit	Gharphalia Maibela Patia Gaon	Nazira Gaon	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
						acidic 6.51-7.30 Neutral 7.31-7.80 Slightly alkaline 7.81-8.50 Moderately alkaline 8.51-9.00 Strongly alkaline >9.00 Very strongly alkaline
2.	Electrical Conductivity at 25^{O}C (1:5 suspension.)	ITL/SOP/ENV/Soil/02	µmhos/cm	850	845	Upto 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 Harmful to crops (sensitive to salts)
4.	Texture	ITL/SOP/ENV/Soil/07	-	Sandy Loam	Sandy Loam	-
5.	Sand	ITL/SOP/ENV/Soil/06	% by mass	40.1	42.4	-
6.	Clay	ITL/SOP/ENV/Soil/06	% by mass	38.2	36.4	-
7.	Silt	ITL/SOP/ENV/Soil/06	% by mass	21.6	21.2	-
8.	Nitrogen	ITL/SOP/ENV/Soil/09	mg/kg	21.4	22.4	Upto 50 Very less 51-100 Less 101-150 Good 151-300 Better >300 Sufficient
9.	Potassium (as K)	ITL/SOP/ENV/Soil/11	mg/kg	60.4	58.4	Upto 15 Very less 16-30 Less 31-50 Medium, 51-65 On an avg. sufficient 66-80 Sufficient >80 More than sufficient
10.	Phosphorus	ITL/SOP/ENV/Soil/10	mg/kg	3.11	3.41	0 -120 Very less 120-180 Less 181-240 Medium 241-300 Average 301-360 Better >360 More than sufficient
11.	Organic Matter	ITL/SOP/ENV/Soil/17	% by mass	3.5	3.1	Upto 0.20: Very less 0.21-0.40: Less 0.41-0.50: Medium, 0.51-0.80: On an avg. sufficient

Sr. No.	Parameters	Test Method	Unit	Gharphalia Maibela Patia Gaon	Nazira Gaon	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
						0.81-1.00: Sufficient >1.00 : More than sufficient
12.	Moisture Retention capacity	ITL/SOP/ENV/Soil/05	Inches/foot	1.21	1.14	-
14.	Sulphates	ITL/SOP/ENV/Soil/14	mg/kg	9.2	11.4	-
17.	Bulk Density	ITL/SOP/ENV/Soil/04	gm/cc	1.32	1.29	-

The important physical characteristics of soil are bulk density, porosity and texture. Ph of soil in the proposed study area were found in the range of 7.68 to 7.92 the soil samples are, therefore, moderately alkaline. Conductivity of soil in the proposed study area is found to be in the range of 845 to 850 Mhos/cm. Available phosphorous of soil samples along the proposed study area ranges from 3.11 to 3.41 mg/kg which is very less. Potassium content as K in soil samples along the proposed study area is found in the range of 58.4 to 60.4 mg/kg. Total organic matter in soil samples along the proposed study area is found in the range of 3.1– 3.5 %, therefore the soil is fertile in terms of productivity.

Figure 4-2: Soil Sample Monitoring at Gharphalia Maibela

Figure 4-3: Soil Sample Monitoring at Nazira

Source: Website of National Repository of Open Educational Resources

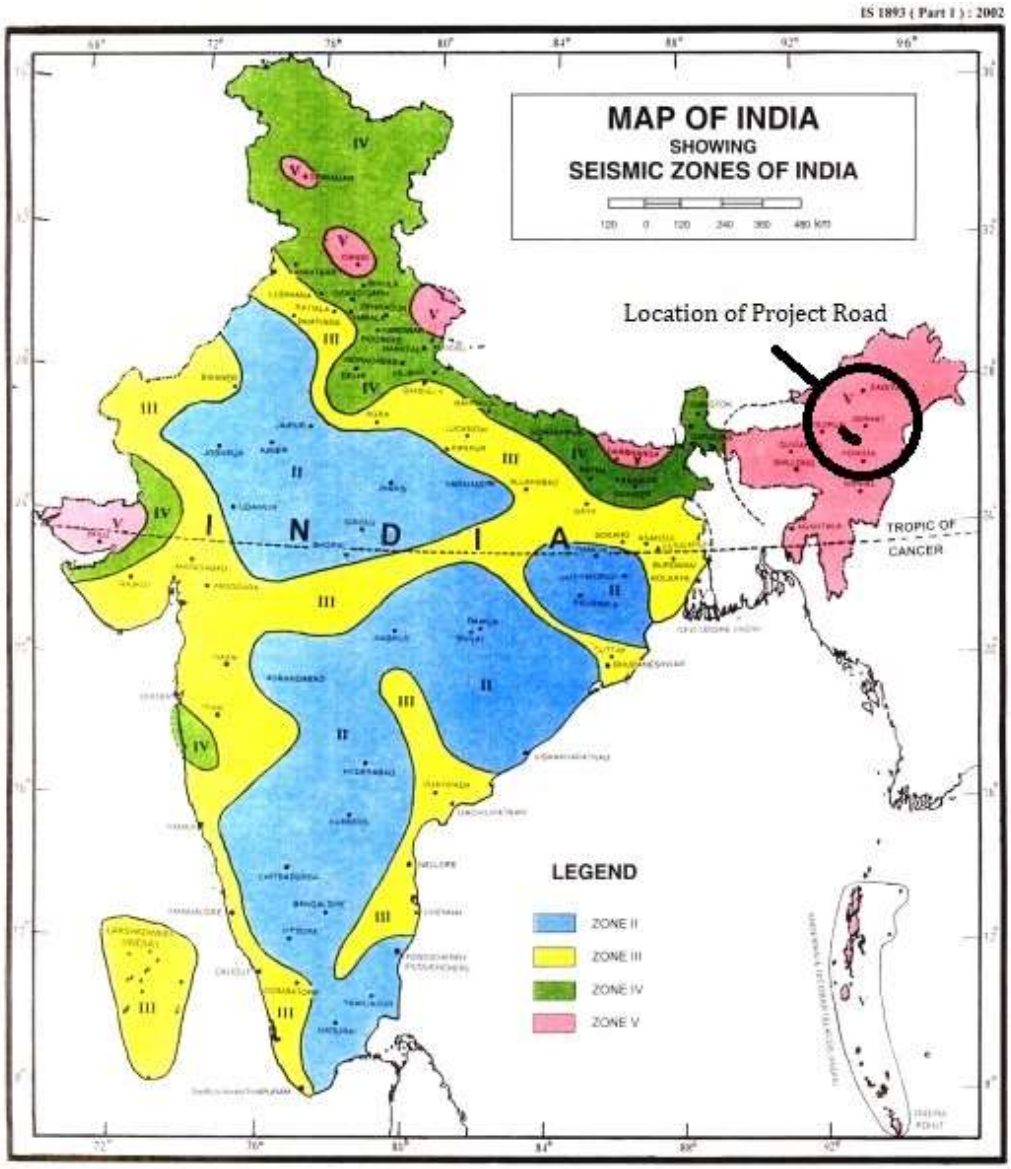
Figure 4-4: Soil Map of India showing the project road

As per the soil map of India, the soil found in the project area is alluvial soil.

4.3.2 Seismicity

Geomorphologically, NE India is located in an earthquake-prone zone (zone V) of the Indian subcontinent. In this region, an earthquake comes with land sliding flood and along with a series of smaller magnitude earthquakes. In the project district earthquakes of up to MM intensity IX can be expected. According to a hazard map by the Global Seismic Hazard Assessment Programme, the state can expect to have a peak gravitational acceleration (PGA) of 0.24g to 0.48g. The region where the highest PGA can be expected is along the state's

border with Meghalaya, the site of the Great Indian earthquake of 1897. The seismic zone map of India showing the project road is shown in the below **Figure 4-5**



Source: IS1893 (Part1) 2002

Figure 4-5: Seismic Zone Map of India showing the project road

4.3.3 Climate

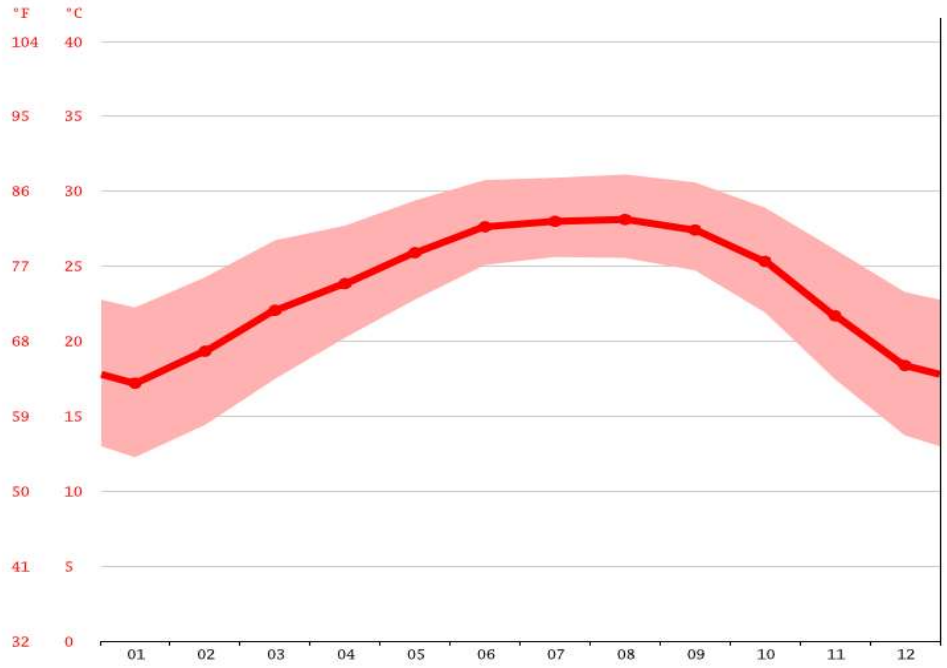
With the 'Tropical Monsoon Rainforest Climate', Assam is a temperate region and experiences heavy rainfall and humidity. The climate of Assam is humid, with a sub-tropical nature, having warm humid and cool dry winters. Due to its unique geographical location, along with the presence of varied physiography, Assam has an array of climatic conditions. Assam is situated in the high rainfall zone.

As the entire road stretch passes through Jorhat and Sivasagar district, information related to climate is studied for Jorhat and Sivasagar district.

4.3.3.1 Annual Temperature

- Jorhat

The climate in Jorhat is warm and temperate. The summers receive heavy rainfall, while the winters are characterized by little amount of rainfall. The average temperature is about 23.7°C (74.7°F) and annual precipitation is about 2699 mm (106.3 inch).The highest temperatureis recorded in the month of August, which averages around 28.1°C (82.6°F). January is the coldest month, with temperatures averaging 17.2°C (63.0°F).



Source: https://en.climate-data.org/asia/india/assam/jorhat-764433/

Figure 4-6: Monthly Average Temperature of Jorhat District

- Sibsagar

The climate in Sivasagar is mild, and generally warm and temperate. In winter season, there is much less rainfall here than in summer season. The average annual temperature in Sivasagar is 23.8°C (74.8°F) and the rainfall received is approximately 2952 mm (116.2 inch). The highest temperature is recorded in the month of August, which averages around 28.2°C (82.8°F). January has the lowest average temperature of the year, which is about 17.2°C (63.0°F).

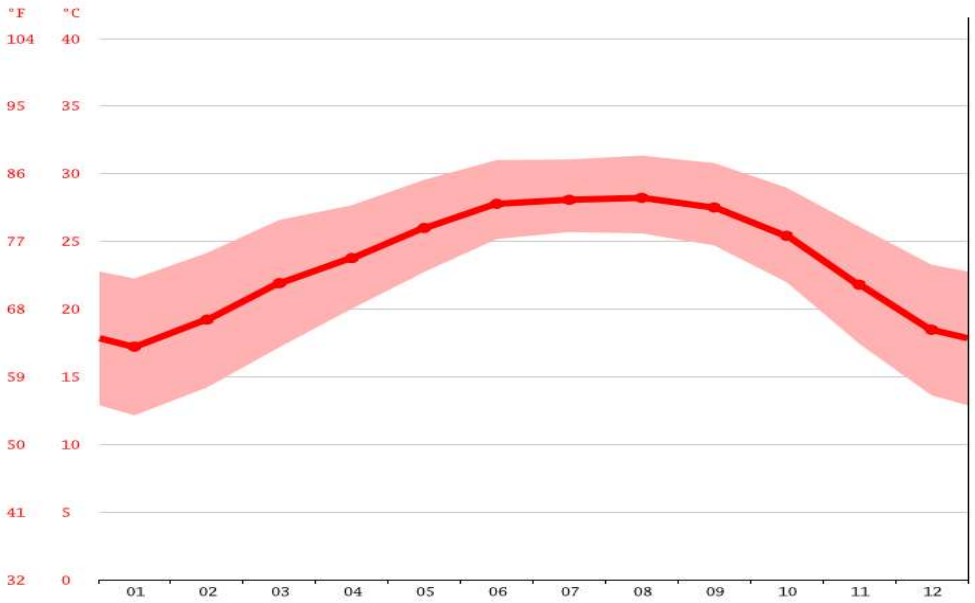
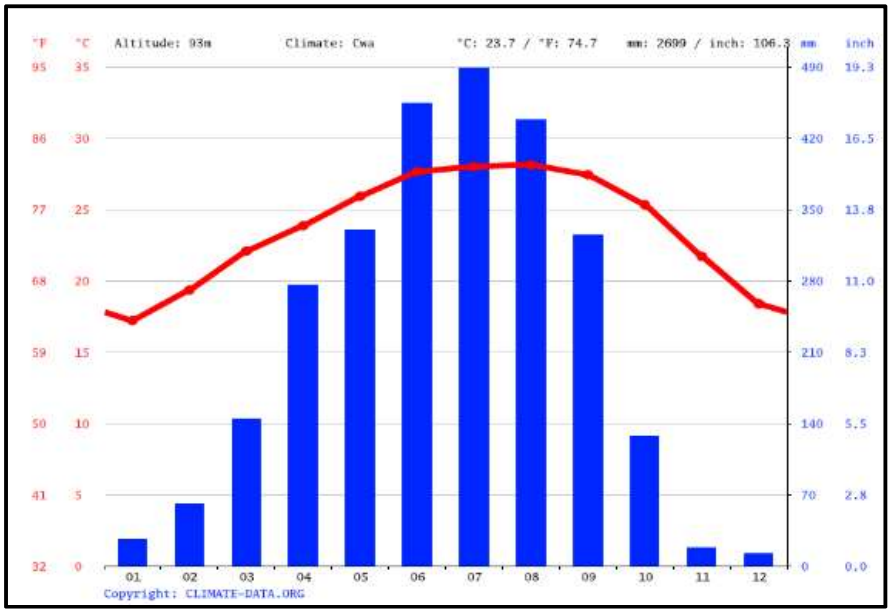


Figure 4-7: Monthly Average Temperature of Sivasagar District

4.3.3.2 Annual Rainfall

- Jorhat

In terms of precipitation received, in Jorhat district December is the driest month with 12 mm (0.5 inch) of rain. July receives the highest amount of precipitation, averaging 489 mm (19.3 inch).



Source: https://en.climate-data.org/asia/india/assam/jorhat-764433

Figure 4-8: Monthly Average Temperature and Precipitation of Jorhat District

- Sibsagar

In terms of precipitation received, in Sivasagar district it is lowest in December, with an average of 14 mm (0.6 inch). Maximum amount of precipitation is recorded in July i.e., an average of 520 mm (20.5 inch).

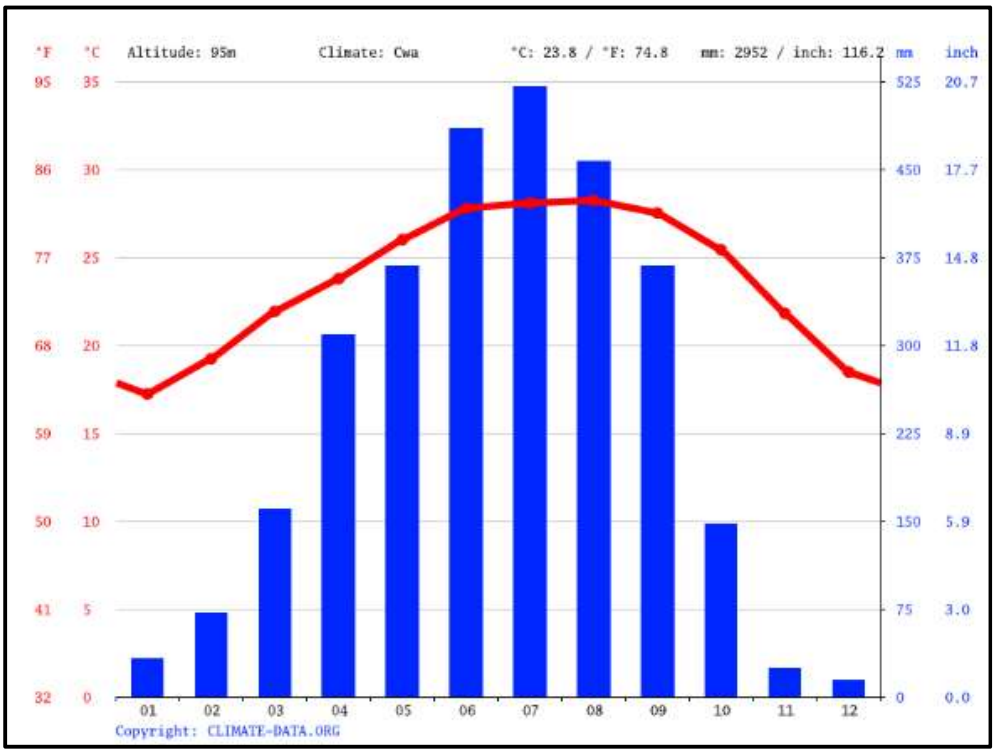


Figure 4-9: Monthly Average Temperature and Precipitation of Sivasagar District

4.3.4 Wind speed/Direction

Generally, light to moderate winds prevails throughout the year with speed ranging from 1 to 19 kmph. Winds were light and moderate particularly during the morning hours, while during the afternoon hours the winds were stronger. The wind rose diagram developed during 2020 is shown in **Figure 4-10** which reveals that pre-dominant wind direction occurs mostly blowing from North-East direction in Dibrugarh IMD station (Nearest IMD from the project road) and the average wind speed is 1.4 m/s. **Table 15** shows the summary of Meteorological Data Parameters at Dibrugarh IMD station.

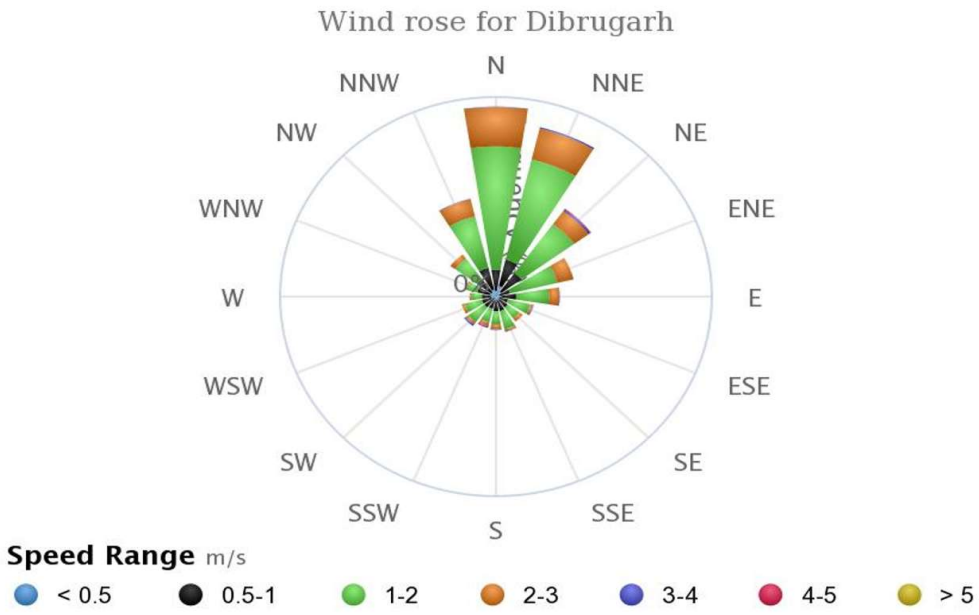


Figure 4-10: Site-Specific Wind rose diagram of Dibrugarh district

Table 15: Meteorological Data Parameters at Dibrugarh (Nearest IMD from projectroad)

Month	Temperature, deg C			Humidity, %			Pressure, hPa			Wind Speed, km/Hr	Predominant Wind Direction
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	
January	10	36.6	23.3	30.1	97.9	74.8	952.8	979.9	967.9	1.4	N-NE

Source: www.imd.gov.in; Met Station: Dibrugarh

4.3.5 Hydrogeology

Hydrogeologically the State can be divided into three units namely consolidated formation, semi consolidated formation and unconsolidated formation. More than 75% of the State is underlain by unconsolidated formation comprising of clay, silt, sand, gravel, pebble and boulders. The Bhabar belt is about 11 to 15 km wide; the tubewells yield 27 to 59 m3/hr in this zone. The Tarai zone follows immediately down slope of the Bhabar zone where the yield of the wells ranges between 80-240 m3/hr. The flood plains follow the Tarai in Brahmaputra valley where the shallow tubewells yield between 20-50 m3/hr and deep tubewells between 150-240 m3/hr. In the semi consolidated formations of Cachar District, the yield of the tubewell ranges between 50 to 100 m3/hr.

Table 16: Details of Hydrogeology in project state

Dynamic Ground Water Resources	
Annual Replenishable Groundwater Resource	28.52 BCM
Net Annual Ground-Water Availability	25.79 BCM

Annual Ground Water Draft	3.49 BCM
Stage of Ground Water Development	14%
Ground Water Development & Management	
Over Exploited	NIL
Critical	NIL
Semi-critical	NIL
Artificial Recharge to Ground Water (AR)	Feasible AR structures 250 Check Dams. 500 weirs, 1000 Gabion structures, 250 development of springs 600 RWH in Urban Areas
Ground Water Quality Problems	
Contaminants	**Districts affected (in part)**
Fluoride (>1.5 mg/l)	Goalpapra, Kamrup, Karbi Anglong, Nagaon
Iron (>1.0 mg/l)	Cachar, Darrang, Dhemaji, Dhubri, Goalpapra, Golaghat, Hailakandi, Jorhat, Kamrup, Karbi Anglong, Karunganj, Kokrajhar, Lakhimipur, Morigaon, Nagaon, Nalbari, Sibsagar, Sonitpur.
Arsenic (>0.05 mg/l	Dhemaji

Source:http://cgwb.gov.in

4.3.6 Water Quality

The objectives behind the monitoring are to develop an overall picture of the ground and surface water quality of the project district. The sampling of ground and surface water was carried out in November 2021 (winter period). The water samples after collection were immediately subjected to the analysis of various parameters in the NABL Accredited laboratory. The parameters analyzed, include pH, Electrical Conductivity (EC), Total Alkalinity (TA), Total Hardness (TH), Nitrate (NO3), and Fluoride (F). The sample collection, preservation, storage, transportation, and analysis were carried out as per the standard methods given in the manual of the American Public Health Association for the Examination of Water and Wastewater (APHA). The groundwater quality data thus generated was first checked for completeness and then the validation of data was carried out using standard checks.

In the study area, two surface and two ground water samples were collected for winter season (November 2021). These samples were taken as grab samples and were analyzed for various parameters to compare with the standards. The details of sample collection for Groundwater and Surface water are given in **Table 17** and **Table 18** respectively. The ground and surface water quality result of the project road is given in the following Table 19 and 20. The Details of Ground and Surface Water Monitoring Location are depicted in **Figure 4-11** and **Figure 4-12** respectively.

Table 17: Groundwater sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Source	Distance (m)	Coordinates	
					Latitude	Longitude
1	14.10.2021	Nakachari	Tube well	100	26.694302	94.413154
2	14.10.2021	Nazira	Hand pump	100	26.916191	94.735280

Source: Environmental Baseline Monitoring

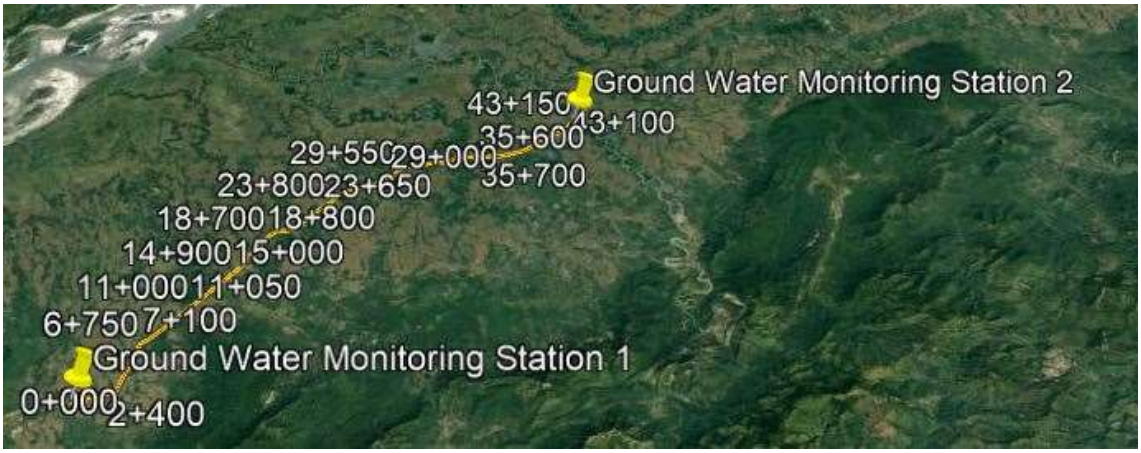


Figure 4-11: Groundwater sampling locations along the project road

Table 18: Surface water sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Source	Distance (m)	Coordinates	
					Latitude	Longitude
1	14.10.2021	Garphalia	Road side pond	100	26.700120	94.437104
2	14.10.2021	Parbatia	Road side Pond	100	26.878510	94.635248

Source: Environmental Baseline Monitoring

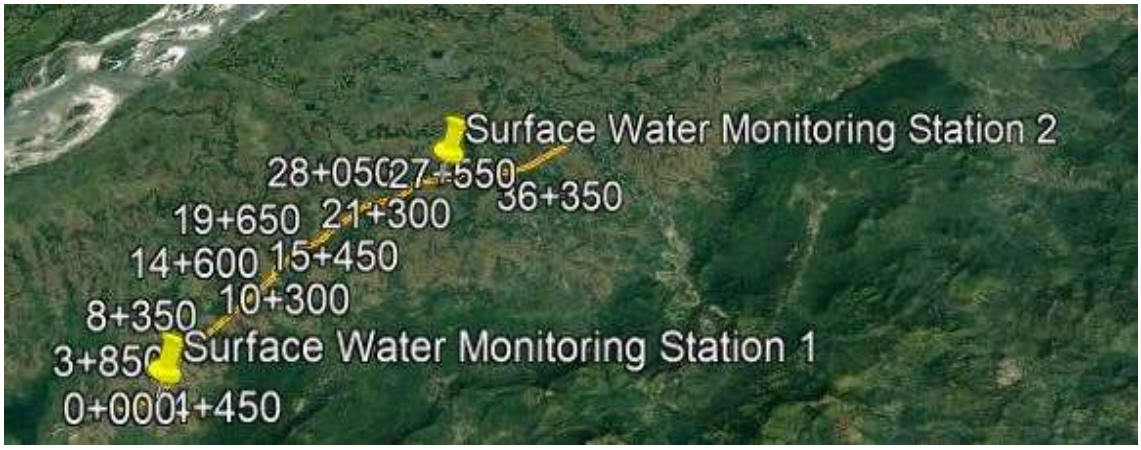


Figure 4-12: Surface water sampling locations along the project road

Table 19: Ground Water quality result of the project road

Sr. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result		WHO Drinking Water Standard (Fourth Edition 2011)
			Desirable Limit	Permissible Limit	Nakachari	Nazira	
1	pH	-	6.5-8.5	No Relaxation	6.37	6.78	8.2-8.8
2	Colour	Hazen	5	25	<1	<1	Not Exceeding 5 hazen Unit
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Unobjectionable
4	Total Hardness (as $CaCO_3$)	mg/l	200	600	72	164	-
5	Chloride (as Cl)	mg/l	250	1000	59.9	43.9	-
6	Fluoride (as F)	mg/l	1	1.5	BDL	BDL	1.5
7	Calcium (as $CaCO_3$)	mg/l	75	200	14	30.4	-
8	Magnesium (as $CaCO_3$)	mg/l	30	100	13.6	32.4	-
9	Sulphate (as SO_4)	mg/l	200	400	26	31	-
10	Nitrate (as NO_3)	mg/l	45	No Relaxation	1.5	1.1	50
11	Alkalinity as ($CaCO_3$)	mg/l	200	600	88	60	-
12	TDS	mg/l	500	2000	112	180	-
13	Electrical Conductivity	Micromhos/cm	-	-	267	288	-
14	Sodium (as Na)	mg/l	-	-	18	12.4	40
15	Potassium (as K)	mg/l	-	-	9	4.9	-
16	Total Coliform	mg/l	Nil	Nil	Absent	Absent	Absent
17	Fecal Coliform	mg/l	Nil	Nil	Absent	Absent	Absent

Source: Environmental Baseline Monitoring

Figure 4-13: Groundwater Samplecollection at Nakachari

Figure 4-14: Groundwater Sample collection at Nazira

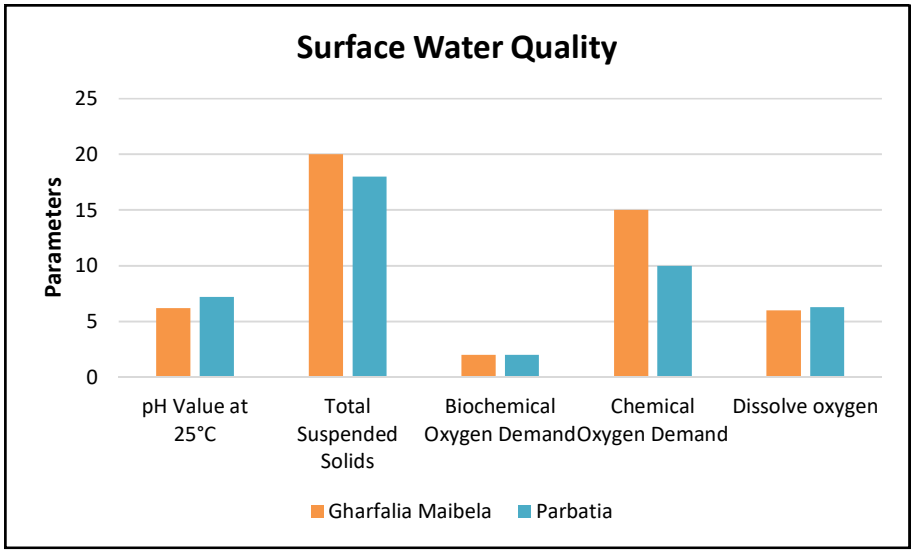
The samples were collected from bore well at all locations. It can be seen from **Table 19** that; the pH of the drinking water varies from 6.37 to 6.78. Total hardness as $CaCO_3$ varies from 72 mg/l to 164 mg/l. BOD level for all analyzed ground water samples is within the permissible limit. Other parameters analyzed like chloride, sulphate, fluorides are found well within standards. It can be seen from the results that the ground water quality meets the standards of IS:10500-2012 standards for drinking water and CPCB standards for ground water, except for the high level of Iron content at all sampling locations.

Table 20: Surface Water quality result of the project road

Organoleptic & Physical Parameters

Sr. No.	Parameter	Test method	Unit	Result		Standards/ Permissible Limits	CPCB Surface Water Standard	
				Gharphalia Maibela **(Pond)**	Parbatia **(Pond)**	**WHO**	**Inland Surface water Tolerance Limits for Class -B**	**Inland Surface water Tolerance Limits for class -D**
1	Colour	IS-3025 (P-04)	Hazen Unit	<1	<1	-	-	-
2	Odour	IS-3025 (P-04)	-	Agreeable	Agreeable	-	-	-
3	pH value	IS-3025 (P-04)	-	6.18	7.22	6-9	6.5 – 8.5	6.5 – 8.5
4	Total Dissolved Solid (TDS)	IS-3025 (P-04)	mg/l	112	126	-	-	-
5	Electrical Conductivity	IS-3025 (P-04)	µs/cm	197	210	-	-	1000

Sr. No.	Parameter	Test method	Unit	Result		Standards/ Permissible Limits	CPCB Surface Water Standard	
				Gharphalia Maibela (Pond)	Parbatia (Pond)	WHO	Inland Surface water Tolerance Limits for Class -B	Inland Surface water Tolerance Limits for class -D
6	Total Suspended Solid	IS-3025 (P-04)	mg/l	20	18	-	-	-
7	Total Dissolve Oxygen	IS-3025 (P-04)	mg/l	6	6.3	-	5	4
8	Biological Oxygen Demand	IS-3025 (P-04)	mg/l	02	02	30	3	-
9	Chemical Oxygen Demand	IS 3025 (Part-I)	Mg/l	15	10			
10	Phosphate Content	IS-3025 (P-04)	mg/l	0.8	0.54	-	-	2
Concerning Substances Undesirable in Excessive Amounts								
11	Total Ammonia	IS: 3025 (P- 34)	mg/l	0.32	0.20	-	-	-
12	Calcium (as Ca)	IS: 3025 (P- 40)	mg/l	20.8	19.2	-	-	-
13	Chloride (as Cl)	IS: 3025 (P- 32)	mg/l	89.9	85	-	-	-
14	Copper (as Cu)	IS: 3025 (P-42)	mg/l	BDL	BDL	-	-	-
15	Iron (as Fe)	IS: 3025(P-53)	mg/l	0.05	0.06	-	-	-
16	Magnesium (as mg)	IS: 3025 (P-46)	mg/l	20.9	16.5	-	-	-
17	Nitrate (as NO_3)	IS: 3025 (P- 34)	mg/l	3.3	3.6	-	-	-
18	Sulphate (as SO_4)	IS: 3025 (P- 24)	mg/l	56	58	-	-	-
19	Alkalinity (as Ca CO_3)	IS: 3025 (P- 23)	mg/l	30	50	-	-	-
20	Total hardness (as $CaCO_3$)	IS: 3025 (P- 21)	mg/l	108	90	-	-	-
21	Zinc (as Zn)	IS: 3025 (P- 49)	mg/l	0.9	0.7	-	-	-
22	Sodium (as Na)	IS-3025(P-45)	mg/l	26	22.5	-	-	-
23	Potassium (as K)	IS-3025(P-45)	mg/l	18.2	16	-	-	-



In the above graph it is clear that at Gharphalia Maibela pH, COD and TSS value is higher than Parbatia. BOD is almost same in all sampling locations and in the case of DO Parbatia region has slightly greater value than Gharphalia Maibela.

CPCB and MOEF&CC has categorized the surface water in 5 different categories namely A, B, C, D and E (Ref: http://cpcb.nic.in/water-quality-criteria/). From **Table 21** it can be differed that in all 3 surface water monitoring locations the pH values are between 6.5 – 8.5, dissolved oxygen level is above 4 mg/l and free ammonia is less than 1.2mg/l. Hence the surface water along the project road can be classified as Category A.

Table 21: Categorisation of surface water by CPCB and MOEF&CC

Designated-Best-Use	*Class of water*	*Criteria*
Drinking Water Source without conventional treatment but after disinfection	*A*	*Total Coliforms Organism MPN/100ml shall be 50 orless pH between 6.5 and 8.5DissolvedOxygen 6mg/lormore Biochemical Oxygen Demand 5 days 20C 2mg/l orless*
Outdoor bathing (Organized)	*B*	*Total Coliforms Organism MPN/100ml shall be 500 orless pH between 6.5 and 8.5 Dissolved Oxygen 5mg/lormore Biochemical Oxygen Demand 5days 20C3mg/l ore less*
Drinking water source after conventional treatment and disinfection	*C*	*Total Coliforms Organism MPN/100ml shall be 5000or less pH between 6 to 9 Dissolved Oxygen 4mg/l ormoreBiochemical Oxygen Demand 5 days 20C 3mg/l orless*
Propagation of Wild life and Fisheries	*D*	*pH between 6.5to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia(asN)1.2mg/l or less*
Irrigation, Industrial Cooling, Controlled Waste disposal	*E*	*pH between 6.0to 8.5Electrical Conductivity at 25C micro mhos/cmMax.2250 Sodium absorption Ratio Max. 26Boron Max.2mg/l*

Figure 4-15: Surface Water Sample collection at Gharphalia Maibela

Figure 4-16: Surface Water Sample collection at Parbatia

As seen from the results, the pH of the drinking water in the region is well within permissible limits (6.18-7.22). The total dissolved solids in the samples collected vary from 6 mg/l to 6.3 mg/l which is well within the permissible standards. Total hardness as CaCO3 in the water sample varies from 90 mg/l to 108 mg/l which is within the standard limits. Other parameters analyzed like chloride, sulphate, fluorides are found well within standards. The surface water quality in the region is reported to be well within the permissible limits and also found by visual identifications. There are no reports of any water-borne decease in the region. People are using this water for various domestic purposes.

4.3.7 Ambient Air Quality

The ambient air quality with respect to the study area forms the baseline information. The prime objective of the baseline air quality study was to assess the existing air quality of the area. This will also be useful for assessing the conformity to standards of the ambient air quality during the construction and operation phase.

This section describes the selection of sampling locations, methodology adopted for sampling, analytical techniques and frequency of sampling. The ambient air quality monitoring was conducted during winter season in the month of October to Novemeber 2021.

4.3.7.1 Methodology Adopted for Air Quality Survey

Selection of Sampling Locations:

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality monitoring network. The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Meteorological conditions on synoptic scale;
- Topography of the study area;

- Representatives of regional background air quality for obtaining baseline status;
- Representatives of likely impact areas.

4.3.7.2 Frequency and Parameters for Sampling

Ambient air quality monitoring was carried out for 24hrs representing winter season. Thebaseline data of air environment was monitored for parameters mentioned below:

- Particulate Matter (PM2.5);
- Particulate Matter (PM10);
- Sulphur dioxide (SO2);
- Oxides of Nitrogen (NOx);
- Carbon Monoxide (CO)

The AAQ sampling is carried out as the present revised standards mentioned in the latest Gazette notification of the Central Pollution Control Board (CPCB) (November, 2009).

The baseline status of the ambient air quality has been checked through ambient air quality monitoring at selected points along the project road. The ambient air quality has been monitored at 3 locations as shown in **Table 23** along the project road for particulate matter ($PM_{2.5}$ and PM_{10}), sulphur dioxide (SO_2), oxides of nitrogen (NO_X); and carbon monoxides (CO) using standard analysis technique is shown in **Table 22**.

Table 22: Techniques Used for Ambient Air Quality Monitoring

Sr. No.	Parameter	Technique	Minimum Detectable Limit (µg/m^3)
1.	Particulate Matter ($PM_{2.5}$)	Gravimetric Method	10.0
2.	Particulate Matter (PM_{10})	Gravimetric Method	25.0
3.	Sulphur dioxide	Modified West and Gaeke	5.0
4.	Nitrogen Oxide	Modified Jacob & Hochheiser	5.0
5.	Carbon Monoxide	Non-Dispersive Infrared Spectroscopy (NDIR)	1 (in mg/m^3)

Table 23: Air Quality Monitoring locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance (m)	Coordinates	
				Latitude	Longitude
1	i. 14.10.2021-15.10.2021 ii. 20.10.2021-21.10.2021 iii. 26.10.2021-27.10.202 iv. 05.11.2021-06.11.2021	Nakachari, inside Public Health Centre	50	26°41'39.75"	94°24'48.99"
2	i. 14.10.2021-15.10.2021 ii. 20.10.2021-21.10.2021 iii. 26.10.2021-27.10.202 iv. 05.11.2021-06.11.2021	Chamguri, inside school	50	26°50'43.842"	94°34'3.686"
3	i. 15.10.2021-16.10.2021 ii. 21.10.2021-22.10.2021 iii. 27.10.2021-28.10.2021 iv. 06.11.2021-07.11.2021	Balighat, New Termination Point	50	26°926'340"	94°74'27.67"

Source: Environmental Baseline Monitoring

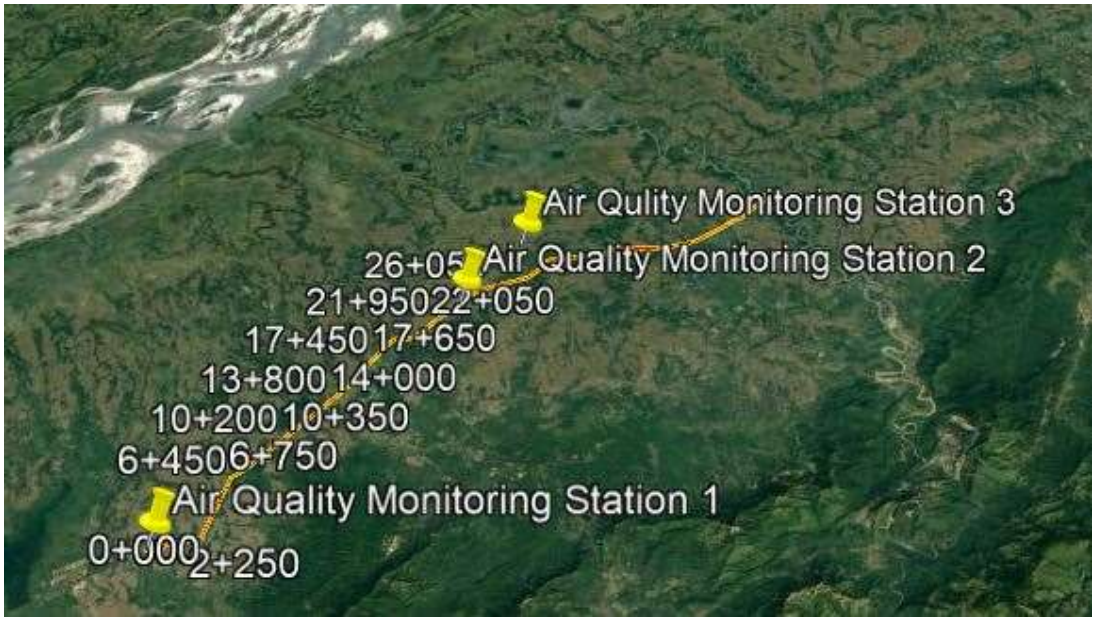


Figure 4-17: Air Quality Monitoring locations along the project road

Ambient air quality monitoring results for $PM_{2.5}$, PM_{10}, SO_2, NO_x, and CO concentrations are given in **Table 24** and summarized below. The monitored values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB) and WHO Ambient Air Quality Guidelines (IFC EHS) for residential, rural, and other areas. The Ambient air quality levels meet the National air quality standards for the rural, residential area all along the project road. Concentration of all the parameters at three locations are within the National Ambient Air Quality Standard (CPCB) - Permissible limit.

- $PM_{2.5}$: The mean $PM_{2.5}$ concentration at ambient air quality monitoring locations varies from 40µg/m^3 to 49 µg/m^3. The values are within the permissible limit at all the stations.

- PM_{10}: The mean PM_{10} concentration at ambient air quality monitoring locations varies from 66 to 89 µg/m^3. The values are within the permissible limit at all the stations as per the NAAQS.
- SO_2: The mean concentrations of SO_2 at all ambient air quality monitoring locations vary from 7.8µg/m^3 to 10.2 µg/m^3. The values are within the permissible limit at all the stations.
- NO_X: The mean concentrations of NO_X at all AAQM locations range from 11.5 to 16.2 µg/m^3. The values are within the permissible limit at all the stations.
- CO: it was present at below detection limit.

Table 24: Ambient Air Quality along the Project Road

	S. N.	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide	Nitrogen Dioxide	Carbon Monoxide	Hydrocarbon (HC), µg/m^3	Lead (Pb), µg/m^3
National Ambient Air Quality Standard (CPCB) - Permissible limit		100	60	80	80	2	-	1
AAQM 1: Nakachari, Inside Public Health Center								
Week 1	1	75	41	9.2	13.6	BDL	BDL	BDL
Week 2	2	79	45	9.9	14.2	BDL	BDL	BDL
Week 3	3	78	44	8.5	12.4	BDL	BDL	BDL
Week 4	4	71	42	8.4	11.5	BDL	BDL	BDL
AAQM 2: Chamguri, Inside School								
Week 1	5	68	40	7.8	12.4	BDL	BDL	BDL
Week 2	6	70	42	8.4	13.2	BDL	BDL	BDL
Week 3	7	78	44	8.5	12.4	BDL	BDL	BDL
Week 4	8	66	42	8.2	13.2	BDL	BDL	BDL
AAQM 3: Balighat, Near Termination Point								
Week 1	9	82	46	9.4	15.2	BDL	BDL	BDL
Week 2	10	89	49	10.2	16.2	BDL	BDL	BDL
Week 3	11	78	43	8.8	14.4	BDL	BDL	BDL
Week 4	12	87	48	9.2	14.8	BDL	BDL	BDL

Source: Environmental Baseline Monitoring

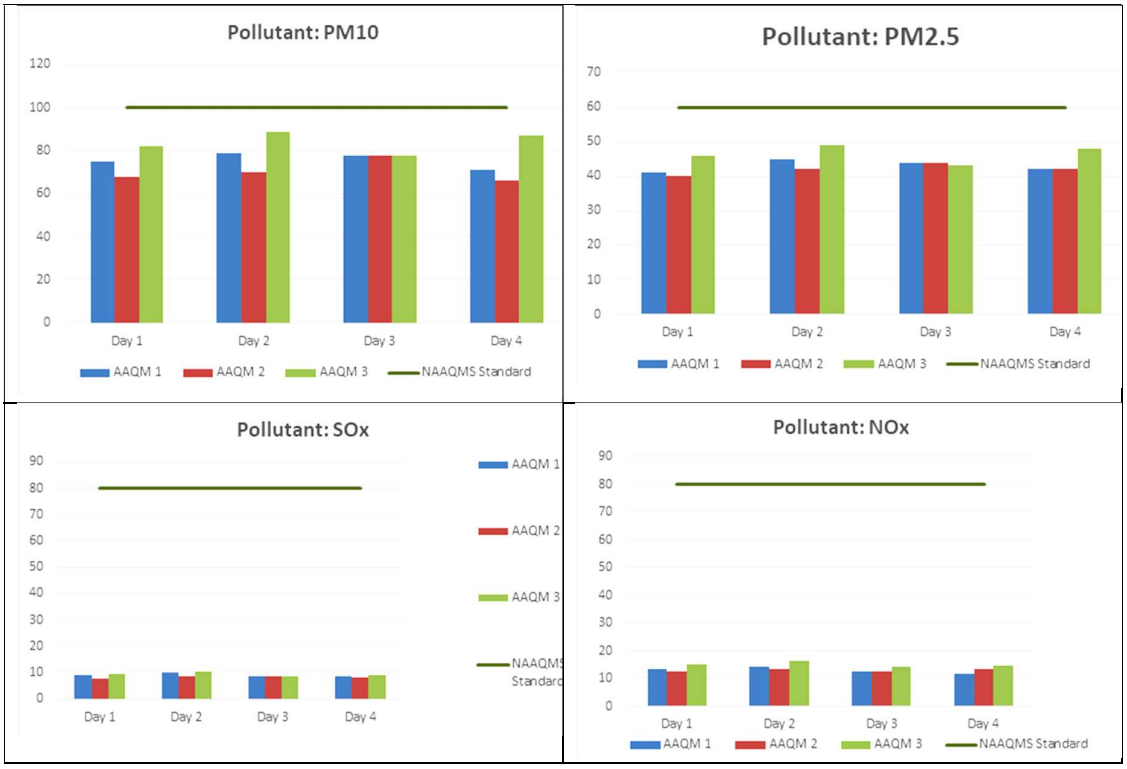


Figure 4-18: Ambient Air Quality along the Project Road

Figure 4-19: AAQM 1 Nakachari, Inside Public Health Center 14-10-2021 to 15-10-2021

Figure 4-20: AAQM 1 Nakachari, Inside Public Health Center 20-10-2021 to 21-10-2021

Figure 4-21: AQM2 Chamguri, Inside School 14-10-2021 to 15-10-2021

Figure 4-22: AQM2: Chamguri, Inside School 20-10-2021 to 21-10-2021

Figure 4-23: AQM3 Balighat, Near Termination Point 15-10-2021 to 16-10-2021

Figure 4-24: AQM3 Balighat, Near Termination Point 21-10-2021 to 22-10-2021

4.3.8 Noise Measurements

Noise in general is sound which is composed of many frequency components of various types of loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human to complex sound made up of various frequencies at different loudness levels. The noise is measured as dB (A).

This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of a human ear. The impact of noise sources on surrounding community depends on:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness;
- The time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance; and
- The location of the noise source, with respect to noise sensitive land-use, which determines the loudness and period of exposure.

The main objective of noise monitoring in the study area is to establish the baseline noise levels, and assess the impact of the total noise generated by the construction work and movement of vehicles during operations phase.

Identification of Sampling Locations

A preliminary reconnaissance survey was done to identify the major noise generating sources along the proposed alignment. The noise at different noise generating sources has been identified based on industrial, commercial, and residential activities, traffic, and noise at sensitive areas. Sound Pressure Level (SPL) measurements were undertaken at all locations, with an interval of about 5 seconds over 10 minutes per hour for 24 hr. The day noise level has been monitored from7 AM to 10 PM and night levels from 10 P.M. to 7 AM at 3 locations. The Details of the monitoring locations are given in **Table 24** and in **Figure 4-25.** Day and night-time Leq have been calculated from hourly Leq values and compared with the stipulated standards.

The monitored values are compared with CPCB Ambient Air Quality Standards in respect of Noise and Guidelines for Community Noise, World Health Organization for residential areas. The monitored levels meet the National as well as WHO standards for the residential area all along the project road.

The main objective of noise monitoring in the study area is to establish the baseline noise levels, which was used to assess the impact of total noise generated by the proposed project activities. Noise level monitoring was carried out continuously for 24 – hours with one-hour interval at each location using Sound level meter capable of measuring the Sound Pressure Level (SPL) in Db (A). Hourly Leq values were computed by the noise integrating sound level meter and statistical analysis was done for measured noise levels in the study area.

Table 25: Noise Monitoring locations along the project road

Sampling Location	Date of Sampling	Name of place	Coordinates	
			Latitude	Longitude
1	10.10.2021	Nakachari Near Public Health Center	26°41'39.75"	94°24'48.99"
2	10.10.2021	Chamguri, Inside School	26°50'43.842"	94°34'3.686"
3	10.10.2021	Balighat, Near Termination Point	26°92'6340"	94°74'2767"

Source: Environmental Baseline Monitoring

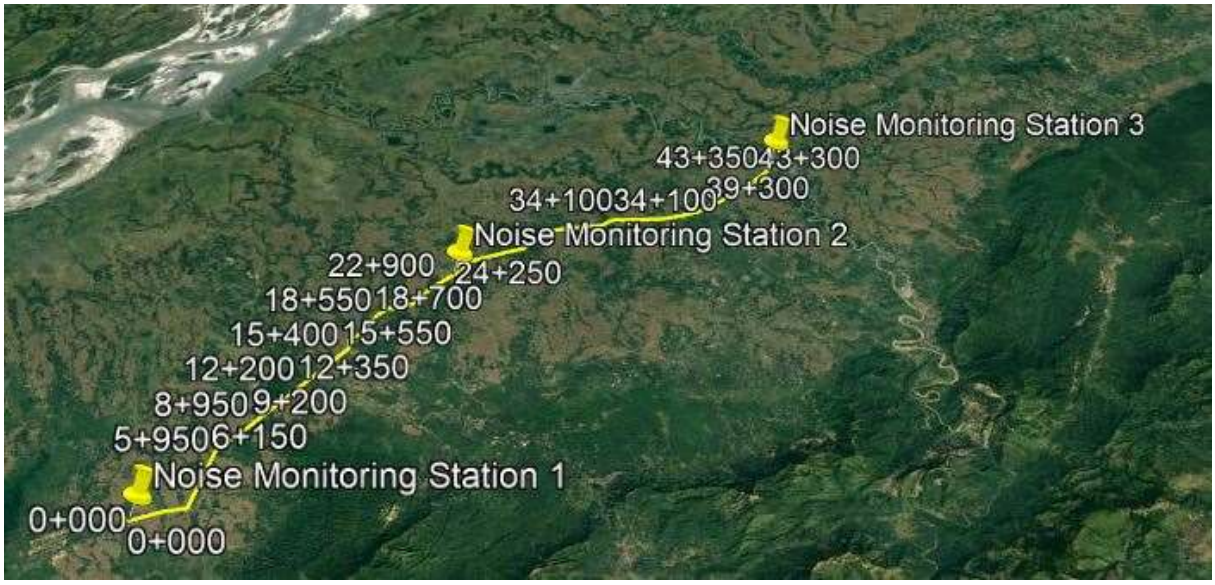


Figure 4-25: Noise Monitoring locations along the project road

Table 26: Day and Night Time Leq in the Project Area

	Noise location1Nakachari Near Public Health Center		Noise location 2 Chamguri, Inside School		Noise Location 3Balighat, Near Termination Point	
Date	**14/10/2021**	**15/10/2021**	**14/10/2021**	**15/10/2021**	**16/10/2021**	**17/10/2021**
Maximum	52.6	53.7	51.6	52.5	54	51.6
Minimum	40.2	39.9	39.3	40.9	39	39.3
Leqday	49.3	49.5	48	49.2	50.2	48
Leqnight	41.4	41.2	40.6	44.5	40.8	40.8
Leq	50.1	50.1	49	51.7	50.4	49
STANDARD	**Day–65**	**Night-55**	**Day–55**	**Night - 45**	**Day–50**	**Night - 40**

Source: Environmental Baseline Monitoring

It can be seen from **Table 25** that at all the monitoring locations, the ambient noise levels are well within the permissible limits for residential areas prescribed by CPCB and also by World Bank EHS standards of 55 dB(A) and 45 dB(A) for day time and night time respectively. The maximum recorded day time noise level is 54 dB(A) and night time noise level is 40.9 dB(A) at Balighat and Chamguri, inside school. Average day time noise level along the subproject roads varies from 48 dB(A) to 50.2 dB(A) whereas average night time noise levels vary from 40.6 dB(A) to 44.5 dB(A).

Figure 4-26: Noise Monitoring at Nakachari Near Public Health Center on 14.10.2021

Figure 4-27: Noise Monitoring at Nakachari Near Public Health Center on 14.10.2021

Figure 4-28: Noise Monitoring at Nakachari NearChamguri, inside school on 14.10.2021

Figure 4-29: Noise Monitoring at Nakachari NearChamguri, inside school on 14.10.2021

Figure 4-30: Noise Monitoring at Balighat on 16.10.2021

Figure 4-31: Noise Monitoring at Balighat on 17.10.2021

4.3.9 Land Use

Most of the geographical area of the state about 98% is available for utilization. The major portion of the land use is under residential followed by Agricultural cover. Agriculture is the major land use in the state followed by forests. The land use pattern of the road stretch is mainly agricultural. However, some stretches of the existing road is passing through built-up /semi built up area. The Land Use Pattern Abutting Project road is presented in **Table 27**. The land use map of the project district is shown **Figure 4-32.**

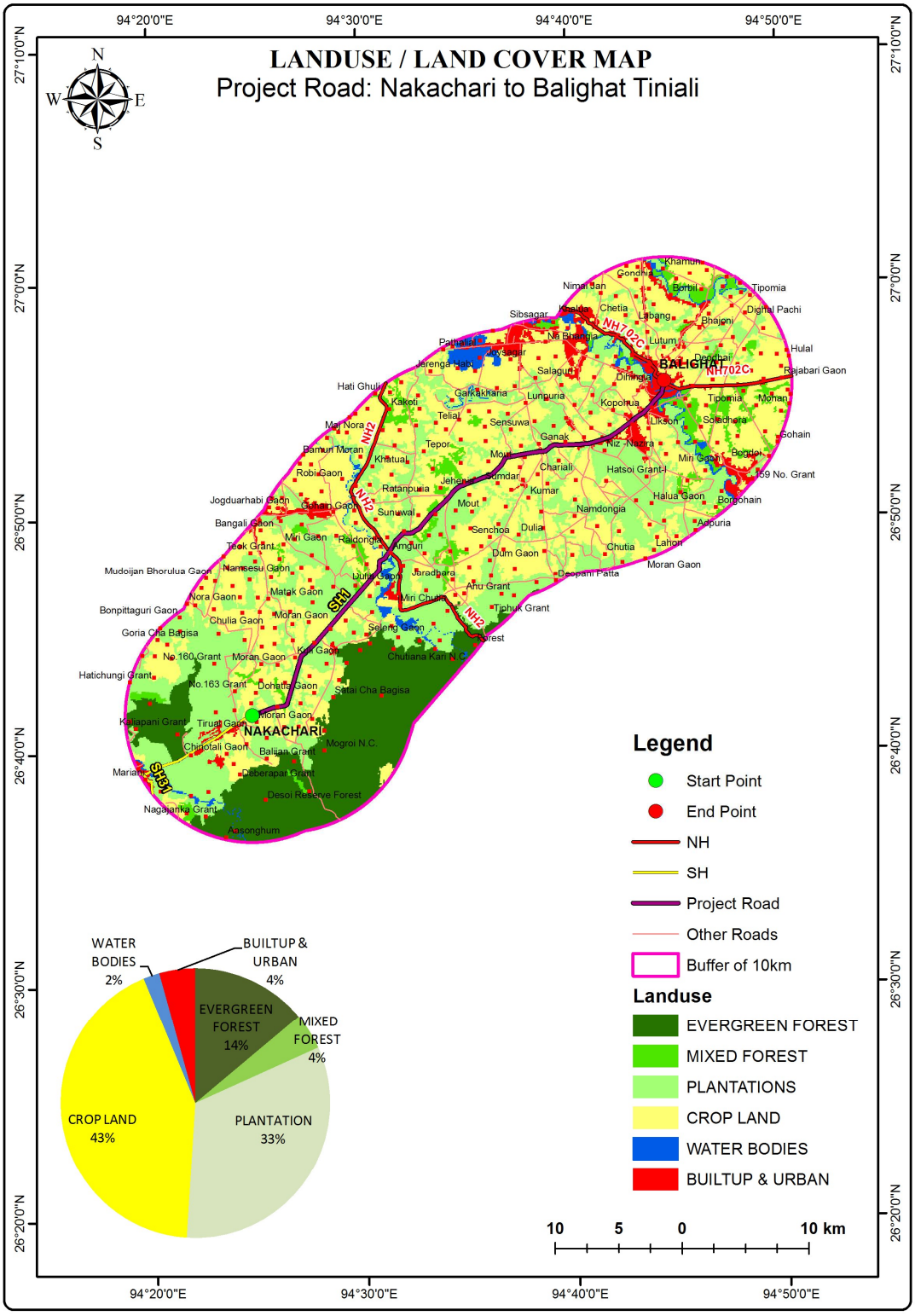


Figure 4-32: Land use map of the project district

Table 27: Land Use Pattern Abutting Project Road

Land Use	Land Use Pattern
Built-up & urban area	4%
Water Body	2%
Forest	18%
Plantation	33%
Cropland	43%
Total	**100%**

Source: Road Inventory Survey

4.4 Biodiversity and Biological Environment

4.4.1 Forests of Assam

Forests of Assam have rich biodiversity of flora and fauna. It has a wide range of forests viz. Evergreen and Semi Evergreen forests, Mixed Deciduous forests, Sal Forests, Riverine forests, Moist Savannah, dry Savanna, and Dry Miscellaneous Type of forests. The state also has a humid weather which combined with the rich forest biodiversity gives the state several endemic species of flora and fauna. The state has many varieties of important commercial crops including rice, banana, citrus, ginger and tea. The state boasts of 3010 species of flowering plants including 347 medicinal plants, 102 endemic and restricted range plants, 182 species of orchids, 42 species of Bamboos and 14 species of cane. Different Forest types in the state can be classified as below:

- Tropical Wet Evergreen Forests
- Tropical Semi-Evergreen Forests
- Tropical Moist Deciduous Forests
- Sub-tropical Broadleaf Hill Forests
- Sub-tropical Pine Forests
- Littoral and Swamp Forests
- Grassland and Savannahs

A total of 26,832 sq km (37.21%) of the geographical area of the state is covered by forest. These forests have 193 species of mammals including 10 primates, 820 species and subspecies of birds, 185 species of fish, 405 species of butterflies, 115 species of reptiles, 46 species of amphibians and 39 species of snails. The state has 4% of its total green cover notified as Protected Area, comprising of 5 National Parks and 20 Wildlife Sanctuaries. The state also has 2 UNESCO World Heritage sites and 2 Biosphere reserves, 4 Tiger Reserves and 5 Elephant Reserves and 46 Important Bird Areas.

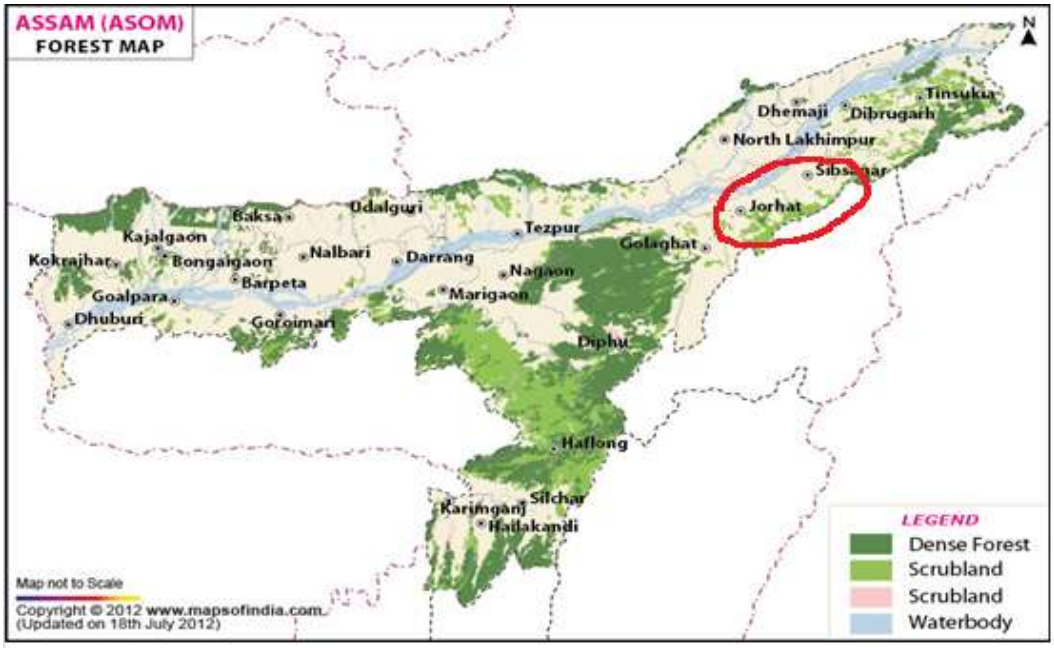


Figure 4-33: Forest Map of Assam

Based on the Primary survey and discussion with the DFO while doing tree inventory for tree felling permission, it was noted that no forest land notified under the Indian Forest Act – 1927 are reported within the proposed ROW.

4.4.2 Important Flora of the State

The state is rich with several important flora species. Different types of species are prevalent in different type of forest in the state. Each of these forest types, regions for the same and the prevalent flora species in each are given below.

The state is rich with several important flora species. Different types of species are prevalent in different type of forest in the state. Each of these forest types, regions for the same and the prevalent flora species in each are given below.

Evergreen Forests:

Evergreen Forests are mainly found in Lakhimpur, Dhemaji, Dibrugarh, Sibasagar, Tinsukia, Cachar extending upto Panchnadi in north bank and Golaghat district. Present species in these forests includes the following.

Table 28: Present Species in Evergreen forests of Assam

Sr. No.	Dominant Families
1	Dilleniaceae
2	Anonaceae
3	Clusiaceae
4	Magnoliaceae
5	Fabaceae
6	Myrtaceae
7	Styraceae

Sr. No.	Dominant Families
8	Ebenaceae
9	Myristicaceae
10	Lauraceae
11	Euphorbiaceae
12	Fagaceae
13	Myrtaceae
14	Styraceae
15	Ebenaceae
16	Myristicaceae
17	Lauraceae
18	Euphorbiaceae
19	Fagaceae
20	Arecaceae
21	Poaceae
22	Dipterocarpaceae

Deciduous Forests:

Deciduous Forests lie mainly in Dhubri, Kokrajhar, Goalpara, Bongaigaon, Chirang, Baksa, Nalbari and Udalguri regions in the state. Various species under this includes the following.

Table 29: Present Species in Deciduous forests of Assam

Sr. No.	Dominant Families
1	Lagerstroemia parviflora
2	Kydia calycina
3	Schima Wallichi
4	Careya arborea
5	Gmelina arborea
6	Cassia fistula
7	Albizzia lucida
8	A. Odoratissima
9	Millusa velutina
10	Stereospermum chelonoides

Swamp Forests

These forests are usually found in low lying areas, abandoned river channels etc. Dominant species in these includes:

Table 30: Present Species in Swamp forests of Assam

Sr. No.	Dominant Families
1	Crataeva lophosperma
2	Eugenia species
3	Duabanga grandiflora
4	Te rminalia myriocarpa
5	Largerstroemia flos-regina
6	Trewia nudiflora
7	Ficus pyriformes
8	Hygrorhiza aristate

Sr. No.	Dominant Families
9	Vossia procera
10	Panicum proliferum
11	Phragmities communis
12	P. karka
13	Arundo donax
14	Nymphaeceae
15	Lamnaceae
16	Alismaceae
17	Naiadaceae
18	Eriocauleceae
19	Cyperaceae

Grass lands:

Grasslands in the state is found in the riparian belt and in low rainfall areas. Some of the species in these grasslands are as follows:

Table 31: Present Species in Grasslands of Assam

Sr. No.	Dominant Families
1	Saccharum
2	Anthistena
3	Erianthus
4	Arundo
5	Phragmities
6	Imperata arundinaceae
7	Aptuda varia
8	Andropogon jwarancusa
9	Nardus contortus
10	Setaria glauca

Some of the species of plants of medicinal importance to the state are as follows:

Table 32: Plants of medicinal importance to the state

Sr. No.	Scientific Name	Common Name	Uses
1	*Flacoutia jangomas*	Paniol	The fruits from the plant are used as a medicine to treat jaundice. Leaves and Roots are taken for schistoosmiasis, malaria and diarrhoea. Roots of the plant are believed to treat pneumonia, intestinal worms and act as pain reliever.
2	*Baccaurea ramiflora*	Leteku	The bark, roots and wood from this plant are harvested for medicinal use and is used to treat skin diseases.
3	*Garcinia lanceifolia*	Rupahi thekera	The fruits from this plant are used for preparation of soft drinks and used as a medicine for diarrhoea.
4	*Myrica esculenta*	Nagatenga	The fruits have antioxidant, anviral and antidiarrhoeal properties.

Sr. No.	Scientific Name	Common Name	Uses
5	*Garcinia pedunculata*	Bor thekera	This dried fruit is used to treat dysentery. The bark of this fruit is used to dye clothes.
6	*Carissa carandas*	Karza tenga	The fruit is antiscorbutic and is used for anaemia. It is also an ingredient in jelly, jam syrup and chutney.
7	*Ajuga integrifolia*	Nilakantha	This plant is aromatic, astringent and tonic. It is useful in treatment of agues. Roots are helpful in treatment of diarrhoea and dysentery. The leaves are used in the treatment of fever substituting quinine.
8	*Andrographis paniculata*	Sirata/Kalmegh	The plant extract has antityphoid and antifungal properties. It is also reported to be helpful as antihepatotoxic, antibiotic, antimalarial, antihepatitic, antithrombogenic, anti-inflammatory, anti-snake venom and antipyretic.
9	*Bacopa monnieri*	Brahmi	It is used in Ayurvedic treatment for epilepsy and asthma. It is also used for ulcers, tumors, enlarged spleen, indigestion etc.
10	*Centella asiatica*	Manimuni	This has antibacterial, antiviral, anti-inflammatory, antiulcerogenic, anxiolytic, nervine and vulnerary properties and acts as cerebral tonic.
11	*Cheilocostus speciosus*	Jomlakhuti	This plant has uses in Ayurveda to treat fever, rash, asthama, bronchitis and intestinal worms.
12	*Catharanthus roseus*	Nayantara	This species is cultivated for herbal medicine and is prevalent in Ayurveda as a cure against several diseases like diabetes, malaria and Hodgkin's lymphoma.
13	*Amaranthus spinosus*	Khutura xak	This is used in treatment of diarrhoea, excessive menstruation and snake bites.

4.4.3 Flora of Jorhat and Sivasagar District

- **Jorhat**

The forests of Jorhat district can be classed into two categories – tropical evergreen forest and miscellaneous forest. The first category includes Hollong, Nahar, Sham, Amri, Makai, Chopa etc. In the remaining category those species have been included which are deciduous and the middle and lower canopies of evergreen in character.

The forest wealth plays an important role in uplifting the district economy. A large proportion of rural inhabitants in the district depend upon forest resources. Forests serve as fuel supplier in the tune of fire-woods, and bamboo, ekora, reed, thatch, cane, etc. are used for both house-building and making furniture. The forests of Assam are the principal source of medicinal plants. The same is equally applicable in case of forests of this district.

➢ **Sibsagar**

Botanically the forests of Sibsagar can roughly be divided into two divisions - the tropical and evergreen forests. The first category includes climatic vegetation such as Hollong, Nahor, Sam, Amri, Gunseroi, Makai, and Sopa etc. They are the best-stocked stand of the district. The evergreen forests, as the name suggests, are evergreen in character and are generally found in Dilih Sapekhati, Geleki, Tiruhill, Disai and Disai valley reserves. In some reserves, Makai is also found associated with Hollong in this canopy.

4.4.4 Wild Life and Protected Areas

The protected area network of Assam includes 5 National Parks and 18 wildlife sanctuaries covering an area of 0.40 million ha constituting 4.98% of the geographical area. The state has three Tiger Reserves, namely Kaziranga, Manas, and Nameri. Kaziranga National Park and Manas National Park are in the list of World Heritage sites. The List of National Park and Wildlife declared protected the Wildlife (Protection), Act -1972 located in the State of Assam and Project district is discussed in **Table 33**. As per consultation with the Gibbon bit office forest official it was understood that there is no elephant and other wild animal movement along the project road.

Table 33: List of Wildlife Sanctuary & National Parks in the State of Assam

Sr. No	Name	Location	Area	Year
List of National Park in Assam				
1.	Kaziranga National Park	Golaghat, Nagaon district and Karbi Anglong	858.98	1905
2.	Manas National Park	Kokrajhar, Chirang, Baksa, Bajali, Udalguri, and Darrang	950.0	1985
3.	Nameri National Park	Sonitpur	200.0	1978
4.	Dibru-Saikhowa National Park	Dibrugarh and Tinsukia district	340.00	1978
5.	Orang National Park	Darrang, Udalguri and Sonitpur district	78.81	1999
6.	Raimona National Park*	Kokrajhar	422	2021
7.	Dehing Patkai Wildlife Sanctuary#	Dibrugarh and Tinsukia	111.19	2021
*Assam Gazette Notification no.FRW.02/2021/27 dtd. 08th June, 2021. # Upgraded to National Park from Wildlife Sanctuary on 9th June 2021				
Wildlife Sanctuary in Assam				
1.	Hoollongapar Gibbon Sanctuary	Jorhat	20.98	
2.	Garampani Wildlife Sanctuary	Karbi Anglong	6.05	
3.	Bura Chapori Wildlife Sanctuary	Sonitpur	44.06	
4.	Bornadi Wildlife Sanctuary	Darrang	26.22	1980
5.	Sonai Rupai Wildlife Sanctuary	Sonitpur	220.00	
6.	Pobitora Wildlife Sanctuary	Marigaon	38.80	1987
7.	Panidihing Bird Sanctuary	Sibsagar	33.99	

Sr. No	Name	Location	Area	Year
8.	Bherjan-Borajan-Padumoni Wildlife Sanctuary	Tinsukia	7.22	
9.	Nambor Wildlife Sanctuary	Karbi Anglong	37.00	
10.	East Karbi-Anglong Wildlife Sanctuary	Karbi Anglong	222.81	
11.	Laokhowa Wildlife Sanctuary	Nagaon	70.13	
12.	Chakrashila Wildlife Sanctuary	Dhubri and Kokrajhar	45.57	
13.	Marat Longri Wildlife Sanctuary	Karbi Anglong	451.00	
14.	Nambor-Doigrung Wildlife Sanctuary	Golaghat	97.15	
15.	Borail Wildlife Sanctuary	Cachar and Dima Hasao	326.25	
16.	Amsang Wildlife Sanctuary	Guwahati	78.64	
17.	Dipor Bil Wildlife Sanctuary	Kamrup	4.14	
18.	Bordoibam Bilmukh Bird Wildlife Sanctuary (Proposed)*	Dhemaji and Lakhimpur	11.25	
19.	North Karbi Anglong Wildlife Sanctuary (Proposed)*	Karbi Anglong		
*https://forest.assam.gov.in/portlets/wildlife-sanctuary				

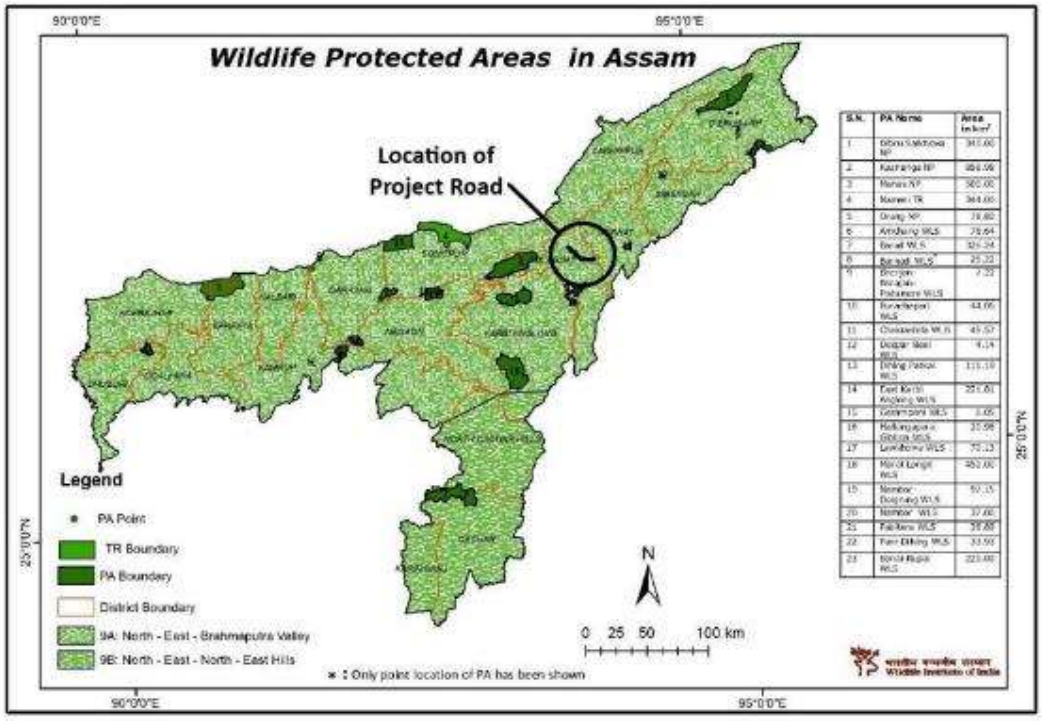


Figure 4-34:Wildlife Sanctuary and National Park of Assam

- Hoollongapar Gibbon Sanctuary is situated amidst tea gardens and human settlements. The Sanctuary is named after the only Ape (Hoolock Gibbon) found in India. A small Sanctuary of 20.98 sq. kms. in Jorhat district with semi-evergreen forests and evergreen patches

- Panidihing Bird Sanctuary, is A rich wetland eco-system of 33.93 sq. kms. on the southern bank of river Brahmaputra in the Sibsagar district. The sanctuary is A paradise of migratory and resident birds, so far 165 species of Birds have been identified and recorded. A place for quite high concentration of Geese and other Migratory birds.
- As per the approved Protected areas and Reserve forests map received from the PCCF office, Guwahati vide Letter No. FG 69/REWP/GIS/PART-1/7032 during the initial survey, the project road does not pass through any protected area such as Wildlife Sanctuary, National Park, or bio-reserve. The Hoollongapar Gibbon Sanctuary Wildlife Sanctuary and Panidihing Bird Sanctuary lies at a distance of approximately 8km and 20 km the respectively from the project road.

Hoollongapar Gibbon Sanctuary

Th[1]e present project road is situated about 6 km from The Hoollongapar Gibbon Sanctuary and it is about 3m from the ESZ. Hoollongapar Gibbon Sanctuary formerly known as the Gibbon Wildlife Sanctuary or Hollongapar Reserve Forest (Assamese: হোলোঙাপাৰ গিবন অভয়াৰণ্য), is a small, isolated protected area of evergreen forest located in Assam, India. During the British period in 1881, Gibbon Wild life Sanctuary was known as Hollongapar Forest, which was declared a wildlife sanctuary by the group of Assam notification no. FRS/37/97/13 dated 30/7/1997, which was further renamed as Hollongapar Gibbon Wild life Sanctuary on 25th May 2004. It is situated in close proximity to the Naga Hills and the town of Mariani. Initially, the forest used to extend to the foothills of the Patkai range. It covers an area of 20.98 sq. km. and the sanctuary has been divided into five compartments. It has also been recently declared as Important Bird Area by Birdlife International and Key Biodiversity Area by IUCN.

It falls under “North East Biogeographic Zone (9)” and “N.E. Brahmaputra Valley Biogeographic Province (9A)”. As per Champion and Seth19 classification scheme, the forest type of HGWLS is “Eastern Alluvial Secondary Semi-Evergreen Forest (1/2/2B/2S2)” under Moist Tropical Forests of India.
Most of the vegetation within Hoollongapar Gibbon Sanctuary is evergreen in character and is composed of several canopy layers.The major tree species is Hollong(Dipterocarpus macrocarpus)and other associated species found along with hollong are Sam (*Artocarps chaplasha)*, Amari *(Amoora wallichi),* Sopas *(Mcheliai spp.),* Bhelu *(Tetramels mudiflora),* Udal *(Sterculia villosa)* ,Hingori *(Castanopsis spp.),*Nahor *(Mesua ferrea),* Bandordima *(Dysoxylum procerum)*, Dhuna *(Conarium resiniferum),* Bhomora *(Terminalia belerica),* Ful Gomari *(Gmelina sp.)* Bonbogri *(Pterospermum lanceafolium),* Morhal *(Vatica lanceafolia),* Selleng *(Sapium baccatum),* Sassi *(Aqualari agolacha)* and Otenga *(Dillenia indica).*

This is the only sanctuary in India to be named after gibbons- the only ape found in India. The sanctuary is the home to seven types of apes – Western Hoolock Gibbon, Bengal Slow Loris, Stump-Tailed Macaque, Northern Pig-Tailed Macaque, Eastern Assamese Macaque, Rhesus Macaque, And Capped Langur. This Sanctuary has the rare distinction of holding one of the highest densities of gibbon populations in Assam. Apart from the apes, the forest is also abundant in elephants, leopards, jungle cats, civets, Himalayan squirrels, wild boars and other mammals. There are also a large number of bird species and several types of reptiles inhabiting the forest.

[1] http://datazone.birdlife.org/site/factsheet/gibbon-(hollongapar)-sanctuary-iba-india

The area is situated amidst tea gardens and human habitation, crisscrossed with numerous rain-fed streams (nallahs) like the Kaliapani Jan. The surrounding tea gardens include Meleng, Kakajan, Diha, Beluguri, Dihingapar, Kothalguri, Katonibari, Daklongia and Koliapani tea estates. This forest patch is enclosed by villages like Madhupur and Phesual villages in the north and Lakhipur and Kaliagaon villages in the south. The isolated sanctuary forest patch has five compartments, out of which compartment 1 is fragmented from the rest of the forest by the railway track running through the sanctuary. The Meleng-Madhupur road (Fig. 1.3b) bifurcates the rest of the sanctuary which passes through the middle of the sanctuary which connects the Meleng beat office to Madhupur village. This road has compartment 2 and 3 in its west direction and compartments 4 and 5 to its east.

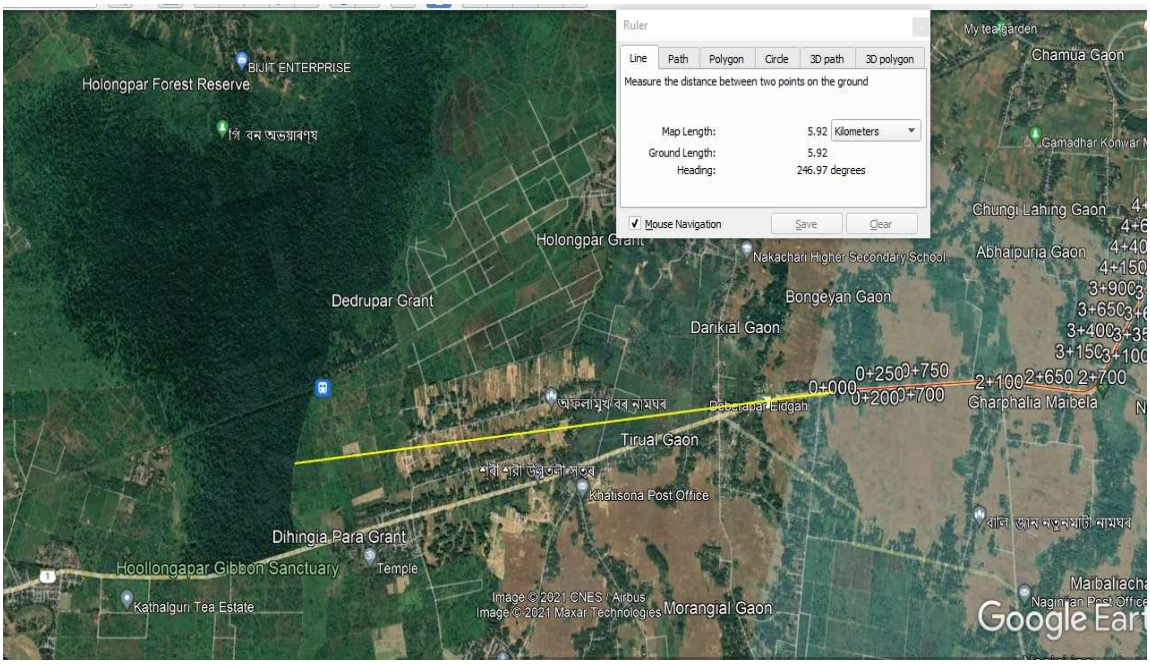


Figure 4-35: Project road distance from the Hoollongapar Gibbon Sanctuary

Table 34: Important Fauna of Hoollongapar Gibbon Sanctuary[2]

Order	Common Name	Local Name	Scientific Name	WPA 1972	IUCN
MAMMALS					
Primates	Rhesus Macaque	Moluwa Bandor	*Macaca mulatta*	*II*	*LC*
Primates	Capped Langur	Tupi Muria Bandor	*Trachypithecus pileatus*	*I*	*EN*
Primates	Hoolock Gibbon	Holou Bandor	*Hoolock hoolock*	*I*	*EN*

[2] District Census Handbook -Jorhat, Census of India 2011, Series-19 Part XII-ADistrict Census Handbook -Sivasagar, Census of India 2011, Series-19 Part XII-ANational Wetland Atlas, SAC/EPSA/ABHG/NWIA/ATLAS/34/2011, Space Applications Centre (ISRO), Ahmedabad, India, 310p.

Order	Common Name	Local Name	Scientific Name	WPA 1972	IUCN
Primates	Bengal Slow Loris	Lajuki Bandor	*Nycticebus bengalensis*	*II*	*VU*
Primates	Stump-Tailed Macaque	Henduri Bandor	*Macaca arctoides*	*II*	*VU*
Primates	Northern Pig-Tailed Macaque	Gahori Nejiya Bador	*Macaca leonina*	*II*	*VU*
Primates	Assamese Macaque	Ahomia/Moluwa Bandor	*Macaca assamensis*	*II*	*NT*
Proboscidea	*Indian Elephant*	*Hathi*	*Elephas maximus*	*I*	*EN*
Carnivora	Jackal	Siyal	*Canis aureus*	*II*	*LC*
Carnivora	Common Palm Civet	Joha Mol	*Paradoxurus hermaphroditus*	*II*	*LC*
Carnivora	Small Indian Civet	Joha Mol	*Viverricula indica*	*II*	*LC*
Carnivora	Large Indian Civet	Joha Mol	*Viverra zibetha*	*II*	*LC*
Carnivora	Small Indian Mongoose	Neul	*Herpestes auropunctatus*	*IV*	*LC*
Carnivora	Jungle Cat	Junglee Mekuri	*Felis chaus*	*II*	*LC*
Carnivora	Leopard	Nahar Futuki	*Pathera pardus*	*I*	*LC*
Pholidota	Chinese Pangolin	Bon Roh	*Manis pentadactyla*	*I*	*CR*
Artiodactyla	Barking Deer	Hugori Pohu	*Muntiacus muntjak*	*I*	*EN*
Artiodactyla	Wild Boar	Gahori	*Sus scrofa*	*III*	*LC*
Rodentia	Himalayan Porcupine	Katela Pohu	*Hystrix brachyura*	*II*	*LC*
Rodentia	Malayan Giant Squirrel	Kerketua	*Ratufa bicolor*	*II*	*LC*
Rodentia	Hoary-Bellied Squirrel	Kerketua	*Callosciurus pygerythrus*	*II*	*LC*
Chiroptera	Flying Fox	Baduli	*Pteropus giganteus*	*V*	*LC*
LIZARDS, SNAKES, TURTLES & AMPHIBIA					
Order	**Common English Name**	**Local Name**	***Scientific Name***	***WPA STATUS***	***IUCN STATUS***
Agamidae	Garden Lizard	Tez-Pia	*Calotes versicolor*	*IV*	*LC*
Gekkonidae	Tokay Gecko	Keko Sap	*Gekko gecko*	*IV*	*LC*
Gekkonidae	Indian House Gecko	Jethi	*Hemidactylus sp*	*IV*	*LC*
Scincidae	Common Skink	Nai Pia	*Eutropis carinata*	*IV*	*LC*
Varanidae	Common Indian Monitor	Gui Haap	*Varanus bengalensis*	*I*	*VU*
Pythonidae	Burmese Python	Ajogor	*Python bivittatus*	*I*	*NT*
Typhlopidae	Diard's Blind Snake	Kechu Haap	*Typhlops diardii*	*IV*	*LC*
Colubridae	Common Wolf Snake	Maroli	*Lycodon aulicus*	*IV*	*LC*
Colubridae	Copper-Headed Trinket Snake	Dhundhuli Feti	*Coelognathus radiatus*	*IV*	*LC*
Colubridae	Indian Rat Snake	Musuagum	*Ptyas mucosa*	*IV*	*LC*
Colubridae	Checkered Keelback	Dhora	*Fowlea piscator*	*IV*	*LC*
Elapidae	Banded Krait	Hokso	*Bungarus fasciatus*	*IV*	*LC*
Colubridae	Spectacled Cobra	Feti	*Naja naja*	*II*	*LC*
Colubridae	Monocled Cobra	Feti	*Naja kaouthia*	*II*	*LC*
Colubridae	Red Necked Keelback Snake	Batchupa	*Rhabdophis subminiatus*	*IV*	*VU*

Order	Common Name	Local Name	Scientific Name	WPA 1972	IUCN
Colubridae	Ornate Flying Snake	Sundori	*Chrysopelea ornata*	*IV*	*LC*
Testudines	Assam Roofed Turtle	Salika / Asomi Dura	*Pangshura sylhetensis*	*I*	*EN*
Testudines	Tricarinate Turtle	Sil /Paharia Dura	*Melanochelys tricarinata*	*I*	*EN*
Bufonidae	Common Asian Toad	~	*Duttaphrynus melanostictus*	~	*LC*
Dicroglossidae	Indian Bull Frog	Bamun Beng	*Hoplobatrachus tigerinus*	*IV*	*LC*
Dicroglossidae	Indian Skipping Frog	Pani Beng	*Euphylctis cyanophlyctis*	*IV*	*LC*
Microhylidae	Ballon Frog	Belun Beng	*Uperodon globulosus*	~	*LC*

SOME IMPORTANT BIRDS OF GIBBON WLS

ORDER	COMMON ENGLISH NAME	LOCAL NAME	*SCIENTIFIC NAME*	*WPA STATUS*	*IUCN STATUS*
COLUMBIFORMES	Rock Dove		*Columba livia*	*IV*	*LC*
COLUMBIFORMES	Oriental Turtle Dove		*Streptopelia orientalis*	*IV*	*LC*
COLUMBIFORMES	Yellow-Footed Green-Pigeon		*Treron phoenicoptera*	*IV*	*LC*
COLUMBIFORMES	Spotted Dove		*Streptopelia chinensis*	*IV*	*LC*
GRUIFORMES	White-Breasted Waterhen		*Amaurornis phoenicurus*	*IV*	*LC*
PELECANIFORMES	Lesser Adjutant		*Leptoptilos javanicus*	*IV*	*VU*
PELECANIFORMES	Asian Openbill		*Anastomus oscitans*	*IV*	*LC*
PELECANIFORMES	Indian Pond Heron		*Ardeola grayii*	*IV*	*LC*
PELECANIFORMES	Cattle Egret		*Bubulcus ibis*	*IV*	*LC*
PELECANIFORMES	Little Cormorant		*Microcarbo niger*	*IV*	*LC*
ACCIPITRIFORMES	White Rumped Vulture		*Gyps indicus*	*I*	*CR*
ACCIPITRIFORMES	Slender Billed Vulture		*Gyps tenuirostris*	*I*	*CR*
ACCIPITRIFORMES	Crested Serpent-Eagle		*Spilornis cheela*	*IV*	*LC*
ACCIPITRIFORMES	Black Kite		*Milvus migrans*	*IV*	*LC*
ACCIPITRIFORMES	Pallas's Fish-Eagle		*Haliaeetus leucoryphus*	*I*	*EN*
STRIGIFORMES	Asian Barred Owlet		*Glaucidium cuculoides*	*IV*	*LC*
STRIGIFORMES	Jungle Owlet		*Glaucidium radiatum*	*IV*	*LC*
BUCEROTIFORMES	Oriental Pied-Hornbill		*Anthracoceros albirostris*	*IV*	*LC*
BUCEROTIFORMES	Great Hornbill		*Buceros bicornis*	*I*	*VU*
CORACIIFORMES	Common Kingfisher		*Alcedo atthis*	*IV*	*LC*
CORACIIFORMES	White-Throated Kingfisher		*Halcyon smyrnensis*	*IV*	*LC*
CORACIIFORMES	Green Bee-Eater		*Merops orientalis*	*IV*	*LC*
CORACIIFORMES	Chestnut-Headed Bee-Eater		*Merops leschenaulti*	*IV*	*LC*
CORACIIFORMES	Indian Roller		*Coracias benghalensis*	*IV*	*LC*
PICIFORMES	Coppersmith Barbet		*Psilopogon haemacephalus*	*IV*	*LC*
PICIFORMES	Common Flame-Backed Woodpecker		*Dinopium javanense*	*IV*	*LC*
PICIFORMES	Black-Rumped Flameback		*Dinopium benghalense*	*IV*	*LC*
PICIFORMES	Greater Flameback		*Chrysocolaptes guttacristatus*	*IV*	*LC*
PSITTACIFORMES	Alexandrine Parakeet		*Psittacula eupatria*	*IV*	*NT*
PSITTACIFORMES	Rose-Ringed Parakeet		*Psittacula krameri*	*IV*	*LC*

Order	Common Name	Local Name	Scientific Name	WPA 1972	IUCN
PSITTACIFORMES	Red-Breasted Parakeet		*Psittacula alexandri*	*IV*	*NT*
PASSERIFORMES	Scarlet Minivet		*Pericrocotus speciosus*	*IV*	*LC*
PASSERIFORMES	Black-Hooded Oriole		*Oriolus xanthornus*	*IV*	*LC*
PASSERIFORMES	Rufous Treepie		*Dendrocitta vagabunda*	*IV*	*LC*
PASSERIFORMES	House Crow		*Corvus splendens*	*IV*	*LC*
PASSERIFORMES	Common Tailorbird		*Orthotomus sutorius*	*IV*	*LC*
PASSERIFORMES	Paddyfield Warbler		*Acrocephalus agricola*	*IV*	*LC*
PASSERIFORMES	Red-vented Bulbul		*Pycnonotus cafer*	*IV*	*LC*
PASSERIFORMES	Jungle Babbler		*Turdoides striata*	*IV*	*LC*
PASSERIFORMES	Asian Pied Starling		*Gracupica contra*	*IV*	*LC*
PASSERIFORMES	Common Myna		*Acridotheres tristis*	*IV*	*LC*
PASSERIFORMES	Jungle Myna		*Acridotheres fuscus*	*IV*	*LC*
PASSERIFORMES	House Sparrow		*Passer domesticus*	*IV*	*LC*
PASSERIFORMES	Oriental Magpie-Robin		*Copsychus saularis*	*IV*	*LC*
PASSERIFORMES	Baya Weaver		*Ploceus philippinus*	*IV*	*LC*
PASSERIFORMES	Citrine Wagtail		*Motacilla citreola*	*IV*	*LC*
PASSERIFORMES	White Wagtail		*Motacilla alba*	*IV*	*LC*
NT= Near Threatened. EN=Endangered, LC= Least Concern, VU= Vulnerable, CR= Critically Endangered					

4.4.5 Fauna of Jorhat and Sivasagar District

- **Jorhat**

Animals are there like elephants, tigers, wild buffaloes etc. Various migratory birds are seen in the Char areas of the Brahmaputra while one makes in road to Majuli during winter. Fishes of all varieties are sufficiently found in the district.

- **Sivasagar**

The Panidihing Wildlife Sanctuary located in the northern part of the Sivasagar district of Assam, which is built over a large area of land. This sanctuary has a rich wetland ecosystem. It is home to many migratory birds and was declared as a Wildlife Sanctuary in the year 1996. Nearly, 267 species of birds have been conserved here so far as per the records out of which there are 70 species of migratory birds. The most commonly found birds here are the grey leg goose, mallard, wigeon, shoveller, common pochard, open bill stork, red crested pochard, adjutant stork, white necked stork and many others. The sanctuary is bordered by the rivers Dishang and Brahmaputra.

4.4.6 Biodiversity of the project area

The Project road connects two important districts of Assam i.e. Jorhat and Sivasagar. The Road originates at Nakachari (Jorhat) and ends in Balighat (Sivasagar) crossing Amguri, Samaguri, Namti, Nazira Town. The Project road mostly runs along human habitation, tea garden and agricultural, thus biodiversity of the project site is low. Several Biodiversity hotspots in the district are as follows:

Hoollongapar Gibbon Sanctuary:[3] Gibbon Wildlife Sanctuary in Jorhat is the only sanctuary in India named after gibbon as it is home to the maximum population of gibbons. It has India's only gibbons - the hoolock gibbons and Northeast India's only nocturnal primate- the Bengal slow loris. The place is also known as the Hoollongapar Gibbon sanctuary which is named after its dominant tree species Hollong. The Sanctuary is surrounded by tea gardens all around and there are also canopy layers. The canopies consist of sam, dipterocapus macrocarpus, amari, bhelu, sopas, udal, nahar, hingori, bandordima, bhomora, dhuna, bonbogri, ful gomari, morhal, sassi, selling, otenga, bojal bamboo, dolu bamboo, jengu, houka bet, jati bet, tora, sorat and kaupat. Other than Gibbon and Slow Loris, the sanctuary is home to Northern pig tailed macaque, stump tailed macaque, Eastern Assamese macaque, capped langur, rhesus macaque, etc. Other than the primate, animals like elephants, leopards, barking deer, sambar, wild pig, wild boar, jungle cats, squirrel and civet are also found in the sanctuary. 219 species of birds such as owl, India pied hornbill, eagle, hill myna, osprey, white winged wood duck and kalij pheasant are found in the area. There are also several types of reptiles such as common monitor lizard, Indian python, tortoise, Indian cobra, India tent turtle are frequently seen in the sanctuary.

Pani-Dihing Bird Sanctuary: It is a 33.93-square-kilometre (13.10 sq mi) bird sanctuary located in Sivasagar district, Assam. It is 22 km away from Sivasagar town. This protected area was established as a Bird Sanctuary in August 1996 by the Government of Assam. Pani-Dihing and adjacent areas is on the global map being an Important Bird & Biodiversity Area. As many as 267 species of birds including 70 species of migratory birds have been identified and recorded at Pani Dihing.

Molai Forest: Molai forest is named after Jadav Payeng, Indian environmental activist and forestry worker. After an initial 200-hectare planting by the social forestry division of Golaghat district was abandoned in 1983, the forest was single-handedly attended by Payeng for 30 years and now encompasses an area of about 1,360 acres / 550 hectares. Payeng planted and tended trees on a sandbar of Majuli island in the Brahmaputra River, eventually becoming a forest reserve. Molai forest now houses Bengal tigers, Indian rhinoceros, over 100 deer and rabbits besides monkeys and several varieties of birds, including a large number of vultures. There are several thousand trees, including valcol, arjun (Terminalia arjuna), Pride of India (Lagerstroemia speciosa), royal poinciana (Delonix regia), silk trees (Albizia procera), moj (Archidendron bigeminum) and cotton trees (Bombax ceiba). Bamboo covers an area of over 300 hectares. A herd of around 100 elephants regularly visits the forest every year and generally stays for around six months. They have given birth to 10 calves in the forest. This plantation forest is situated at a distance of nearly 30 Km form the project road and the project road has no impact on this plantation forest.

[3] http://wiienvis.nic.in/database/iba_8463.aspx
https://www.academia.edu/8086314/Ichthyofaunal_Diversity_in_the_Wetlands_Beels_of_Charaideo_Subdivision_Sivasagar_District_Assam_and_Their_Health_and_Management

Figure 4-36: Project road distance from Molai Forest

Fauna in Study Area:

On the basis field observations, there is no major wildlife as there are no forest areas in and around the project road alignment. Primary field surveys are conducted through random observation in the study area and also information collected from elderly persons of the area, forest officials. This area hosts jackal, foxes and other animals. There are no endangered animals in project influence area.[4]

Table 35: Fauna in Study Area

Order	*Common Name*	*Scientific Name*	*Local Name*	*IUCN Status*	*WPA Status*
Primates	Monkey	*Macaca mulatta*	Molu Bandor	LC	II
Artiodactyla	Wild Boar	*Sus scrofa*	Gahori	LC	III
Carnivora	Jackal	*Canis aureus*	Siyal	LC	II
Carnivora	Common Palm Civet	*Paradoxurus hermaphroditus*	Joha Mol	LC	II
Carnivora	Small Indian Mongoose	*Herpestes auropunctatus*	Neul	LC	IV
Chiroptera	Flying Fox	*Pteropus giganteus*	Baduli	LC	V
Eulipotyphla	The Asian House Shrew	*Suncus murinus*	Sika	LC	V
Rodentia	Hoary-Bellied Squirrel	*Callosciurus pygerythrus*	Kerketua	LC	V
Rodentia	The House Mouse	*Mus musculus*	Nigoni	LC	V
Rodentia	Bandicoot Rat	*Bandicota bengalensis*	Musua	LC	IV
LC= Least Concern, EN= Endangered					

1. [4] https://forest.assam.gov.in/
2. https://www.researchgate.net/publication/333774167

Herpetofauna of study area:

Herpetofauna includes Reptiles and amphibian animals of a particular area. Major reptiles include snakes, lizards etc. Snakes are common in the project site as the area being a predominantly agriculture zone. Few snakes are also venomous such as Banded Krait, Monocled Cobra, Spectacled Cobra and Red Necked Keelback.[5]

Table 36: Herpetofauna of study area

Snakes and lizards					
Order	***Common Name***	***Scientific Name***	***Local Name***	***IUCN Status***	***WPA Status***
Agamidae	Garden Lizard	*Calotes versicolor*	Tez-Pia	LC	IV
Gekkonidae	Tokay Gecko	*Gekko gecko*	Keko Sap	LC	IV
Gekkonidae	Indian House Gecko	*Hemidactylus sp*	Jethi	LC	IV
Scincidae	Common Skink	*Eutropis carinata*	Nai Pia	LC	IV
Varanidae	Common Indian Monitor	*Varanus bengalensis*	Gui Haap	LC	I
Pythonidae	Burmese Python	*Python bivittatus*	Ajogor	VU	I
Typhlopidae	Diard's Blind Snake	*Typhlops diardii*	Kechu Haap	LC	IV
Colubridae	Common Wolf Snake	*Lycodon aulicus*	Maroli	LC	IV
Colubridae	Copper-Headed Trinket Snake	*Coelognathus radiatus*	Dhundhuli Feti	LC	IV
Colubridae	Indian Rat Snake	*Ptyas mucosa*	Musuagum	LC	IV
Colubridae	Checkered Keelback	*Fowlea piscator*	Dhora	LC	IV
Elapidae	Banded Krait	*Bungarus fasciatus*	Hokso		IV
Colubridae	Spectacled Cobra	*Naja naja*	Feti	LC	II
Colubridae	Monocled Cobra	*Naja kaouthia*	Feti	LC	II
Colubridae	Red Necked Keelback Snake	*Rhabdophis subminiatus*	Batchupa	LC	IV
Colubridae	Vine Snake	Ahaetulla Sp	Lata Sap	LC	IV
Colubridae	Ornate Flying Snake	Chrysopelea ornata	Sundori	LC	IV
Colubridae	Painted Bronzeback Tree Snake	Dedrelaphis pictus	Achari	LC	IV
Amphibians					
Bufonidae	Common Asian Toad	*Duttaphrynus melanostictus*		LC	~
Rhacophoridae	Terai Tree Frog	*Polypedates teraiensis*		LC	~
Dicroglossidae	Indian Bull Frog	*Hoplobatrachus tigerinus*	Bamun Beng	LC	IV

[5] https://www.researchgate.net/publication/307906362
http://www.wiienvis.nic.in/Database/Key_Biodiversity_Areas_8647.aspx

Dicroglossidae	Indian Skipping Frog	*Euphylctis cyanophlyctis*	Pani Beng	LC	IV
Microhylidae	Ornate Narrow Mouth Frog	*Microhyla ornata*	Paruwa Beng	LC	~
Microhylidae	Ballon Frog	*Uperodon globulosus*	Belun Beng	LC	~
LC= Least Concern, EN= Endangered, NT= Near Threatened, VU= Vulnerable					

Common Fishes of study area:

Water bodies of Jorhat district is rich in ichthyofaunal diversity. Dikhow is a major tributary of Brahmaputra River and host a good number of fish species. Fish cultivation is a common practice in the area. Carps constitute the largest group of ichthyo fauna in the study area. Chital (Notopterus chitala), Borali (Wallago Sp.) along with some other large sized catfishes are some highly valuable fish species found abundantly in this zone of Assam.[6]

Table 37: Common Fishes of study area

Order	Scientific Name	Local Name	IUCN Status
Clupeiformes	*Gudusia chapra*	Karati	LC
Cypriniformes	*Lepidocephalichthys guntea*	Getho	LC
Cypriniformes	*Amblypharyngodon mola*	Moa	LC
Cypriniformes	*Barbonymus gonionotus*	Puthi	LC
Cypriniformes	*Catla catla*	Bhakua	LC
Cypriniformes	*Cirrhinus mrigala*	Mirika	LC
Cypriniformes	*Ctenophryngodon idella*	Grass carp	LC
Cypriniformes	*Cyprinus carpio*	Common carp	VU
Cypriniformes	*Labeo calbasu*	Mali	LC
Cypriniformes	*Labeo gonius*	Kurhi	LC
Cypriniformes	*Labeo rohita*	Rou	LC
Cypriniformes	*Puntius chola*	puthi	LC
Cypriniformes	*Systomus sarana*	Cheniputhi	LC
Cypriniformes	*Acanthocobitis botia*	Botia	LC
Osteoglossiformes	*Chitala chitala*	Chital	NT
Osteoglossiformes	*Notopterus notopterus*	Kanduli	LC
Perciformes	*Chanda nama*	Chanda	LC
Perciformes	*Anabas testudineus*	Kaowi	DD
Perciformes	*Channa gachua*	Seng	DD
Perciformes	*Channa marulius*	Sal	LC
Perciformes	*Channa orientalis*	Seng	NE
Perciformes	*Channa punctata*	Goroi	LC
Perciformes	*Channa striata*	Shol	LC

3. [6] http://researchjournal.co.in/upload/assignments/7_145-150.pdf

Order	Scientific Name	Local Name	IUCN Status
Perciformes	*Nandus nandus*	Gedgedi	LC
Siluriformes	*Mystus cavasius*	Singora	LC
Siluriformes	*Mystus tengara*	Tengera	LC
Siluriformes	*Mystus bleekari*	Singora	LC
Siluriformes	*Sperata aor*	Ari	LC
Siluriformes	*Sperata seenghala*	Ari	LC
Siluriformes	*Chaca chaca*	Kurkuria	LC
Siluriformes	*Clarias batrachus*	Magur	LC
Siluriformes	*Heteropneustes fossilis*	Singi	LC
Siluriformes	*Ompok pabda*	Pavo	NT
Siluriformes	*Wallago attu*	Barali	NT
Siluriformes	*Pangasius pangasius*	Koch	LC
Synbranchiformes	*Mastacembelus armatus*	Bami	LC
Synbranchiformes	*Macrognathus aral*	Tura	LC
Synbranchiformes	*Macrognathus puncalus*	Tura	LC
Synbranchiformes	*Monopterus cuchia*	Cuchia	LC
LC= Least Concern, NT= Near Threatened, VU= Vulnerable, DD= Dada Deficient, NE= Not Evaluated			

Common Birds of study area:

As the proposed road mostly running along human habitation, tea gardens and agricultural field, avian diversity is low. The project site is also not at close vicinity of any Important Bird area. But due to presence of water-logged low-lying areas, there are reports of some winter migratory birds. The common birds of the area are-

Table 38: Common Birds of study area

Order	*Common Name*	*Scientific name*	*Type*	*IUCN Status*	*WPA Status*
Anseriformes	Lesser Whistling Duck	*Dendrocygna javanica*	R	LC	IV
Columbiformes	Rock Dove	*Columba livia*	R	LC	IV
Columbiformes	Oriental Turtle Dove	*Streptopelia orientalis*	R	LC	IV
Columbiformes	Yellow-Footed Green-Pigeon	*Treron phoenicoptera*	R	LC	IV
Columbiformes	Spotted Dove	*Streptopelia chinensis*	R	LC	IV
Cuculiformes	Indian Cuckoo	*Cuculus micropterus*	R	LC	IV
Cuculiformes	Asian Koel	*Eudynamys scolopaceus*	R	LC	IV
Gruiformes	White-Breasted Waterhen	*Amaurornis phoenicurus*	R	LC	IV
Gruiformes	Purple Swamp Hen	*Porphyrio porphyrio*	R	LC	IV
Pelecaniformes	Lesser Adjutant	*Leptoptilos javanicus*	R	VU	IV
Pelecaniformes	Asian Openbill	*Anastomus oscitans*	R	LC	IV

Order	*Common Name*	*Scientific name*	*Type*	*IUCN Status*	*WPA Status*
Pelecaniformes	Indian Pond Heron	*Ardeola grayii*	R	LC	IV
Pelecaniformes	Cattle Egret	*Bubulcus ibis*	R	LC	IV
Pelecaniformes	Little Egret	*Egretta garzetta*	R	LC	IV
Pelecaniformes	Little Cormorant	*Microcarbo niger*	R	LC	IV
Charadriiformes	Red-Wattled Lapwing	*Vanellus indicus*	R	LC	IV
Charadriiformes	Bronze-Winged Jacana	*Metopidius indicu*	R	LC	IV
Strigiformes	Barn Owl	*Tyto alba*	R	LC	IV
Strigiformes	Asian Barred Owlet	*Glaucidium cuculoides*	R	LC	IV
Strigiformes	Jungle Owlet	*Glaucidium radiatum*	R	LC	IV
Strigiformes	Spotted Owlet	*Athene brama*	R	LC	IV
Bucerotiformes	Oriental Pied-Hornbill	*Anthracoceros albirostris*	R	LC	IV
Bucerotiformes	Common Hoopoe	*Upupa epops*	R	LC	IV
Coraciiformes	Common Kingfisher	*Alcedo atthis*	R	LC	IV
Coraciiformes	White-Throated Kingfisher	*Halcyon smyrnensis*	R	LC	IV
Coraciiformes	Pied Kingfisher	*Ceryle rudis*	R	LC	IV
Coraciiformes	Green Bee-Eater	*Merops orientalis*	R	LC	IV
Coraciiformes	Chestnut-Headed Bee-Eater	*Merops leschenaulti*	R	LC	IV
Coraciiformes	Indian Roller	*Coracias benghalensis*	R	LC	IV
Piciformes	Blue-Throated Barbet	*Psilopogon asiaticus*	R	LC	IV
Piciformes	Common Flame-Backed Woodpecker	*Dinopium javanense*	R	LC	IV
Piciformes	Greater Flameback	*Chrysocolaptes guttacristatus*	R	LC	IV
Psittaciformes	Rose-Ringed Parakeet	*Psittacula krameri*	R	LC	IV
Psittaciformes	Red-Breasted Parakeet	*Psittacula alexandri*	R	NT	IV
Passeriformes	Black-Hooded Oriole	*Oriolus xanthornus*	R	LC	IV
Passeriformes	Common Iora	*Aegithina tiphia*	R	LC	IV
Passeriformes	Black Drongo	*Dicrurus macrocercus*	R	LC	IV
Passeriformes	Long-Tailed Shrike	*Lanius schach*	R	LC	IV
Passeriformes	Rufous Treepie	*Dendrocitta vagabunda*	R	LC	IV
Passeriformes	House Crow	*Corvus splendens*	R	LC	IV
Passeriformes	Common Tailorbird	*Orthotomus sutorius*	R	LC	IV
Passeriformes	Paddyfield Warbler	*Acrocephalus agricola*	R	LC	IV
Passeriformes	Red-vented Bulbul	*Pycnonotus cafer*	R	LC	IV
Passeriformes	Red-whiskered Bulbul	*Pycnonotus jocosus*	R	LC	IV
Passeriformes	Jungle Babbler	*Turdoides striata*	R	LC	IV

Order	*Common Name*	*Scientific name*	*Type*	*IUCN Status*	*WPA Status*
Passeriformes	Indian White-eye	*Zosterops palpebrosus*	R	LC	IV
Passeriformes	Asian Pied Starling	*Gracupica contra*	R	LC	IV
Passeriformes	Common Myna	*Acridotheres tristis*	R	LC	IV
Passeriformes	House Sparrow	*Passer domesticus*	R	LC	IV
Passeriformes	Oriental Magpie-Robin	*Copsychus saularis*	R	LC	IV
Passeriformes	Baya Weaver	*Ploceus philippinus*	R	LC	IV
Passeriformes	Citrine Wagtail	Motacilla citreola	R	LC	IV
Passeriformes	White Wagtail	Motacilla alba	R	LC	IV

4.4.7 Elephant crossing location

Based on the studies available and consultation with the Forest Department officials, it can be concluded that there is no elephant crossing along the project road. The project road does not form the part of any of the 23 identified elephant corridors identified in North East India by Wildlife Trust of India.

Table 39: Availability of ecologically sensitive area

Ecologically/Culturally significant feature	**Availability within project area**
Wildlife Sanctuary	No
National Park	No
Ramsar Site	No
Biodiversity Heritage Site	No
Biosphere Reserve	No
Important Bird Area	No (The nearest is Pani Dehing bird Sancturay, which is outside of direct influence zone of the ROW, No impact)
Key Biodiversity Area	No (The nearest is Hollongopar Gibbon Sanctuary, which is outside of direct influence zone of the ROW, No impact)
Wildlife Corridor	No
Elephant Corridor	No
Tiger Reserve	No
Reserve Forest	No
Elephant Reserve	No
Community Forests	No
Sacred Groove	No
Archeological Sites	Yes (Moidam Of Swargadeo Hso-Hung at Samaguri)
Unprotected/NonClassified Forest	Yes

Ecologically/Culturally significant feature	Availability within project area
Major River	No
Fish Sanctuary	No
Surface water bodies	Yes. Small ponds mostly used for fishery.
Plantation	Private plantation Sachi/ Agar (Aquilaria malaccensis) Between Amguri and Nazira Town beside the proposed road.

4.4.8 Nesting Trees

As per the detailed site study conducted and tree inventory conducted with the forest department officials, no nesting trees have been found within the proposed RoW of the project.

4.4.9 Vegetation

During primary survey of the proposed road, tree species were reported beyond the earthern shoulder of the existing road. The species of trees reported during primary survey and based on the tree inventory done during tree numeration. The details of tree inventory are attached. Vegetation around 10 km and 15 km buffer of the study area mostly comprises of large/ medium/ small trees bushy shrubs and annuals perennial or biennials herbs. No scheduled species as per Wildlife Protection Act ,1972 had been described from the project site nor any species listed under Endangered or Vulnerable as per IUCN status had been described from the project site.

Family	Scientific Name	Local Name	Type	IUCN Status
Anacardiaceae	*Mangifera indica*	Aam	T	DD
Anacardiaceae	*Spondias pinnata*	Amora	T	NA
Arecaceae	*Calamus latifolius*	Bet	S	LC
Aracea	*Alocasia sp*	Kochu	H	NA
Athyriaceae	*Diplezium esculentum*	Dhekia sak	H	NA
Bambacaceae	*Bombax ceiba*	Himulu/Shimul	T	LC
Basellaceae	*Basella sp*	Puroi/ Pui xak	C	NA
Brassicaceae	*Brassica nigra*	Soriyoh Sak	H	LC
Caesalpiniaceae	*Bauhinia acuminata*	Kanchan	T	LC
Caesalpiniaceae	*Cassia fistula*	Hunaru/Amaltas	T	LC
Caricaceae	*Carica papaya*	Amita	T	LC
Combretaceae	*Terminalia chebula*	Silikha	T	NA
Combretaceae	*Terminalia bellerica*	Bhomora	T	NA
Commelinales	*Eichhornia crassipes*	Meteka	AV	NA
Dilleniaceae	*Dillenia indica*	Ou tenga	T	LC
Dipterocarpaceae	*Shorea robusta*	Sal	T	LC
Euphorbiaceae	*Baccaurea ramiflora*	Leteku	T	LC
Elaeocarpaceae	*Elaeocarpus floribundus*	Jolphai	T	NA
Euphorbiaceae	*Phyllanthus emblica*	Amlokhi	T	NA
Euphorbiaceae	*Trewia nudiflora*	Bhelo	T	LC
Fabaceae	*Tamarindus indica*	Teteli	T	LC

Family	Scientific Name	Local Name	Type	IUCN Status
Gentianaceae	*Swertia chirayita*	Chirota tita	H	NA
Lauraceae	*Cinnamomum tamala*	Tejpat	T	LC
Lythraceae	*Lagerstroemia speciosa*	Ajar,Jarul	T	NA
Meliaceae	*Azadiracta indica*	Maha-neem	T	LC
Meliaceae	*Toona ciliata*	Poma	T	LC
Moraceae	*Artocarpus heterophyllus*	Kothal	T	NA
Moraceae	*Ficus hispida*	Dumur,Dumuru	T	LC
Moraceae	*Ficus benghalensis*	Bor, Bot	T	NA
Moraceae	*Ficus religiosa*	Ahot, Asothyo	T	NA
Moringaceae	*Moringa oleifera*	Sajina	T	NA
Musaceae	*Musa sp*	kol	H	NA
Myrtaceae	*Syzygium cumini*	Kola Jamu, Jam	T	LC
Myrtaceae	*Psidum guajava*	Madhuri/Peyara	T	LC
Nelumbonaceae	*Nelumbo nucifera*	Podom/Podmo	AV	DD
Nymphaeaceae	*Nymphaea rubra*	Seluk	AV	LC
Oxalidaceae	*Averrhoa carambola*	Kordoi	T	NA
Oleaceae	*Nyctanthes arbor-tristis*	Sewali phul	T	NA
Poaceae	*Bambusa balcooa*	Bhaluka Bah	S	LC
Poaceae	*Bambusa tulda*	Jati Bah	S	LC
Piperaceae	*Piper betle*	Pan	C	NA
Rhamnaceae	*Zizyphus mauritiana*	Bogori	T	NA
Rutaceae	*Aegle marmelos*	Bel	T	NA
Rubiaceae	*Anthocephalus chinensis*	Kadam	H	NA
Rutaceae	*Citrus grandi*	Robab tenga	T	NA
Rutaceae	*Murraya koenigii*	Narasingha	S	NA
Salicaceae	*Flacourtia jangomas*	Ponial	T	NA
Solanaceae	*Capsicum sp*	Bhot Jolokia	S	NA
Trapaceae	*Trapa natans*	Singori/Pani phal	AV	LC
Verbenaceae	*Tectona grandis*	Segun	T	NA
Zingiberaceae	*Curcuma longa*	Halodhi	H	DD
T= Tree, S= Shrub, AV= Aquatic Vegetation, H= Herb, C= Climbers LC= Least Concern, DD= Data Deficient, NA= Not Listed				

4.4.10 Rice Cultivation

Assam has always been a rice growing state. Some of the special classes of rice in the state include joha or aromatic rice, bora or waxy rice and chokuwa or soft rice. Many of the rice in the state can also be divided into Autumn Rice, Winter Rice, Summer Rice and Jhum cultivation. Black rice has been a latest addition to the rice cultivation in the state. Black rice is a common name for a range of rice belonging to Oryza Sattiva L. species. These varieties grow well in tropical zones like Japan, Korea, Myanmar, China and North-east India. These black rice variety are beneficial not only for the health consideration but also due to the fact that these varieties are more resilient to the effect of climate change. These varieties can grow well even at a higher temperature and flood conditions. A detailed

study was conducted to identify black rice cultivation in the project region no such rice cultivation is present within 500 m radius of the project road.

4.4.11 Heritage Trees

There are a range of criteria that designate a tree as a heritage tree. These attributes—both material and non-material—makes the tree stand out. The material attributes could be age or size of the tree. It could also be the result of the form or shape of the tree. Further, it could be that the tree is a rare species or a tree at risk of being lost. The non-material criteria relate to cultural and aesthetic aspects. It could be that the tree has a historical or cultural association either with a person, an event or a place. It could also be a tree associated with myth or folklore.

In order to identify Heritage trees in the study area a detailed field study was conducted. As per the study conducted 6 trees of cultural significance have been identified along the road. Details of the religious tree are given below.

Figure 4-37: Marked religious trees in Google Map

Religious Tree	Chainage	Distance
Religious Trees 1	31+350	3.87
Religious Trees 2	17+350	6.85
Religious Trees 3	17+300	6.09
Religious Trees 4	13+000	2.29
Religious Trees 5	12+100	2.14
Religious Trees 6	9+700	0.87

Figure 4-38: Religious tree along the project road

4.4.12 Tea Estates

Tea Plantations are an important constituent of biodiversity of Assam and play a major role in conservation of biodiversity of the region. Several tea germplasms (a total of 1074) have been identified in the state of Assam. Some of the species identified are C. kissi, C. caduca, C. drupifera etc. Since cultivation of tea depends closely on the water availability, water quality, humidity, pests and several other biological factors. It is important to conserve the biodiversity of the region to maintain the micro-climate around the tea estates. Also, several wild varieties of tea

are also found naturally in the forest of the state. Such wild varieties of plant need to be conserved to ensure that the genetic diversity of the tea plants is not lost. Since, tea plantation is highly critical to changes in temperature, pests and other factors, gene pool conservation is important to ensure further development and continued productivity of the tea estates in the state. Hence, the developmental activities in this region should not affect the tea plants growing in wild or in the abandoned tea estates. Various tea estates identified along the project road are given in **Table 40**.

Table 40: Tea Estates Along the project road

Sr. No.	Name of the Estate
1	Tirual Tea Estate
2	Seleng Tea Garden

4.4.13 Sericulture

Muga silk is the product of the silkworm Antheraea assamensis which are endemic to Assam. The locals along the project road are involved in cultivation of this silk worm from larvae to when they are 20-25 days old. These silk worms are sold at a rate of Rs 600-700 per kilo. The larvae of these silk worms feed on som leaves (Machilus gamblei) and sualu (Litsea monopetala) leaves. The silk produced from these silk worms are natural golden colored and glossy in texture. Muga and Pat silk are famous from these silk worms. Since, cultivation of these silk worms is important to the economy of the locals. Som and suala trees are necessary for this region.

A detailed study was conducted to identify Sericulture activities in the project region. No Sericulture activities were identified in the project region.

4.4.14 Aquatic Ecology and Fisheries

In Jorhat and Sivasagar district, fishes of various kinds are found in the ponds, beels and rivers. The bigger fishes are Rau, Barali, Chital, Bahu, Kalijara, Ari, Gagal, Bhakuwa, etc. As per the field survey conducted along the project road the fish species found in the Bonale, Bahu, Kohe, Bha, Chital, Puthe, Shiyana, Chandu, Shigi, Maghun, Bami, Karoy etc. A detailed list of fish species found in the district is also attached separately.

The Dikhow river which important south bank tributary of the mighty river Brahmaputra having a catchment area of 4372 sq.km. crosses the project road between Ch. 44+200 and Ch 44+350 near Balighat Tiniyali. There are some seasonal streams crosses the alignment where water is available during rainy season only and dry the rest of the year.

4.4.15 Rare or Endangered Species

The local forest department was consulted to know the presence of any endangered and protected species of flora and fauna within the formation width. It is confirmed by the forest department officials that there are no endangered species that are likely to be affected by the current project.

Joint inspection is being carried out with field officials from the local forest department to prepare the detailed inventory and marking of the trees to be cut. During the joint inspection, if any endangered and or protected species of flora are found within the

formation width of the subproject road, necessary mitigation measures will be adapted to protect such species. Also based on the joint inspection, a suitable compensatory afforestation plan will be prepared to mitigate the loss of vegetative cover due to the subproject activities.

4.4.16 Fauna and Wildlife

Based on the primary survey within the Corridor of impact (COI) and secondary information obtained for buffer zone by public interaction, interaction with forest officials during site inspection, etc., it can be concluded that no wildlife habitat for mammals is reported within the COI excepts. List of wildlife such as mammals, reptiles ect had been attached separately. Hoollongapar Gibbon Sanctuary is situated amidst tea gardens and human settlements. The Sanctuary is named after the only Ape (Hoolock Gibbon) found in India. A small Sanctuary of 20.98 sq. kms. in Jorhat district with semi-evergreen forests and evergreen patches. The sanctuary is about 6 km from the project road.

Panidihing Bird Sanctuary, is A rich wetland eco-system of 33.93 sq. kms. on the southern bank of river Brahmaputra in the Sibsagar district. The sanctuary is A paradise of migratory and resident birds, so far 165 species of Birds have been identified and recorded. A place for quite high concentration of Geese and other Migratory birds. The sanctuary is situated at a distance of more than 15km from the project site.

4.4.17 Avian Fauna

The region near the project location which includes the Hoollongapar Gibbon Sanctuary and Panidihing Bird Sanctuary and bothThe region has been identified as an Important Bird Area as per the IBA programme of Birdlife International. Both the IBA's are situated at considerable distance i.e respectively 6km and 20 km form the project road. There is no other beels or wetlands known fro spotting birds along the project road. A list of common birds seen in Jorhat and Sivasagar district had been provide separately.

4.4.18 Wetlands

Total wetland area in the Jorhat district is 45979 ha that includes 363 small wetlands (<2.25 ha). River/stream occupies 89.1% of wetlands. The other major wetland types are Lake/pond (5.01%), Waterlogged-natural (2.4%), and Ox-bow lakes (1.51%). Aquatic vegetation is mainly observed in Lake/pond, waterlogged wetland types. The area under aquatic vegetation is slightly more during post monsoon (3357 ha) compared to pre-monsoon (2586 ha).

Total wetland area in the Sivasagar district is 12582 ha that includes 530 small wetlands (<2.25 ha). River/stream occupies 68.71% of wetlands. The other major wetland types are Lake/pond (8.23%), Waterlogged-natural (10.5%), and Ox-bow lakes (4.17%). The area under aquatic vegetation is more or less similar in both post monsoon (2403 ha) and pre-monsoon (2458ha).

4.5 Socio-economic Environment

The primary purpose of the socio-economic analysis is to provide an overview of the State's socioeconomic status and the relative status of the Project Influence Area (PIA) within the

State. The proposed project passes through two districts of Assam i.e., Jorhat and Sivasagar. The demographic profile and socioeconomic status of the people in the project affected district and state as per census 2011 are as follows. The demographic details of the project area are listed in **Table 41** and **Table 42.**

- **Jorhat**

As per Census 2011, Jorhat has a total population of 1,092,256; out of which 556,805 are males and 535,451 are females. The density of population in the district is 383 persons per sq.km. The decadal population growth rate between 2001-2011 is 9.31 %. The sex ratio of Jorhat is 962 females per 1000 males. In the rural and urban areas of the district, the sex ratio is 968 per 1000 males and 937 per 1000 males, respectively. 20.19 % of the population lives in urban areas and 79.81 % comprises of rural population. Therefore, majority of the total population resides in rural areas. The overall literacy rate in Jorhat is 82.15 %. 87.63 % of the males and 76.45 % of the females are literate here. In terms of religious composition of the district, 92.31 % are Hindus, 5.01 % are Muslims, 1.93 % are Christians, 0.14 % adhere to Sikhism and 0.22 % are Buddhists.

Table 41: Demographic details of Jorhat district

	Assam	Jorhat
Total Population	31,205,576	1,092,256
Rural Population	26,807,034	8,71,722
Urban Population	4,398,542	220,534
Male	15,939,443	556,805
Female	15,266,133	535,451
Gender Ratio	958	962
SC Population	2,231,321	88,665
% SC	7.15	8.11
ST Population	3,884,371	139,971
% ST	12.45	12.8
Density of Population (per sq. km.)	398	383

- **Sibsagar**

As per Census 2011, the district of Sibsagar has a total population of 1,151,050; out of which 589,216 are males and 561,834 are females. The density of population in the district is 431 persons per sq.km. The decadal population growth rate between 2001-2011 is 9.44 %. The sex ratio of Sibsagar is 954 females per 1000 males. In the rural and urban areas of the district, the sex ratio is 959 per 1000 males and 901 per 1000 males, respectively.

9.56 % of the population lives in urban areas and 90.44 % comprises of rural population. Therefore, majority of the total population resides in rural areas. The overall literacy rate in Sibsagar is 80.41 %. 85.84 % of the males and 74.71 % of the females are literate here. In terms of religious composition of the district, 87.51 % are Hindus, 8.30% are Muslims, 2.88% are Christians, 0.08% adhere to Sikhism and 0.34% are Buddhists.

Table 42: Demographic details of Sivasagar district

	Assam	Sivasagar
Total Population	31,205,576	1,151,050
Rural Population	26,807,034	1,040,954
Urban Population	4,398,542	110,096
Male	15,939,443	589,216
Female	15,266,133	561,834
Gender Ratio	958	954
SC Population	2,231,321	42,347
% SC	7.15	3.68
ST Population	3,884,371	49,039
% ST	12.45	4.26
Density of Population (per sq. km.)	398	431

4.5.1 Road Network

Roads are considered the most important component of infrastructure, to which national economy either directly or indirectly connected. Constructing high-quality roads of international standards has come to reality in the soil of Assam because of the potential will of the Government of Assam. The state is connected to other neighboring states like Nagaland, Meghalaya, Mizoram, and Tripura through all-weather high standard roads. The approaching roads to the main roads have qualitatively improved. In recent years the internal roads connecting villages, hamlets have become R.C.C roads. The roads connecting to Gram Panchayats Road and Taluka (Block) Road have also been constructed through R.C.C. In recent days attempts have been made for constructing roads through Public-Private Partnership (PPP). The road map of the Jorhat and Sivasagar district has been shown in the following **Figure 4-39** and **Figure 4-40.**

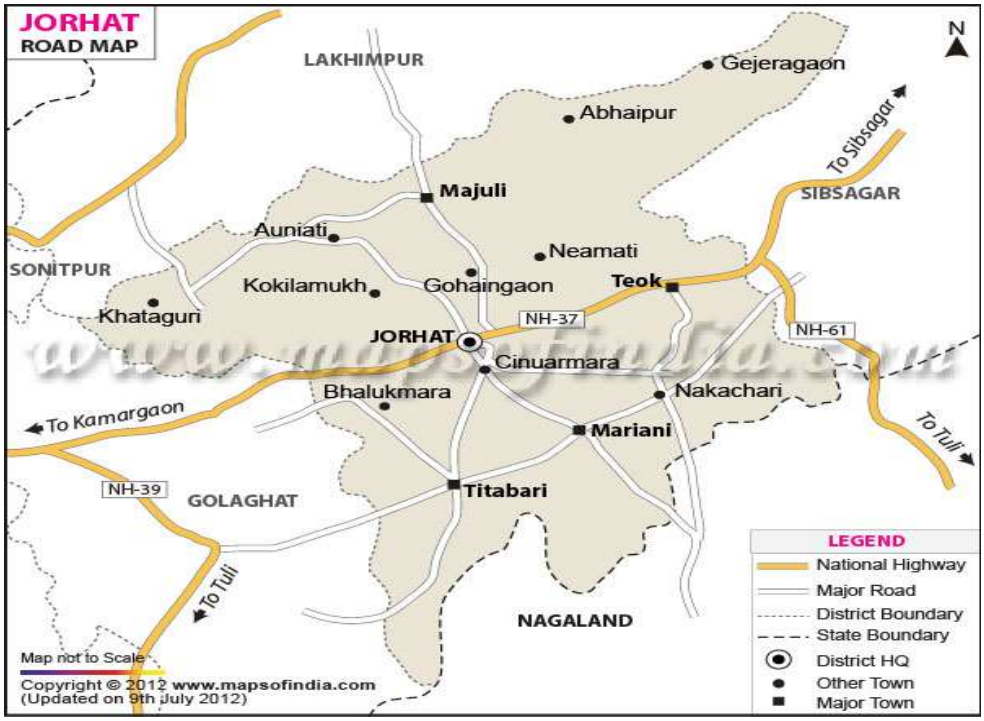


Figure 4-39: Road Map of Jorhat district

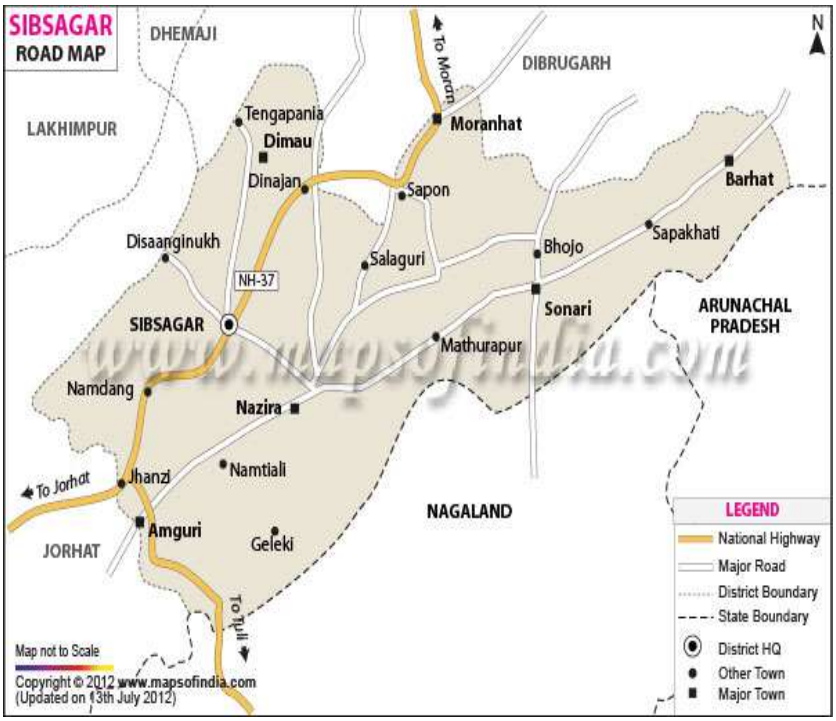


Figure 4-40: Road Map of Sivasgar district

4.5.2 Settlements along the Sub-project

The list of villages and towns on the sides of the project highway, identified during the Reconnaissance Survey and Road Inventory of project road is presented in **Table 43.**

Table 43: Important Settlements Abutting Project Highway

Sl.	Chainage (km)		Length (km)	Habitation Name
	From	To		
1	0.000	0.700	0.700	Debarapar
2	3.800	4.150	0.350	Abhoipuria Gaon
3	6.850	7.900	1.050	Hemlai Samtal
4	9.750	10.000	0.250	Gabhru Tiniali
5	12.150	12.400	0.250	Koliapani
6	13.300	13.850	0.550	Rahadhal
7	15.675	17.000	1.325	Podumani
8	17.000	20.800	3.800	Amguri
9	21.800	23.350	1.550	Lalimchiga
10	24.100	26.050	1.950	Samguri
11	26.400	28.750	2.350	Belimukhiya Tiniali
12	28.750	29.650	0.900	Dikshu Mout Village
13	30.000	34.000	4.000	Ksanakar
14	34.200	35.100	0.900	Namti Charali
15	36.150	39.400	3.250	Mezenga
16	39.700	41.600	1.900	Bortal
17	41.600	44.931	3.331	Nazira

Source: Detailed Project Report

4.5.3 Existing Economy & Employment Base

- **Jorhat**

Tea industry is the major industry in this district. This growing industry plays an important role in the development of Jorhat's economy. It employs a large workforce, not just from Assam, but attracts migrant workers from neighboring states as well. Several ancillary industries, such as plywood industry, are located in the vicinity of Mariani town about 20 kms from Jorhat town.

Jorhat's Cinamora Industrial Estate has a total area of 34069.77 sq.mt. A total of 29 sheds have been constructed and 19 units are functioning. Titabar Integrated Infrastructure Development (IID) Project has a total area of 160536 sq.mt. and only 1unit is functioning.

- **Sibsagar**

Weaving is the most important cottage industry of Assam from the early days. The Government of Assam has opened several centers in the district for skill development and to assist and promote the existing weaving units. It also helps the weavers by ways of giving training, aid, etc. for improvement of products, as well as their livelihood.

Another major cottage industry in Sibsagar is bamboo and cane work. The bamboo and cane products are essential and common items founds in almost every Assamese household. Fishing equipment made of bamboo such as Jakai, Khalai, Chepa etc. are still used by the people of the district.

The small-scale sawmills are playing an important role in the exploitation of the forest wealth of the district. The products of the sawmills mainly go to meet the demands of local construction work such as building houses, bridges, furniture's, etc.

Sibsagar (Darikapar) Industrial Estate has a total area of 40140 sq.mt. A total of 28 sheds have been constructed and 28 units are functioning. Demow Integrated Infrastructure Development (IID) Project has a total area of 123078 sq.mt. 4 sheds have been constructed and 3 units are functioning.

4.5.4 Cultural/Religious resources

- **Jorhat**

The cultural environment which prevails in Jorhat is the result of unitiring effort of people to preserve its culture. Jorhat has been able to produce many creative writers, historians, journalists etc. The only Assamese to win highest award of Literature in India also happens to be in Jorhat. Apart from it, Jorhat is the home of internationally reputed ideologist and 3educationists like Krishna Kanta Handique, former Vice Chancellor of Guwahati University.

- **Sibsagar**

The city of Sivasagar is named after the famous Sivasagar tank, locally known as Borpukhuri. The city embraces multiple ethnic groups such as the Mishing, Naga, Manipuri, Garo and Deori. The peaceful co-existence of these ethnic groups has led to the evolution of their diverse cultures in the arena of Sivasagar.The art, folklore, costumes, dance, cuisines of these groups are unique and collectively exhibit the rich tradition of Assam. The monuments on the other hand, stand as a symbol of the power and the might of the Ahoms. The locals of Sivasagar embraced Hindu rites, beliefs and customs. Sivasagar is home to two popular saints of the Vaishnavite tradition, Mahapurush Srimanta Sankardeva and Sri Sri Madhabdeva.There are various religious/ cultural and public utility structures e.g. educational and health care facilities along the project road. The details of the sestructures are presented below:

Table 44: List of religious structures along the project road

Sr. No.	Receptor	Side	Chainage (Km)	Approx distance from the edge of the road (m)	Physically impacted or not
1	Temple	Right	1+800	8.4	_
2	Temple	Right	3+900	5	Impacted (less than 50%)
3	Temple	Right	7+000	5	Impacted (less than 50%)
4	Temple	left	9+450	40	
5	Temple	Right	10+100	3	Impacted
6	Temple	Right	12+300	2	Impacted
7	Temple	Left	13+050	3	Impacted
8	Temple	Left	13+100	2	Impacted
9	Temple	Left	14+550	2	Impacted
10	Temple	Right	14+800	4	Impacted (less than 50%)
11	Temple	Left	16+100	4	Impacted (less than 50%)
12	Temple	Right	17+300	3	Impacted
13	Temple	Right	17+350	3	Impacted
14	Temple	Left	17+700	11	_
15	Temple	Right	17+850	6	Impacted (less than 50%)

Sr. No.	Receptor	Side	Chainage (Km)	Approx distance from the edge of the road (m)	Physically impacted or not
16	Temple	Left	19+500	13	_
17	Temple	Left	20+500	6	Impacted (less than 50%)
18	Temple	Right	22+800	30	_
19	Masque	Right	25+800	2	Impacted
20	Masque	Right	27+000	21	_
21	Temple	Right	27+650	16	_
22	Temple	Right	30+750	8	_
23	Temple	Right	31+400	3	Impacted
24	Masque	Left	32+100	6.8	Impacted (less than 50%)
25	Masque	Right	32+800	6	Impacted (less than 50%)
26	Eidgha	Left	34+000	5	Impacted (less than 50%)
27	Masque	Left	34+500	4	Impacted
28	Temple	Left	34+930	4	Impacted
29	Temple	Right	36+350	10	_
30	Temple	Left	36+550	2.5	Impacted
31	Temple	Left	38+600	8	Impacted (less than 50%)
32	Temple	Right	38+900	4	Impacted
33	Masque	Left	40+700	8	Impacted (less than 50%)
34	Temple	Right	43+100	4	Impacted
35	Temple	Left	43+100	5	Impacted (less than 50%)
36	Temple	Right	43+230	6	Impacted (less than 50%)
37	Temple	Left	43+400	4	Impacted
38	Masque	Right	43+600	3.5	Impacted
39	Temple	Right	43+700	7	_
40	Eidgha	Left	43+850	7.2	_
41	Temple	Left	44+500	3	Impacted

Source: Environmental Baseline Survey

4.5.5 Archaeological and Historical Monuments

A reconnaissance survey has been made for identification of Valued Environmental Components (VECs) on proposed project road. One archeological place has been observed at the 43+950 chainage. This archaeological structure is not listed in ASI list and the site is approximately 250m away from the ROW.

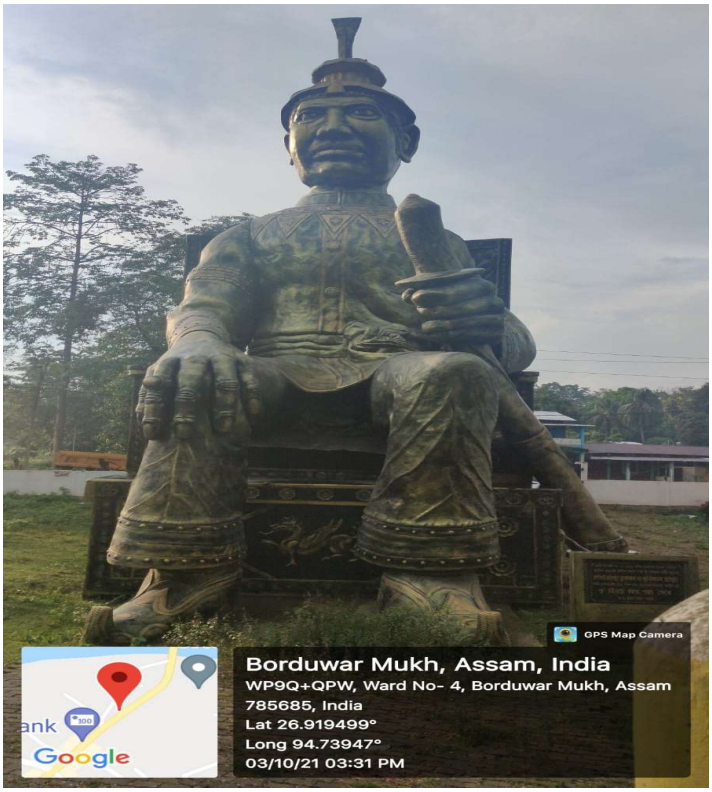


Figure 4-41: Archeological Structure at 43+950 chainage

4.5.6 Sensitive Receptors

During the environmental and social screening survey, several sensitive receptors such as religious places, schools, colleges, hospitals, etc. are located within the 500m of existing RoW. The list of these structures is presented in **Table 45** and **Table 46** below.

Table 45: Sensitive receptors along the project road

Sr. No.	Receptor	Side	Chainage (Km)	Approx distance from the edge of the road (m)	Physically impacted or not
1	PHC	Left	0+100	11	_
2	School	Left	0+200	6.5	Impacted (less than 50%)
3	School	Right	2+150	20.5	_
6	School	Left	2+550	30.1	_
7	School	Right	4+430	6	Impacted (less than 50%)
8	School	Right	4+700	22	_
9	School	Right	5+950	25	_
11	School	Left	6+500	6.30	Impacted (less than 50%)
12	School	Left	7+600	11	_
13	School	Left	8+250	60	_
14	School	Right	8+900	40	_
15	School	Left	9+450	30	_

Sr. No.	Receptor	Side	Chainage (Km)	Approx distance from the edge of the road (m)	Physically impacted or not
16	School	Left	9+700	80	_
17	School	Left	10+100	16.2	_
18	School	Left	13+250	25	_
19	School	Left	14+750	6	Impacted (less than 50%)
20	School	Left	16+050	13.3	_
21	School	Right	17+100	7.5	Impacted (less than 50%)
22	School	Left	17+530	7.5	Impacted (less than 50%)
23	School	Left	19+800	24	_
24	School	Left	20.500	6	Impacted (less than 50%)
25	School	Left	22+800	30	_
26	School	Right	22+800	30	_
27	School	Left	23+950	18.2	_
28	College	Left	24+100	14.75	_
29	School	Left	24+300	30	_
30	School	Left	24+450	6.6	Impacted (less than 50%)
31	School	Left	25+100	5.9	Impacted (less than 50%)
32	School	Left	25+500	6	Impacted (less than 50%)
33	School	Left	29+450	31	_
34	School	Left	30+450	17	_
35	School	Right	31+100	18.5	_
36	School	Left	32+000	32.2	_
36	School	Left	33+700	83	_
37	Madrassa	Left	33+850	13	_
38	School	Left	35+050	60	_
39	School	Right	36+950	14	_
40	School	Left	37+100	7	Impacted (less than 50%)
41	School	Left	38+350	49.8	_
42	School	Right	38+950	6	Impacted (less than 50%)
43	School	Right	39+400	31	_
44	School	Left	39+800	4	Impacted (less than 50%)
45	School	Left	40+400	7	Impacted (less than 50%)
46	School	Right	41+350	15	_
47	School	Left	41+650	5.10	Impacted (less than 50%)
48	Hospital	Right	43+150	20	_
49	School	Right	43+300	14	_
50	College	Left	44+700	12	_

Source: Environmental Baseline Survey

Figure 4-42: Primary School at Ch. 5.450 km

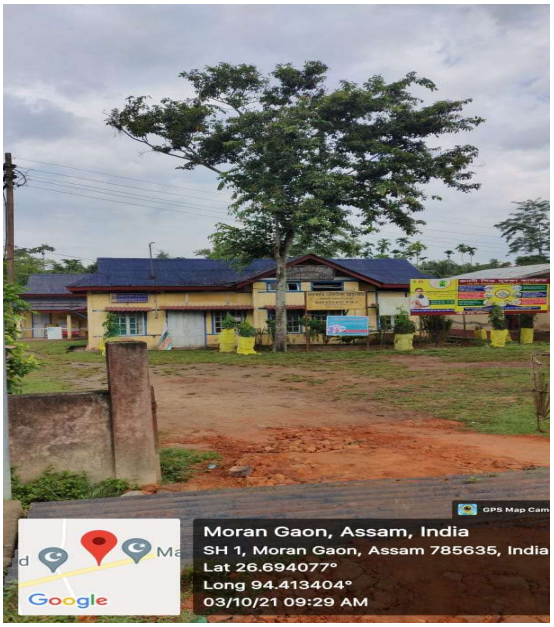


Figure 4-43: Health Centre at Ch. 0.100 km

Figure 4-44: High Sec School at Ch. 7.600 km

Figure 4-45: Graveyard at Ch. 43.850 km

4.5.7 Demography of Displaced families

The total number of Displaced Persons is 2355 with 51.97% (1224) males and 48.03% (1131) females. Almost 53% of the Displaced Persons are in the age group of 21 to 50 years. The age-wise distribution of Displaced Persons is presented in **Table 46.**

Table 46: Total Displaced Persons Age wise

Age Category	Total Males	Total Females	Total Persons	Percentage
0 to 6 Years	70	50	120	5.1%
7 to 14 Years	141	128	269	11.4%
15 to 20 Years	96	79	175	7.4%

Age Category	Total Males	Total Females	Total Persons	Percentage
21 to 30 Years	192	205	397	16.9%
31 to 40 Years	230	247	477	20.3%
41 to 50 Years	215	160	375	15.9%
51 to 60 Years	129	139	268	11.4%
Above 60 Years	151	123	274	11.6%
Total	**1224**	**1131**	**2355**	**100%**

Source: Primary Census Socio Economic Survey, 2021

4.5.8 Social Stratification

The social fabric of the project area predominantly comprises of five social groups, a) Scheduled Tribes (ST) b) Scheduled Castes (SC) the Other Backward Class (OBC) and d) General Castes. Of the total 510 families displaced by the project, 263 i.e., 51.6% are OBC's, followed by the General Category at 45.1%, the Scheduled Castes at 1.8% and lastly Scheduled Tribes at 1.6%. Category-wise break-up of the different sections of the population of the area affected by the project is given in **Table 47** below.

Table 47: Social Category of the Displaced Families

Social Category	Total No. of Families	Percentage
Schedule Tribe	8	1.6%
Schedule Caste	9	1.8%
Other Backward Class	263	51.6%
General	230	45.1%
Total	**510**	**100%**

Source: Primary Census Socio Economic Survey, 2021

4.5.9 Educational Profile

The educational status of the Sample Displaced Persons is presented in **Table 48**. The total number of Sample Displaced Persons, of more than school going age of 6 years, is 1468. Out of which 27.5% reported to be illiterate, 5.0% reported that they are only literate as they can sign their name in the local language but never had any formal schooling, 13.9% of the Displaced Persons have education up to primary level, 44.0% up to secondary/ higher secondary, 7.2% up to graduation & Masters, 2.4% (35 persons) technical qualification.

Table 48: Educational Status

Educational Status	Male	Female	No. of Displaced Persons	Percentage
Illiterate	165	239	404	27.5%
Literate (can only sign)	39	35	74	5.0%
Primary	98	106	204	13.9%
Secondary & Higher Secondary	365	281	646	44.0%
Graduate & Masters	62	43	105	7.2%
Technical	29	6	35	2.4%
Total	**758**	**710**	**1468**	**100%**

Source: Primary Census Socio Economic Survey, 2021

4.5.10 Occupational Profile

The occupational status done on basis of Socio-Economic Survey. Out of Total 510 Displaced Families the 335 Sample Household were surveyed. of which the Displaced Persons is presented in **Table 49**. It is reported that out of the total sample displaced population of 1547, 256 are children below 14 years and 180 persons above 60 years have not been included in the analysis of occupation. Out of the total remaining 1111 Sample Displaced Persons, 495 reported to be unemployed (including housewives). The total working population is 616 taking the workforce participation rate to 55.45%. Overall, the contribution of females in the workforce is 26.79% and that of males is 73.21%. Analysis of work force data also points to the fact that the main occupational sector affected is Business (29%), followed by Agricultural sector only 10.5% along with Non-agricultural laborers (5.5%) and the Services (Private/Government) (5.3%). Therefore, there will be more impact on people in business sector in comparison to people engaged in Agriculture as well as Services.

Table 49: Employment Status

Employment Status	Male	Female	Total	Percentage
Agriculture	75	42	117	10.5%
Non-Agriculture Labourer	38	23	61	5.5%
Business/ Trade	249	73	322	29.0%
Services (Private/Govt.)	45	14	59	5.3%
Self Employed	44	13	57	5.1%
Unemployed	185	310	495	44.6%
Total	**636**	**475**	**1111**	100%

Source: Primary Census Socio Economic Survey, 2021

5. Anticipated Environmental Impacts and Mitigation Measures

5.1 Introduction

This chapter presents key environmental issues associated with various aspects of the proposed subproject. The environmental impacts caused due to the development of the subproject road sections can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the subproject whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action. Interaction of the subproject activities with environmental attributes is presented as Activity- Impact matrix in **Table 50.**

The immediate benefits of road construction and improvement will come in the form of direct employment opportunities during construction for the roadside communities and especially those who are engaged as wage laborers, petty contractors, and suppliers of raw materials.

During the operation stage, road-side economic activities supporting transport like Petrol pumps, automotive repair shops, lodging, and restaurants will increase due to the increased number of vehicles. An increase in agro-industrial activities is also expected to take advantage of improved access to urban centers where there are higher demands and better prices for agricultural products. The project will accelerate the industrial activities and induced development significantly. One important project-specific benefit is the avoidance of flooding or waterlogging by increasing the waterway of bridges and the provision of side drains. Other generic benefits of road improvement projects are: (i)reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care, educational and other infrastructural facilities (iv)improved quality of life of rural tribal population (v) reduced accident events and (vi)better investment climate for industries creating more employment opportunities to local people.

The identification of potential effect requires identifying the components of the physical, biological, and human environments that are at risk of being impacted in the upgrading of state roads in Assam. It involved an integration grid between the valued environmental components and project activities. The valued environmental components for this project were drawn from the environmental baseline and are as follow:

- Physical environment – air quality and greenhouse gas emissions, land and soil, surface water quality and quantity, and groundwater quality and quantity,
- Biological environment – terrestrial vegetation
- Human environment – private land and buildings, public infrastructures, sound
- Environment, aesthetic and visual, and community and occupational health and safety.

The assessment of potential environmental impacts requires the definition of the effects associated with the MDR upgrading in terms of intensity, duration, and scope as follow:

- Nature of the effect: The nature of the effect refers to the kind of effect on the environment. Two levels have been defined:
  - Positive: The work would have a good impact on the environment or stakeholders.
  - Negative: The work will have a bad impact on the environment or stakeholder.
- Duration of the effect: Duration means the time dimension of the effect. The term short term and long term are used to describe the period:
  - Short-term: the effect disappears promptly once the source is eliminated;
  - Long Term: the effect is felt for a while even after the source is eliminated;
- Scope of the effect: The scope describes the spatial dimension of the effect caused by an action in the environment. It refers to the distance or area covered by the disruption. The terms regional, local, and limited are used to describe the scope:
  - Limited: the scope is limited when the action affects only one environmental element located near the project;
  - Local: the scope is local when the action affects the study area;
  - Regional: the scope is regional when the action affects areas beyond the study area

Assessment of the potential effect: The potential effect considering the above parameters come into one of three categories:

- Major (MAJ): signifies an effect that is permanent and that affects the integrity, diversity, and sustainability of the element. Such an effect substantially or irremediably alters the quality of the environment.
- Medium (MED): signifies a perceptible, temporary, and/or low- return effect that has little impact on the environmental component and is not irreversible. Such an effect is short-lived and/or limited in scope.
- Minor (MIN): signifies that the effect is non-existent or virtually non-existent, that it does not affect the environmental component in any observable or quantifiable way and that it is related to a randomly occurring natural effect.

Table 50: Activity Impact Identification Matrix

Activity	Severity of Impact	Degree of impacts		Duration of Impact		Scope of Impact		
		Positive	Negative	Short term	Long Term	Local	Regional	Limited
PRE-CONSTRUCTION PHASE								
Road alignment and design considerations	MED	×			×	×		
Utility shifting: removal and transfer of electrical and other utilities, tree cutting	MED		×	×			×	
CONSTRUCTION PHASE								
Site Clearance	MIN		×	×			×	
Generation of Debris	MIN		×	×		×		
Non-bituminous waste	MIN		×	×		×		
Bituminous waste	MIN		×	×		×		
Traffic diversion	MED		×	×			×	
Borrow areas	MIN		×	×			×	
Quarries	MIN		×	×			×	
Water extraction	MED		×	×		×		
Haul vehicles	MED		×	×		×		
Material storage	MED		×	×		×		
Excavation	MED		×	×		×		
Natural drainage	MIN		×	×		×		
ENVIRONMENTAL AND SOCIAL ATTRIBUTES								
Air	MED		×	×		×		
Water	MIN		×	×		×		

Activity		Severity of Impact	Degree of impacts		Duration of Impact		Scope of Impact		
			Positive	Negative	Short term	Long Term	Local	Regional	Limited
Noise		MED		×	×		×		
Soil		MIN		×	×		×		
Flora		MED		×		×	×		
Social Environment		MAJ	×			×		×	
	OPERATION PHASE								
	Environmental Attribute								
Air		MIN		×		×	×		
Water		MIN	-	-	-	-	×		
Noise		MIN		×		×	×		
Soil		MIN	-		-		×		
	Social Environment								
Increase in property value		MED	×			×		×	
Transportation Development		MAJ	×			×		×	
	Road User								
Safety and Better Connectivity		MAJ	×			×		×	
Road Users Safety		MAJ	×			×	×		

Identification and assessment of the potential environmental impacts are based on secondary information supplemented by field visits. Impacts on various environmental components have been assessed at four different stages, namely:

- The project location;
- Design and pre-construction;
- Construction; and
- Operation stages.

A few permanent as well as short-term and long-term adverse effects, mainly at the construction and operation stages, are, nonetheless, anticipated. Temporary short-term impacts can be kept in check through proper planning and adopting environment-friendly road construction methods and the appropriate regulatory measures

5.2 Positive Environmental impacts due to the improvement of sub-project road

The positive impacts expected from the improvement of the project road section includes:

- Employment generation of unskilled and skilled man-days throughout the construction period.
- Improved quality of life for the rural population in the project influence: this as a result of better access to markets, health, education and other facilities; and the derived stimulus for local economic activity
- A more efficient and safe road transport system: through reduced travel times, reduced road accidents, reduced vehicle operating and maintenance costs and reduced transportation costs for goods
- The facilitation of tourism
- Improved interstate connectivity to neighboring Districts; and
- Connectivity to the Asian Highway network.

5.3 Adverse Environmental impacts due to the improvement of sub-project road

The adverse environmental impacts anticipated from the improvement of the project road section are:

- Cutting of roadside trees that fall within formation width may reduce the ecological balance of the area and also increase soil erosion problems.
- Impacts on physical environment: impacts on air, noise, water and soil during the construction of project road will be significant. It can may increase soil erosion and can change the landscape due to the establishment of many quarries.
- Improvement of project road can affect the ecological balance of the region and can disturb the habitation of fauna living in this area.

5.4 Impacts Related to Sub- Project Location, Preliminary Planning and Design

5.4.1 Natural Hazard

The entire Assam falls under zone V (very high-risk zone) as per the seismic map of India and therefore the risk of damage to the subproject road due to an earthquake is critical. Relevant IS codes shall be adopted in the design of civil structures.

5.4.2 Road Widening, Utilities shifting and Safety Planning

The entire road section has enough available ROW to accommodate the proposed road improvement works and will be undertaken along the existing alignment with minimal land acquisition required at some locations. Road widening will result inthe shifting of utilities and encroaching structures. Poor coordination with local authorities and communities will increase the risk of accidental damage to drainage channels and temporary disruption of water and electricity supplies along active construction fronts. The further contraction of the useable carriageway during construction will exacerbate traffic and will hinder direct access across the road by residents along the road. Temporary detention of drain water on depressed areas during the reconstruction of drainage canals may occur.

Road formation widening will be made based on minimizing tree cutting, utility shifting, and damage to community properties. Road design has incorporated the drainage system to avoid the accumulation of drainage water and surface run-off. Temporary pits will be constructed at side-and cross drains to collect drainage water from demolished or damage drainage channels which will be hauled for off-site treatment.

Adequate safety provisions like crash barriers on accident prone areas rumble strips in community areas to regulate speed, retro-reflective warning sign boards near school, hospital, and religious places are incorporated in the design. All utilities requiring shifting shall be largely made before the start of construction. Before shifting, the Contractor will coordinate with the concerned agencies regarding the time and extent of shifting and community affected will be informed of a potential service disruption at least 1 week earlier.

5.4.3 Impact on Land

The proposed project will envisage 110.0 hectare of land. There is no forest land which is impacted in the proposed project stretch. **Table 51** shows the land to be acquired for the proposed project.

Table 51: Proposed Land Acquisition

Sl No.	Name of the Village / Town	Chakra	District	Land to be Acquired	Remarks
1	Moran Gaon	Nokchari	Jorhat	0.12116	
2	Gharfollia Mybelia 2 Nd Part	Nokchari	Jorhat	2.19015	
3	Gharfollia Mybelia 1 St Part	Nokchari	Jorhat	1.11364	
4	Deberapar Gaon	Nokchari	Jorhat	0.44467	
5	Mybelia Chakiyal	Nokchari	Jorhat	1.25738	
6	Abhoipuria Gaon 2 Nd Part	Nokchari	Jorhat	0.37761	

Sl No.	Name of the Village / Town	Chakra	District	Land to be Acquired	Remarks
7	Nakachari 1 St Part	Nokchari	Jorhat	0.78756	
8	Nakachari 2 Nd Part	Nokchari	Jorhat	0.86869	
9	Gohain Pather	Nokchari	Jorhat	1.39588	
10	Darokial Gaon	Nokchari	Jorhat		Map not available
11	Kuli Gaon	Lahing	Jorhat	0.32037	
12	Hemlai Chah Bagicha 2 Nd Part	Lahing	Jorhat	1.79547	
13	Hemlai Chah Bagicha 1 St Part	Lahing	Jorhat		Map not available
14	Loanpuria Gaon	Lahing	Jorhat	1.75664	
15	Deogharia Gaon	Lahing	Jorhat		Map not available
16	Baisahabi Grant	Lahing	Jorhat		Map not available
17	Chalenga Grant	Lahing	Jorhat	0.71153	
18	Tengabari Gaon	Lahing	Jorhat	1.37750	
19	Khatalboria Gaon	Lahing	Jorhat	1.98884	
20	Duliagaon	Lahing	Jorhat	0.88917	
21	Beltol Japisojia	Nokchari	Jorhat		Map not available
22	Pani Gaon	Amguri	Shivsagar		Map not available
23	Habichuck	Amguri	Shivsagar		Map not available
24	Amguri	Amguri	Shivsagar		Map not available
25	Gharfulia Jopisojia Gaon	Godhuli Bazar	Shivsagar	1.18712	
26	Hatinuria Gharphalia 1 St Part	Godhuli Bazar	Shivsagar	0.89793	
27	Hatinuria Gharphalia 2 Nd Part	Godhuli Bazar	Shivsagar	0.84403	
28	Hatinuria Gharphalia 3 Rd Part	Godhuli Bazar	Shivsagar	1.52958	
29	Uttar Gharphalia	Godhuli Bazar	Shivsagar	1.48483	
30	Jeheniya Gharfulia	Mora Bazar	Shivsagar		Map not available
31	Samguri Gaon 1 St Part	Salguri	Shivsagar	0.10735	
32	Samguri Gaon 2 Nd Part	Salguri	Shivsagar	0.11965	
33	Gharfollia Gaon	Dhupdhar	Shivsagar		Map not available
34	Borshok Dibruyal	Dhupdhar	Shivsagar	0.63657	
35	Kachari Gaon 1 St Part	Dhupdhar	Shivsagar	0.09490	
36	Somdar Gaon	Dhupdhar	Shivsagar	1.07376	
37	Mout	Dhupdhar	Shivsagar		Map not available
38	Khanikar Gaon	Salguri	Shivsagar	1.38275	
39	Parbatiya Gaon 2 Nd Part	Salguri	Shivsagar	0.61632	
40	Jolagaon	Dhupdhar	Shivsagar		Map not available
41	Ganak Gaon	Salguri	Shivsagar	0.71817	
42	Sathsoigrant	Atkhel	Shivsagar		Map not available
43	Aboipuria 2 Nd Part	Atkhel	Shivsagar	1.29686	
44	Aboipuria Pt-1	Atkhel	Shivsagar		Map not available
45	Kataki Bari	Nazira	Shivsagar		Map not available

Sl No.	Name of the Village / Town	Chakra	District	Land to be Acquired	Remarks
46	Hulang Katoni-1	Nazira	Shivsagar	1.52451	
47	Hulang Katoni-2	Nazira	Shivsagar		Map not available
48	Raboti Gaon 1 St Part	Joktali	Shivsagar	0.66662	
49	Raboti Gaon 2 Nd Part	Joktali	Shivsagar	0.74039	
50	Nazira Town 6Th Part	Nazira	Shivsagar	0.49877	
51	Nazira Town 5Th Part	Nazira	Shivsagar	0.12991	
52	Nazira Town 4Th Part	Nazira	Shivsagar	0.16713	
53	Nazira Town 3Rd Part	Nazira	Shivsagar	0.11057	
54	Nazira Town 2Nd Part	Nazira	Shivsagar	0.11922	
55	Nazira Town 1St Part	Nazira	Shivsagar	0.11788	
56	Nijnazira	Nazira	Shivsagar	0.58440	
57	Barduwar Mukh	Dhopabar	Shivsagar	0.35986	

5.4.4 Impact on Structure

After plotting the structures on the alignment map, the extent of impact on the 510 structures (excluding 120 cases where only boundary wall/ fencing is getting impacted) was worked out and it is observed that 457 (90%) structures are getting impacted by more than 40%. The extent of impact on structures has been presented in **Table 52**, Impact on structures on the basis of type of construction in **Table 53** & others category is presented in **Table 54**.

Table 52: Impact on Structures

Impact	Residential	Commercial	Residential cum Commercial	Others	Total
Less than 10%	1	2	1	0	4
10-20%	2	16	4	0	22
20-30%	0	11	1	1	13
30-40%	2	10	1	1	14
40% & above	20	309	10	118	457
Total	25	348	17	120	510

Source: Primary Census Socio Economic Survey, 2021

Table 53: Type of Construction

Type of structure	Temporary	SemiPermanent	Permanent	Total	%
Residential	13	9	3	25	5%
Commercial	193	138	17	348	68%
Residential Cum Commercial	4	9	4	17	3%
Others	13	15	92	120	24%

Source: Primary Census Socio Economic Survey, 2021

Table 54: Structures – Others Category

Type of structure	No. of Structures	No. of Families
Boundary Wall	104	104
Shed/ Parking Shed	6	6
Cattle Shed/ Cow Shed	1	1
Pvt Temple	2	2
School/ Under construction/ Abandoned	7	7
Total	**120**	**120**

Source: Primary Census Socio Economic Survey, 2021

Mitigation Measures

The Resettlement plan will be prepared on the mitigation measures of finding of SIA and in guidance of re-settlements framework. The RP will be implemented through PR implementing agency onset of civil work.

5.4.5 Terrestrial Ecology

The project road does not pass through any protected area or forest area. The nearest protected area from the project road is the Hoollongapar Gibbon Sanctuary y which is at a distance of 5.5 km (approx.) from the project road.

8389 roadside trees are likely to be affected. The impact and mitigation due to tree cutting have been discussed in the following paragraphs. The road has a direct bearing on tree resources. Road widening option is made is such a way as to minimize the cutting of trees. However, efforts have been made in the design to reduce the tree cutting to only eight meters from the central line of the existing road. Compensatory plantation in 1:10 ratio with preference to fast-growing local species has been proposed under the project to address this impact.

5.5 Environmental Impacts - Construction Stage

5.5.1 Air Quality

The potential sources of air emission during the construction phase of the project are (i) dust re-suspension from earthworks including materials loading and unloading; (ii) quarrying and rock crushing; (iii) operation of construction equipment's and machines; (iv) fugitive emissions from unpaved travel on road; and (v) combustion of fuels in equipment, machinery, and vehicles. Particulate matter, comprising the majority from road construction, Particle size distribution from road construction is dominantly large, with 85.5% > 10µm and 55% > 20 µm which can settle within proximity of the source. Hot mix plant will generate carbon monoxide (CO), un-burnt hydrocarbon, sulphur dioxide, particulate matters, and nitrogen oxides (NO_x). These may affect the air quality of nearby areas especially due to emission from low height stack. The deterioration of the air quality within the immediate vicinity of the road construction activities will be significant but temporary.

- Deterioration of air quality due to fugitive dusts emission from construction activities like excavation, backfilling & concreting, and hauling & dumping of earth materials & construction spoils, and vehicular movement along unpaved roads.
- Deterioration of air quality due to gaseous emissions from construction equipment & vehicular traffic.
- Deterioration of air quality due to emission from asphalt and hot mix plants.
- Emission of Carbon monoxide, sulphur-di-oxide, nitrogen oxides etc. will be generated from the hot mix plant

Mitigation Measures: Following measures are proposed to minimize the dust and emission generation:

- Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- Loading and unloading of construction materials in the project area or provisions of water logging around these locations.
- Storage areas should be located downwind of the habitation area.
- Water shall be sprayed on earthworks and unpaved haulage roads regularly.
- Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory.
- Explore the potential for using readymade asphalt and crushed rocks to avoid or minimize the use of hot mix and rock crushing plants.
- Mixing plants and asphalt (hot mix) plants shall be located at least 1 km downwind of the human settlements. The asphalt plants, crushers, and the batching plants shall be sited at least 500m in the downwind direction from the nearest settlement and after securing a No-ObjectionCertificate (NOC) from the SPCB. Hot mix plants shall be fitted with a stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.
- Only crushers licensed by PCB shall be used.
- LPG should be used as a fuel source in construction camps instead of wood. Tree cutting shall be restricted.
- Mask and other PPE shall be provided to the construction workers.
- Diesel Generating (DG) sets shall be fitted with adequate height as per regulations
- Low sulphur diesel shall be used in DG sets as well as machinery.
- Air quality monitoring should be carried out during the construction phase. If monitored parameters are above the prescribed limit, suitable control measures must be taken.
- Dust Control Measures – Contractor shall sprinkle water to suppress dust as per site condition. However, settlement areas, schools, markets shall be given preference. Contractor shall cover material by tarpaulin during transportation.
- Contractor shall install wet scrubber or any other suitable pollution control mechanism for Hot Mix Plant and ensure that flue gas passes through the wet scrubber before releasing into ambient air. Contractor shall also ensure that wet scrubber or other filter is always in operational stage when HMP is in operation.

- Contractor shall install water sprinkler at different point of crusher operation such before feeding into hopper, transportation at conveyor belt and before screening so that emission of dust is minimized.
- Debris Handling – contractor shall sprinkle water before handling debris to minimize generation of dust as per requirement of the site.
- Maintenance of the existing road and haul road – Contractor shall maintain existing road and haul road so that vehicle can pass easily and ensure that generation of dust is minimized.
- Storage sites of top soils shall be covered with grass and separated with bund. Water should be sprinkled to facilitate growing of grass.
- Storage area should be located downwind of the habitation area.
- Hot mix plant should be located at least 1.5 km from the nearest habitation, school, hospital, river, streams, lakes, 500m from pond at 6+250 (R), and national highways, 250m from state highways. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure dispersion of exit gases.
- LPG should be used as fuel source in construction camps instead for woods.
- Vehicles and machinery shall be maintained regularly and PUC certificate shall be obtained by the Contractor regularly
- Ambient air quality shall be monitored by Contractor as per Environmental Monitoring Plan to ensure that air quality parameter is within permissible limit.

Air Quality Monitoring: Apart from provision of the mitigation measures, air quality shall be monitored. The monitoring plan shall be functional in construction as well as in operation stages. The frequency, duration and responsibility will be as per the Environmental Monitoring Plan (**Table 76**). The monitored values should be checked against maximum desirable limits provided in National Ambient Air Quality Standards (ref: **Annexure-1**). All deviated results shall be reported to Supervision Consultant for remedial measures.

5.5.2 Noise

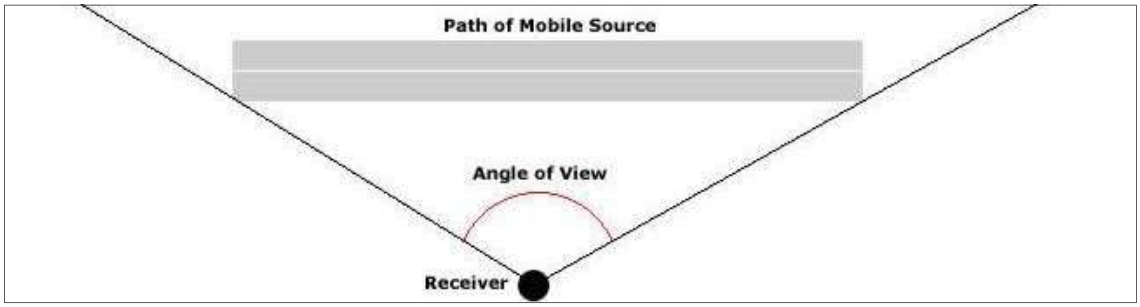
The scale of the construction necessary to upgrade the road and the corresponding slight increase in traffic is not expected to generate adverse impacts. Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops, and vehicles and earthmoving equipment. These construction activities are expected to generate noise levels in the range of 80 – 95 dB(A) at a distance of about 5 m from the source.

At the outset, it should be noted that unavailability of exact information on the construction methodology, hours of work, no. of equipment and their ratings / fuel consumption, construction schedule, etc. are the limiting factors while estimate the construction noise for this subject project; however, to represent the possible worst-case scenario, an effort has been made based on our knowledge on the construction of similar project using QUESTOR Construction Noise Tool.

The QUESTOR Construction Noise Tool is a simple application capable of calculating noise levels for construction sites. It is based on the construction site noise calculation model

documented in PR70 "How much noise do you make? A guide to assessing and managing noise on construction sites" by Dr Alan Wills (KVÆRNER) and David Churcher (CIRIA). The tool itself works on a relationship of one receiver to many sources.

'QUESTOR Construction Noise Tool' provides a library of sample plants and the activities they are performing from the BS 5228 standard: The British Standard on Noise. The total noise level calculated by the application is the noise level at the receiver.



As depicted in the above picture, it is considered that for particular construction zone, the source is located at a distance of 50m with 900angle of view. Accordingly, the sound pressure levels are predicted at the receptor location during different activities.

Inference

Based on the calculations, presented below it is anticipated that whenever the construction will happen in any zone other than industrial, the ambient noise level will exceed the statutory level at a distance of 50m away from the construction zone, if no barrier is put.

Table 55: Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50 Feet

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
Site Clearing										
1	Dozer	116	50	None	None	20	90	10	10	46
2	Tracked excavator	113				20	90			76
3	Tracked loader	113				20	90			76
4	Wheeled loader	108				20	90			71
									Total noise from site at receiver	80
Ground Excavation										
1	Dozer	114	50	None	None	20	90	10	10	44

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
2	Tracked excavator idling	96				20	90			59
3	Tracked excavator	113				20	90			76
4	Wheeled loader	104				20	90			67
5	Tracked loader	112				20	90			75
									Total noise from site at receiver	79
Tipping Fill										
1	Dump Truck	110	50	None	None	100	90	10	10	57
									Total noise from site at receiver	57
Spreading Fill										
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
									Total noise from site at receiver	81
Spreading Fill										
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
									Total noise from site at receiver	81
Ground leveling										
1	Dozer	114	50	None	None	50	90	10	10	58
2	Grader	111				50	90	10	10	55
									Total noise from site at receiver	60
Unloading										
1	Tipper lorry	113	50	None	None	50	90	10	10	57
2	Tracked loader	112				50	90	10	10	89
									Total noise from site at receiver	89
Rolling gravel / bricks										
1	Road roller	108	50	None	None	100	90	10	10	55

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
									Total noise from site at receiver	85
Compacting fill										
1	Vibratory roller	106	50	None	None	50	90	20	15	84
2	Compactor rammer	108	50	None	None	50	90	20	15	86
									Total noise from site at receiver	88
Compacting sub-base										
1	Compactor rammer	108	50	None	None	100	90	20	15	89
									Total noise from site at receiver	89
Compacting earth										
1	Compactor rammer	108	50	None	None	100	90	20	15	89
									Total noise from site at receiver	89
Road surfacing										
1	Asphalt melter (Stationary)	103	50	None	None	70	NA	NA	NA	59
2	Asphalt spreader	110	50	None	None	70	90	10	10	88
3	Road roller and lorry	96	50	None	None	80	90	10	10	42
									Total noise from site at receiver	88
Installation of traffic light controls										
1	Groove cutter	115	50	None	None	100	NA	NA	NA	73
									Total noise from site at receiver	71

- Receiver Distance: The minimum distance in meters between the source plant and the receiver – considered as 50m.
- On Time (%): The percentage of time (of the overall time period in question) for which this plant is on.
- Barrier: If there is a barrier between the source and the receiver (None - To reflect the worst-case scenario)
- Reflection: If the receiver is within 1m of a wall then select this option
- Angle of view: 900
- Traffic Volume (veh/hour): Total number of return journeys that is made by the mobile plant in an hour
- Speed: Average speed of the plant in kilometers per hour

Although this level of noise is higher than the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporarily. This noise level will attenuate with an increase in distance from the noise source, decreasing by 10dB at a distance of about 55m and 20 dB at 180 meters. Impact due to noise during construction activities will be minimal near communities as construction camps are located at least 50 meters away from community areas.

Along the project road, noise-sensitive places have been located which includes schools, hospitals, and religious places. Noise impacts during project construction will be significant on these but temporary.

The major source of noise and vibration pollution are use of vehicle for material transport, equipment used for cutting, leveling, dumping, pressing, concrete mixing, welding etc. These vehicles/equipment's when operated by the operator generate noise level which is discussed in This will also have impact on the sensitive receptors if located nearby, resulting in hearing loss, loss in sleep, and other health related problems to the local nearby.

- Further, using the Inverse Square Law of noise propagation, anticipated noise at the sensitive receptor due to construction was also calculated. This is given below.

Table 56: Anticipated Noise due to construction in the sensitive receptor

Name of the Component	Chainage	side of the road (L/R)	Distance from the road (m)	Noise Level (dB)
TEM	1+800	RHS	8.4	86.49
TEM	3+900	RHS	5	91
TEM	7+000	RHS	5	91
TEM	9+450	LHS	40	72.93
TEM	10+100	RHS	3	95.43
TEM	12+300	RHS	2	98.95
TEM	13+050	LHS	3	95.43
TEM	13+100	LHS	2	98.95
TEM	14+550	LHS	2	98.95
TEM	14+800	RHS	4	92.93
TEM	16+100	LHS	4	92.93
TEM	17+300	RHS	3	95.43
TEM	17+350	RHS	3	95.43
TEM	17+700	LHS	11	84.15
TEM	17+850	RHS	6	89.41
TEM	19+500	LHS	13	82.70
TEM	20+500	LHS	6	89.41
TEM	22+800	RHS	30	75.43
MSQ	25+800	RHS	2	98.95
MSQ	27+000	RHS	21	78.53
TEM	27+650	RHS	16	80.89
TEM	30+750	RHS	8	86.91

Name of the Component	Chainage	side of the road (L/R)	Distance from the road (m)	Noise Level (dB)
TEM	31+400	RHS	3	95.43
MSQ	32+100	LHS	10	84.97
MSQ	32+800	RHS	6	89.41
EID	34+000	RHS	5	91
MSQ	34+500	RHS	4	92.93
TEM	34+930	LHS	4	92.93
TEM	36+350	RHS	10	84.97
TEM	36+550	LHS	2.5	97.02
TEM	38+600	LHS	8	86.91
TEM	38+900	RHS	4	92.93
MSQ	40+700	LHS	8	86.91
TEM	43+100	RHS	4	92.93
TEM	43+100	LHS	5	91
TEM	43+230	RHS	6	89.41
TEM	43+400	LHS	4	92.93
MSQ	43+600	RHS	3.5	94.09
TEM	43+700	RHS	7	88.07
EID	43+850	LHS	6.5	88.72
TEM	44+500	LHS	3	95.43
PHC	0+100	LHS	11	84.15
SCH	0+200	LHS	9.5	85.42
SCH	2+150	RHS	20.5	78.74
SCH	2+550	LHS	30.1	75.40
SCH	4+430	RHS	6	89.41
SCH	4+700	RHS	22	78.13
SCH	5+950	RHS	25	77.02
SCH	6+500	LHS	6.3	88.99
SCH	7+600	LHS	11	84.15
SCH	8+250	LHS	60	69.41
SCH	8+900	RHS	40	72.93
SCH	9+450	LHS	30	75.43
SCH	9+700	LHS	80	66.91
SCH	10+100	LHS	16.2	80.78
SCH	13+250	LHS	25	77.02
SCH	14+750	LHS	6	89.41
SCH	16+050	LHS	13.3	82.50
SCH	17+100	RHS	7.5	87.47
SCH	17+530	LHS	7.5	87.47
SCH	19+800	LHS	24	77.37
SCH	20+500	LHS	6	89.41
SCH	22+800	LHS	30	75.43

Name of the Component	Chainage	side of the road (L/R)	Distance from the road (m)	Noise Level (dB)
SCH	22+800	RHS	30	75.43
SCH	23+950	LHS	18.2	79.77
CLG	24+100	LHS	14.75	81.60
SCH	24+300	LHS	30	75.43
SCH	24+450	LHS	6.6	88.58
SCH	25+100	LHS	5.9	89.56
SCH	25+500	LHS	6	89.41
SCH	29+450	LHS	31	75.15
SCH	30+450	LHS	17	80.37
SCH	31+100	RHS	18.5	79.63
SCH	32+000	LHS	32.2	74.82
SCH	33+700	LHS	83	66.59
MDS	33+850	LHS	13	82.70
SCH	35+050	LHS	60	69.41
SCH	36+950	RHS	14	82.05
SCH	37+100	LHS	7	88.07
SCH	38+350	LHS	49.8	71.03
SCH	38+950	RHS	6	89.41
SCH	39+400	RHS	31	75.15
SCH	39+800	LHS	4	92.93
SCH	40+400	LHS	7	88.07
SCH	41+350	RHS	15	81.45
SCH	41+650	LHS	5.1	90.82
HSP	43+150	RHS	20	78.95
SCH	43+300	RHS	14	82.05
CLG	44+700	LHS	12	83.39

From the above study we have observed that the range of noise level of maximum locations are exceeding the permissible limit. To avoid the impact, the mitigation measures are mentioned below.

Although all the construction related activities are not expected to occur simultaneously at a given location yet Increases in noise due to construction activities (land clearing, site preparation, material/ equipment's /machinery movement, establishment of camps/site offices) are expected.

Control Measures adopted during Construction Phase for Noise Environment

- Site Controls: Stationary equipment will be placed along un-inhabited stretches as per distance requirements computed above as far as practicable to minimize objectionable noise impacts. These locations should be away from known bird nesting areas.

- Scheduling of Project Activities: Construction activities will be scheduled to coincide with period when people would least likely to be affected. Construction activities will be strictly prohibited between 10 P.M. and 6 A.M. Near sensitive areas like schools', construction activities should be prohibited at the schooling hours. Near residential areas. Noisy operation near known nesting areas should be avoided during winter, typical breeding period of migratory birds.
- Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines.
- Construction equipment and machinery should be fitted with silencers and maintained properly.
- Noise measurements should be carried out along the road to ensure the effectiveness of mitigation measures

Mitigation Measures:

In view of above, following mitigation measures are proposed:

- All construction equipment used for an 8-hour shift shall conform to a standard of less than 90 dB(A). If required, machinery producing high noise as concrete mixers, generators etc., must be provided with noise shields;
- At construction sites within 500m of human settlements, noisy construction activities shall be stopped between 9.00PM and 6.00AM and near sensitive locations such as schools' construction activities should not be done during the schooling hours.
- Vehicles and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to minimum;
- Workers in the vicinity of high noise levels must wear ear plugs and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 85 dB(A)per8-hourshift.

Impact of/on	severity	Duration	Extent of Impact (after Mitigation)
Noise Environment	**Minor**-Few Exceedances of Statutory or prescribed limits but assessed to be ALARP. No complaint from third parties or governmental body	**Transient**	**Δ**

5.5.3 Impact on Land and Soil

Borrow areas may lose their productivity if the topsoil is not preserved. Similarly, land area used for locating construction camp may lose its productivity, if it is not restored to its original stage after disbanding the construction camp.

Mitigation Measures: The topsoil from the productive land shall be preserved and reused for plantation purposes. It shall also be used as a top cover of the embankment slope for growing crops and vegetation to protect soil erosion. It shall be ensured that the land taken on lease for access to the road and construction camp is restored to its original land use before handing over back to be the owner.

5.5.4 Soil Erosion

Soil erosion may take place at locations of the sharp bend near bridge construction locations, along steep and incompact embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect viz. siltation, embankment damage, and drainage problem. Loss of soil due to runoff from earth stock-piles may also lead to the siltation of nearby water bodies. The intensity of soil erosion at different locations will be influenced by the lithology, topography, soil type, and climatic condition (mainly rainfall) and drainage pattern.

Mitigation measures: Following mitigation measures are proposed for the prevention of soil erosion:

- Bank protection measures shall be taken at erosion-prone areas. The protection measures may include the use of geo-textiles matting, bio (vegetative) – turfing
- Provision of side drain to guide the water to natural outfalls.
- Stone pitching wherever necessary.
- When soil is spread on slopes for permanent disposal, it shall be buttressed at the toe by retaining walls.
- Side slopes of the embankment shall not be steeper than 2H: 1V. Turfing of embankment slopes shall be done along the stretch.
- Shrubs shall be planted in loose soil areas.
- In rural stretches, longitudinal side drains shall be intercepted by drains serving as outlet channels to reduce the erosion
- IRC: 56 -2011 recommended practice for the treatment of embankment slopes for erosion control shall be taken into consideration.
- Soil erosion shall be visually checked on slopes and high embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion further including bio-turfing.
- During excavations, the Contractor will take all adequate precautions against soil erosion as per MoRTH 306.
- The earth stockpiles to be located shall be provided with gentle slopes to prevent soil erosion and flow with water.

5.5.5 Borrow Areas and Quarries

The project area is flat terrain. Farmers are willing to provide earth from their field up to a certain depth on adequate compensation; it is recommended that borrowing from agricultural land shall be minimized to the extent possible.

Borrow areas if left un-rehabilitated may pose risk to people, particularly children and animals of accidentally falling into the pit as well as become potential breeding ground for mosquitoes of vector born disease.

Illegal quarrying may lead to unstable soil conditions; destroy the landscape of the terrain, air, and noise pollution. The opening of new quarries is not envisaged due to the proposed project. Quarry material will be sourced from existing nearby quarries.

Mitigation measures: Borrow pits shall be selected from barren land/wasteland to the extent possible. Borrow areas should not be located on cultivable lands except in the situations where landowners desire to level the land. The topsoil shall be preserved and depth shall be restricted to the desired level.

Borrow areas should be excavated as per the intended end use by the owner. The Indian Road Congress (IRC):10-1961 guideline shouldbe used for the selection of borrow pits and the amount of material that can be borrowed.

The depths in borrow pits to be regulated so that the sides shall not be steeper than 25%. To the extent possible, borrow areas shall be sited away from inhabited areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. In addition, it shall be converted into fishpond in consultation with the fishery department and if desired by the landowner/community. The borrow shall be rehabilitated according to the broad guidelines.

Aggregates will be sourced from existing licensed quarries. Copies of consent/approval/rehabilitation plan for a new quarry or use of existing sources will be submitted to EO, PIU. The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state, and submit a copy of it for the approval to EA if new quarries are opened.

5.5.6 Compaction and Contamination of Soil

The soil in the adjoining productive lands beyond the ROW, haulage roads, and construction camp area may be compacted due to the movement of construction vehicles, machinery and equipment, and due to the sitting of construction camps and workshops. Approach road either paved or unpaved is available for most of the bridge approaches. However, for some bridges approach road has to be constructed.

Soil may be contaminated due to inappropriate disposal of liquid waste, (lubricating oil and fuel spills, waste oil and lubricant and vehicle/equipment washing effluent) and solid waste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment, and machinery. Soil may be contaminated due to the inappropriate disposal of domestic solid waste and sewage from construction camps.

Mitigation Measures: Fuel and lubricants shall be stored at the predefined storage location and away from drainage channels. The storage area shall be paved with a gentle slope to a corner and connected with a chamber to collect any spills of the oils. Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil.

All efforts shall be made to minimize waste generation. Unavoidable waste shall be stored at the designated place before disposal. To avoid soil contamination at the wash-down and re-fueling areas, oil interceptors shall be provided. Oil and grease spill and oil-soaked materials are to be collected and stored in labeled containers (Labeled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/MoEF&CC authorized Waste Oil Recycler.

To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery, and equipment shall be restricted to the designated haulage route.

- Approach roads shall be designed along the barren and hard soil area to reduce the compaction induced impact on soil.
- The productive land shall be reclaimed after construction activity.
- Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at the construction camp.
- Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. The non-biodegradable and recyclable waste shall be sold off.
- Efforts shall be made that biodegradable waste shall be composted in the mechanized and movable composter by the contractor. Non-bio-degradable and non-saleable waste shall be disposed ofat authorized landfill site. Non-bituminous wastes to be dumped in borrow pits with the concurrence of the landowner and covered with a layer of topsoil conserved from opening the pit.
- Bituminous wastes will be disposed of in an identified dumping site approved by the State Pollution Control Board.

Construction waste constitutes debris, which is generated due to dismantling of pavement (though involved only for few kilometers in DBH Road), quarry dust, and unused iron bars or damaged support structures. Uncontrolled disposal of these wastes may affect soil and even receiving water bodies may cause contamination of soil, and landscape of the area.

Mitigation Measures: Construction waste shall be disposed of in an environmentallyacceptable manner. Some of the measures are as follows:

- The existing bitumen surface can be utilized for paving of crossroads, accessroads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. All excavated materials from roadway, shoulders, drains, cross drainage should be used for backfilling embankments, filling pits, and landscaping. Unusable debris material should be suitably disposed ofat pre-designated disposal locations, with approval of the concerned authority.
- The bituminous wastes shall be disposed of in secure landfill sites only in an environmentally accepted manner. For removal of debris, wastes and itsdisposal MoRTH guidelines should be followed.
- The locations of dumping sites should be selected away from residential areas and located at least 1000 m downwind side of these locations with the following consideration.
- Dumping sites do not contaminate any water sources
- Dumping sites have adequate capacity foraccommodation debrisgenerated.
- Public perception and consent from the village Panchayats about the locationof debris disposal site shall be obtained before finalizing the location.
- Unproductive/wastelands shall be selected for dumping sites.

5.5.7 Groundwater

Contamination of groundwater is not envisaged since construction camps will have toilets commode to septic tanks or mobile toilets depending on the number of workers in each camp.

Mitigation Measures: Requisite permission as applicable shall be obtained for the abstraction of groundwater. The contractor shall make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected. Water intensive activities shall not be undertaken during the summer season.

5.5.8 Surface Water Bodies

Temporary pollution of water bodies may occur due to spillage of chemicals and oil at construction sites. Installation of a haul road or temporary access across the river/nala maybe required while construction work is ongoing in the existing minor bridges and culverts. This may cause sedimentation and other disturbances to the water body.

Mitigation Measures: To prevent the siltation of roadside ponds, the provision of retaining wall is made along the road for the ponds located next to the road. As control measures, efforts shall be made to increase the water-holding capacity of the ponds (other than those affected) in the region by using the bed material as borrow earth. Following measures shall be followed additionally:

- Bridge construction activity including piling is recommended during non-monsoon seasons (October to End of May) period.
- Check dams must be created during construction to catch the silt or debris generated from construction activities across the water channels
- All chemicals and oil shall be stored away from water and concrete platforms with catch pit for spills collection.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.
- Readily available, easy to understand, and preferably written in the local language emergency response procedure, including a reporting system will be provided by the contractors.
- Silt fencing and/or brush barrier shall be installed along drainage path, erosion-prone areas for collecting sediments before letting them into the water body. Silt/sediment should be collected and stockpiled for possible reuse as the surfacing of slopes where they have to be re-vegetated.
- All wastes arising from the construction should be disposed of in an environmentally accepted manner so as not to block the flow of water in the channels. The wastes should be collected, stored, and transported to the approved disposal sites.
- No vehicles or equipment should be parked or refueled near water bodies, to avoid contamination from leakage of fuel and lubricants.
- Substructure construction should be limited to the dry season.

- Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Sewage from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies because these are used for bathing and washing purpose.
- The borrow areas may also be converted into ponds with the concurrence of the landowners. Fisheries activity can be encouraged in such ponds through institutional support from the concerned department

5.5.9 Hydrology and Drainage

Construction material and waste may contaminate or clog the small drains if stored or disposed of close to the water body.

Mitigation Measures: Adequate cross drainage structures shall be provided. Additional balancing culverts shall be provided in flood-prone areas. The embankment height shall be designed consistent with the existing topography of the region and shall be higher than the HFL. The elaborate drainage system shall be provided to drain the stormwater from the roadway and embankment and to ensure minimum disturbance to natural drainage of surface and subsurface water of the area.

The design of the drainage system such as surface and sub-surface drainage shall be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes, and the service roads shall be discharged through longitudinal drains, designed for adequate cross-section, bed slopes, invert levels, and the outfalls. If necessary, the walls of the drains shall be designed to retain the adjoining earth.

IRC: 34-2011: Recommendations for road construction in the waterlogged area and IRC: 75 and MORT&H guidelines for the Design of High Embankments shall be referred.

No construction material will be stored or disposed near any water body except for reusing it for enhancement measures such as embankment raising.

5.5.10 Impact on Biological Environment

5.5.10.1 Terrestrial Ecology

As per the approved Protected Areas and reserve forest map received from the PCCF office, Guwahati vide Letter No. FG 69/REWP/GIS/PART-1/7032 (Annexure 23) during the initial survey, the project road does not pass through any protected area or reserve forest. The nearest protected area from the project road is Nambor Doigrung Wildlife Sanctuary at a distance of 5.5 km (approx.). However, some trees are likely to be affected. The impact and mitigation due to tree cutting have been discussed in the following paragraphs.

One month before the construction starts, clearing and grubbing will be performed by the contractor. A total of 8389 trees are likely to be affected due to the proposed project. The cutting of trees will have a minor to negligible impact on the local environment.

Mitigation Measures: Requisite permission from the Forest Department shall be obtained for cutting of roadside trees located in forest land. In the State of Assam, as per the Assam (Control of Felling and Removal of trees from non-forest lands) Rules, 2002, the felling of trees from the Non-forest area will require prior approval of the Forest Department. The

heritage trees along the project road should be avoided and not be felled. The tree species required for silkworm growth should be conserved and felling of such trees shall be avoided. The land to be acquired from tea estates should be as minimum as possible.

The project envisages plantation of 8389 trees along both sides of the road as per IRC SP: 21 specifications. This will include the compensatory plantation in the 1:10 ratio as per the NGT order. The saplings shall be planted before cutting the existing trees. Besides, additional plantation shall be done on banks of water bodies near bridge sites to enhance the aesthetics and check soil erosion. All tree plantations will be carried out through the forest department, local community, or the civil works contractor. Tree species selected for plantation must be suitable for local climatic conditions and be equal to or better in sequestering carbon than the trees removed/be good for sequestering carbon (only for roads where there is no tree cutting). Necessary advice may be sought from the local Forestry office in the selection of tree species.

Tea Estates

The alignment improvement has been done considering minimum acquisition of tea estates land along the project road. During the construction stage the air pollution levels will have some impact on the tea plants as they are sensitive to the micro climate. But appropriate dust suppression activities will minimize the level of impact.

Elephant Crossing

As per consultation with the Gibbon bit office forest official it was understood that there is no elephant and other wild animal movement along the project road. There is no known elephant corridor across this project area.

5.5.10.2 Aquatic Ecology

Temporary sedimentation and water quality deterioration are expected from the project during the construction stage. An accidental spill of materials, chemicals, and fuels may also deteriorate receiving water quality and hence the aquatic ecology.

Mitigation measures: It is proposed to undertake construction activities near water bodies during the summer season when most of the water bodies are practically dry. Best construction practices shall be adopted to prevent an increase in siltation level of the water. All precautionary efforts shall be made as given under the surface water section to prevent accidental damage of water quality.

5.5.11 Socio-Economic Impact

Economic activities supporting transport like fuel stations, automotive repair shops, lodging, and restaurants are expected to increase with the increase of traffic and induced development of the area. The improved road will provide better connectivity which will result in (i) Reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, access to educational and other infrastructure al facilities (iv) enhanced tourism activities in the area and state which in many times will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

Pandemic Effect of COVID -19 on Health & Safety Issues

During public consultation, care has to take that the State of Assam COVID-19 Guidelines are well practices.

During public consultation with the local people the following guideline need to be followed:

- Social Distancing measures need to be followed as per the guidelines of Assam Government circular.
- No more than 4 people should be Assemble during consultation and that to minimum distance of 6 feet need to be complied.
- During consultation if somebody is seen having cold, cough or unhealthy appearance like from the face reading it appears that he/she is sick, that person should be avoided.
- Do exchange any documents, pens, attendance sheet for signing during consultant. The consultant should enter all the consultation findings and attendance sheet on his/ her own behalf.
- Any document submitted during consultation should be left in one box with all the entries made by the document holder and signed by his/her own pens.
- The social consultant should carry face mask, hand sanitizer, hand gloves, face shield, body cover, etc.
- There should be no exchange or free distribution of face mask during consultation.
- Avoid those people who are not adopting social distancing measures or are not wearing face mask and are not adopting precautionary measures.
- Take photographs of consultation adopting social distancing measures and regular use of hand sanitizer after each consultation.
- Avoid those area, where number of COVID-19 patients are reported in large number by the state authority. The consultation can be repeated after situation improves.

Health and Safety Guideline for Workers under COVID -19 Pandemic situation.

- The labour will have to have COVID -19 induction when he joins the work site.
- The EHS officer during the tool box talk should educate the labors about the COVID -19 pandemic, usage of Mask is mandatory, frequent hand washing and provision of hand sanitizer at all the project site
- The labors coming from home time should be kept under quarantine as per the State quarantine regulations.
- At each project site there should have register maintained for recording of labors temperature at entry gate. At the active construction site all the workers should wear mask. The contractor should provide mask free of cost to all the labors.
- At the labors camps poster in local language should be paster at notice board.
- The social distance measures i.e number of labors in each room, kitchen strength, bathroom facilities and water point should be multiples.
- Each labors camp should have isolation room available to quarantine the labors in case COVID -19 is reported.

- There should be COVID-19 antigen test conducted for each labors travelling from outstations.
- There should be noticed board having number of Police Station, COVID treatment center, Hospitals, doctor on panel with the contractor in case of COVID-19 inspection.
- The EHS office at project site should keep the track records of workers health, traveling scheduled and health complaint or complaint received from other workers on colleague's health.

5.5.12 Labor and Construction Camp

Construction workers expected to be about 250 per day per package are likely to be employed during construction. Most of the workers will be employed locally. However, some may be from nearby areas. This will cause an additional burden on local resources. However, this impact will be temporary and will not have the potential for changes in the demographic scenarios of the area. The outside workers will be housed at the construction camp, which is expected to one per package. Poor sitting and improper management of construction camps may lead to several adverse impacts on environment viz. (i) loss of vegetation due to use of wood as fuel source for cooking (ii) deterioration in nearby surface water bodies‟ quality (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste (iv) Poor sanitation may result to the transmission of communicable diseases among the workers and the host communities. This includes the possible spread of sexually transmitted diseases, diseases from improper handling and supply of foodstuffs, poor water supply, and insect-borne diseases.

Mitigation Measures: Construction camp shall be sited at such locations to utilize the existing infrastructure. No productive land should be utilized for a construction camp. All sites must be graded, ditched, and rendered free from depressions to avoid water stagnation. Accommodation and ancillary facilities including a recreational facility for workers shall be erected and maintained to standards and scales approved by the resident engineer. All camps should maintain a minimum distance of 1000 m from habitation and water bodies.

All construction camps shall be provided sanitary latrines and urinals with the provision of septic tanks attached with soak pits or mobile toilets fitted with the anaerobic digestion system. Stormwater drains shall be provided for the flow of used water outside the camp. Drains and ditches shall be treated with bleaching powder regularly. Garbage bins must be provided in the camp and regularly emptied and disposed of hygienically. LPG cylinders shall be provided as a fuel source for cooking to avoid any tree cutting.

The Contractor will ensure the following:

- The good health and hygiene of all workers to prevent sickness and epidemics. These include the HIV/AIDS prevention program to reduce the risk and transfer of HIV between and among the workers and community, promote early diagnosis, and assist affected individuals.

- Activities under the program include monthly information, education, and consultation communication campaigns to workers, drivers, delivery crew, and communities on the risk, dangers, and impacts of STD and HIV/AIDS.
- The contractor will also provide first aid facilities at the camp and organize regular health check-up camps as well.
- The availability of safe drinking water and sufficient supply of suitable and hygienically prepared food at a reasonable price is available to the workers.
- Adoption of all precautions to protect the workers from insects and pests to reduce the risk to health. This includes the use of insecticides, which should comply with local regulations.
- Prohibition on supply or availability of alcoholic liquor or prohibited drugs at the camp.
- Regular health check-ups and immunization camps shall also be organized for the workers and nearby populations.
- Construction Workers shall be encouraged to clean/sanitize their hands frequently. Necessary arrangements for it like hand basins shall be made. They shall be encouraged to maintain social distancing at worksites and camp.
- The temperature of the workers should be checked every morning using an Infrared Thermometer before the start of construction activities.
- Workers showing symptoms of Covid-19 shall be provided with appropriate medical assistance.
- Workers joining the construction site/labour camp after traveling from outstation shall be tested for Covid-19 before allowing them at site/labour camp.
- Workers should be encouraged to use hand gloves and face masks.
- Labour camps and construction sites shall be sanitized at regular intervals.

5.5.13 Safety

The road construction activities may create various unsafe situations. This will require attention to the following safety aspects viz.

- Safety of construction workers,
- Safety of road users including pedestrians and cyclists
- Safety to cattle;
- Safety of the local community
- Unsafe/ hazardous traffic conditions due to construction vehicle movement need to be considered during the design and construction stage and
- Conduct safety audits.

Mitigation measures: During the construction phase, contractors shall be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during (i) road works (ii) handling of large construction equipment and machinery, (iii) handling of chemicals and hazardous materials, and inflammable substances (iv) welding and (v) electrical works. The contractor shall also arrange required PPEs for workers, first aid, and firefighting equipment at construction sites. The contractor will also prepare an emergency preparedness plan, which shall be duly

approved by EA to respond to any emergency and unsafe conditions. To avoid disruption of the existing traffic due to construction activities, a comprehensive traffic management plan shall be drawn up by the contractor.

Retro-Reflector zed traffic caution signs shall be used during construction. Regular safety audit or periodic reviews shall be made to assess the effectiveness of safety measures adopted during construction.

Adequate caution signage near the school, sensitive locations, speed control, caution notes shall be fixed at appropriate locations. These shall be preferable with Retro-reflective paints. Steel base signage shall be avoided to prevent theft of the same. Crash barriers shall also be installed at appropriate locations particularly near the school to provide safety to school children. The provision of sped breakers shall be made near schools, health centers, and religious places.

5.5.14 Community Health and Safety

Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures. Poor safety signage and lack of barriers at work site and trenches will create hazard to pedestrians and children.

Mitigation measures:

- Provide safety barriers near any trenches, and cover trenches with planks during non-work hours.
- Contractor's activities and movement of staff will be restricted to designated construction areas.
- Consult with local PWRD authority on the designated areas for stockpiling of soils, gravel, and other construction materials.
- If the contractor chooses to locate the work camp/ storage area on private land, he must get prior permissions.
- Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged.
- A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: (i) no alcohol/drugs on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); (iv) no fires permitted on site except if needed for the construction works; (v) trespassing on private/commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; and (vii) no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do.
- Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environmental and social specialist attention immediately;

and (iv) taking remedial action as per environmental and social specialist instruction.

- The contractor shall immediately take the necessary remedial action on any complaint/ grievance received by him and forward the details of the grievance along with the action taken to the environmental specialist within 48 hours of receipt of such complaint/ grievance.

5.5.15 Chance Find Procedure

There is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. Although no such sites have been identified. For this project, excavation will occur in and around the existing RoW and specified government land so no risk is foreseen to these structures. Nevertheless, the PMU and PMC will:

- Consult Archaeological Survey of India and/or State Department of Archaeology to obtain an expert assessment of the archaeological potential of the site.
- Consider alternatives if the site is found to be of medium or high risk.
- Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available.
- Develop a protocol for use by the Contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.
- If fossils, coins, articles of value or antiquity, structures, and their remains of geologic or archaeological interest are found, local government shall be immediately informed of such discovery and excavation shall be stopped until identification of cultural relics by the authorized institution and clearance is given for proceeding with work. All the above discovered on site shall be the property of the Government, and shall be dealt with as per provisions of the relevant legislation.
- The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing.
- He shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, waiting which all work shall be stopped.
- The Engineer shall seek direction from the Archaeological Society of India (ASI) before instructing the Contractor to recommence work on the site.

5.6 Environmental Impacts – Operation Phase

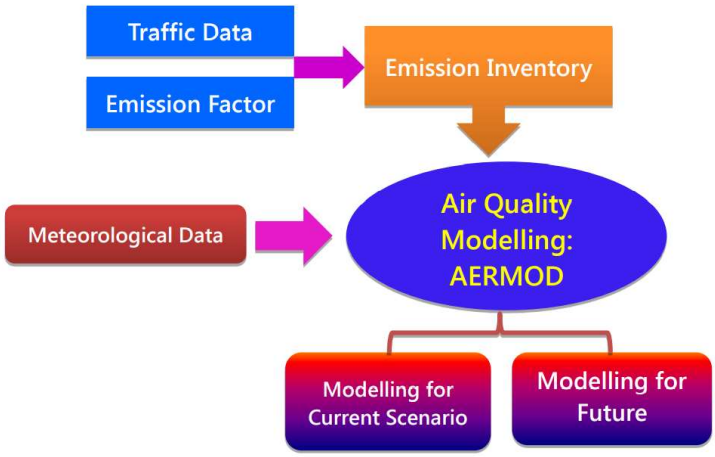
The subproject road passes through open agricultural land in most of the sections, which will provide adequate dispersion of gaseous emission from vehicles. Further, the proposed plantation will ameliorate/enhance the microclimate. No adverse climatic changes/impacts are anticipated during the operation stage other than GHG (CO_2) emission due to increased traffic, which would be largely offset with better fuel efficiency and reduced vehicle idling due to improved road conditions.

5.6.1 Air Quality

Vehicular emissions are the principal source of pollution during the operation stage. The subproject road being mostly located in adjacent to open agricultural land, adequate dispersion of gaseous pollutants is expected.

Prediction of Impact on Ambient Air Quality

To assess the impact on air quality of the project area during the operation phase, air pollution dispersion modeling was carried out using future traffic projections. The modeling was carried out using AERMOD developed by USEPA.The methodology used for air quality assessment is depicted below.



AERMOD Model

The AERMOD air dispersion model is USEPAs official “Appendix A” air dispersion model for regulatory use and was developed by the AERMIC (The American Meteorological Society/EPA Regulatory Model Improvement Committee) work group (Cimorelli et al., 2004).

It is a steady-state plume model. In the stable boundary layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (PDF).

AERMOD aims at modeling short-range (up to 50 km) dispersion from a variety of polluting sources (e.g., point, area, and volume sources) using a number of model configurations. These configurations include different sets of urban or rural dispersion coefficients as well as simple and complex topography. The model has the capacity to employ hourly sequential pre-processed meteorological data to estimate concentrations of pollutants at receptor locations at different time scales ranging from 1 h to 12 months. AERMOD is an advanced plume model that incorporates updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions.

AERMOD has two pre-processors AERMET and AERMAP. AERMET is a meteorological pre-processor that calculates meteorological parameters and passes them to AERMOD. AERMAP is a terrain preprocessor that calculates terrain elevations above mean sea level and passes them to AERMOD. Input data requirement for AERMOD is presented below.

Input Parameters:

- Emission Data (i.e. vehicles emission)
- Geographical Terrain Data
- Meteorological Data (Hourly Nine Meteorological Parameters) Wind Speed, Wind Direction, Ceiling Height, Rain Fall, Pressure, Humidity, Global Horizontal Radiation, Cloud Cover and Temperature

Source and Receptor

Receptor and dispersion modelling are carried considering a study area of 2 km and considering grid of 100 m x 100 m. All the sensitive receptors located within 15m of road edge has been considered as discrete receptors. The entire carriage way of the roads (Nakachari - Balighat) are marked and considered as area source. The average height of release for vehicular emission is taken as 0.15 m.

Model Setup

The model was setup with help of meteorological and emission data based on geographical information. Receptors were set over the domain. Background concentrations were calculated using monitored values from sites which is shown in Table 24.

Model Used	AERMOD
Source Type	Line Source: Vehicular Emissions Source
Receptors Grid	1 Cartesian Grid, 100 m x 100 m Uniform Cartesian Receptors: 441 and Discrete: 22
Emission Factor	ARAI Emission Factors were used and it is for Indian Vehicles Emission
Traffic Data	It has been taken for the year 2020 and 2040 (ref: **Table 7 & Table 8**)
Meteorological Data	1st January 2020 to 31st December 2020 from Jorhat Airport
Prediction Years	2020 (Base Year) & 2040 (End of Operation Phase)

Modelling Result and Analysis

Model outputsas concentration has been obtainedfor estimated emissions ofthe source at each receptorsof the grid. The concentration contours from these emissions are plotted for each pollutant. Isopleths, so obtained, are superimposed on the Google Earth imagery ofthe project location. The air quality results in the future are also predictedbased on projected traffic. To determine the impact of project due to projected increase in traffic during operational phase separate modelling was carried out for the base year (2020) – before start of project and year 2040 (end of project operation phase). The modelling was conducted for two criteria pollutants namely PM10 and NOx. Though CO is one of the major pollutants from vehicular emission, it has not been modelled as the allowable limit in ambient air is considerably high and unlikely to cause any exceedance.

Significance of Impact- Operation Phase

As per the prediction of modelling, the resultant concentrations of NO_X & PM_{10} are well within the NAAQS standard during the operation phase.

The predicted values are less than 90% of the NAAQS hence the severity of the impact is categorized as minor. Also, as the extent of the impact is within the 500 m of the project boundary hence the extent is categorized as Moderate and as the duration of the impact which is regular (e.g. traffic generated by the project occupants) during operation phase therefore it is categorized as high with probability of definite occurrence. Therefore, the overall significance of impact in operation phase is assessed as 'Low'

Impactof/on	severity	Duration	Extent of Impact (after Mitigation)
Air Environment	**Minor-** Well within Statutory or prescribed limits and assessed to be ALARP. No complaint from third parties or governmental body	**Regular**	**Δ**

The predicted results and corresponding isopleths are presented below.

Table 57: Predicted PM10 and NOx concentration at sensitive receptor within 15m from ROW

Description of the component	Chainage	Easting	Northing	PM10 Base	PM10 2040	Nox base	Nox 2040
Public Health Centre	0+100	640597.02	2953336.89	0.11156	0.14532	3.80594	2.71824
School	0+200	640694	2953367	0.111	0.1751	4.58468	2.70461
School	4+430	643695.48	2955620.57	0.0396	0.0491	1.28907	0.96496
School	7+600	644907.41	2958451.35	0.0981	0.16661	4.51816	2.39034
School	9+700	644277.97	2957632.67	0.0383	0.06881	1.80404	0.9332
School	14+750	649637.8	2963811.27	0.1236	0.22218	5.78094	3.01174
School	16+050	650476.07	2964801.84	0.10277	0.17761	4.64583	2.50403
School	17+100	650824.27	2965662.41	0.04407	0.06682	1.74824	1.07387
School	17+530	651108.18	2965970.31	0.05005	0.0877	2.29362	1.21956
School	20+500	653159.41	2967798.03	0.04579	0.08061	2.10447	1.11561
college	24+100	655731.22	2970268.79	0.05715	0.09755	2.5835	1.39255
school	24+300	656685.87	2971285.26	0.04391	0.06462	1.69153	1.06997
school	25+100	656387.68	2971024.27	0.0729	0.05	1.33329	1.77622
Madrassa	25+500	664020.31	2974542	0.05837	0.10161	2.65826	1.42235
School	33+850	667090.78	2974788.2	0.03581	0.06102	1.59253	0.87258
School	36+950	667232.6	2974846.97	0.03129	0.05193	1.35671	0.76236
School	37+100	668961.23	2975440.16	0.0369	0.06469	1.66332	0.89912
School	38+950	669640.98	2975958.23	0.03926	0.04398	1.15418	0.95665
School	39+800	670123.91	2976311.19	0.04544	0.06344	1.65716	1.10731
School	40+400	671122.56	2977072.03	0.02808	0.04996	1.29311	0.68412
School	41+650	672299.54	2978196.33	0.05528	0.09031	2.55243	1.3469
College	44+700	672982.77	2979366.95	0.02195	0.03014	0.80069	0.53491

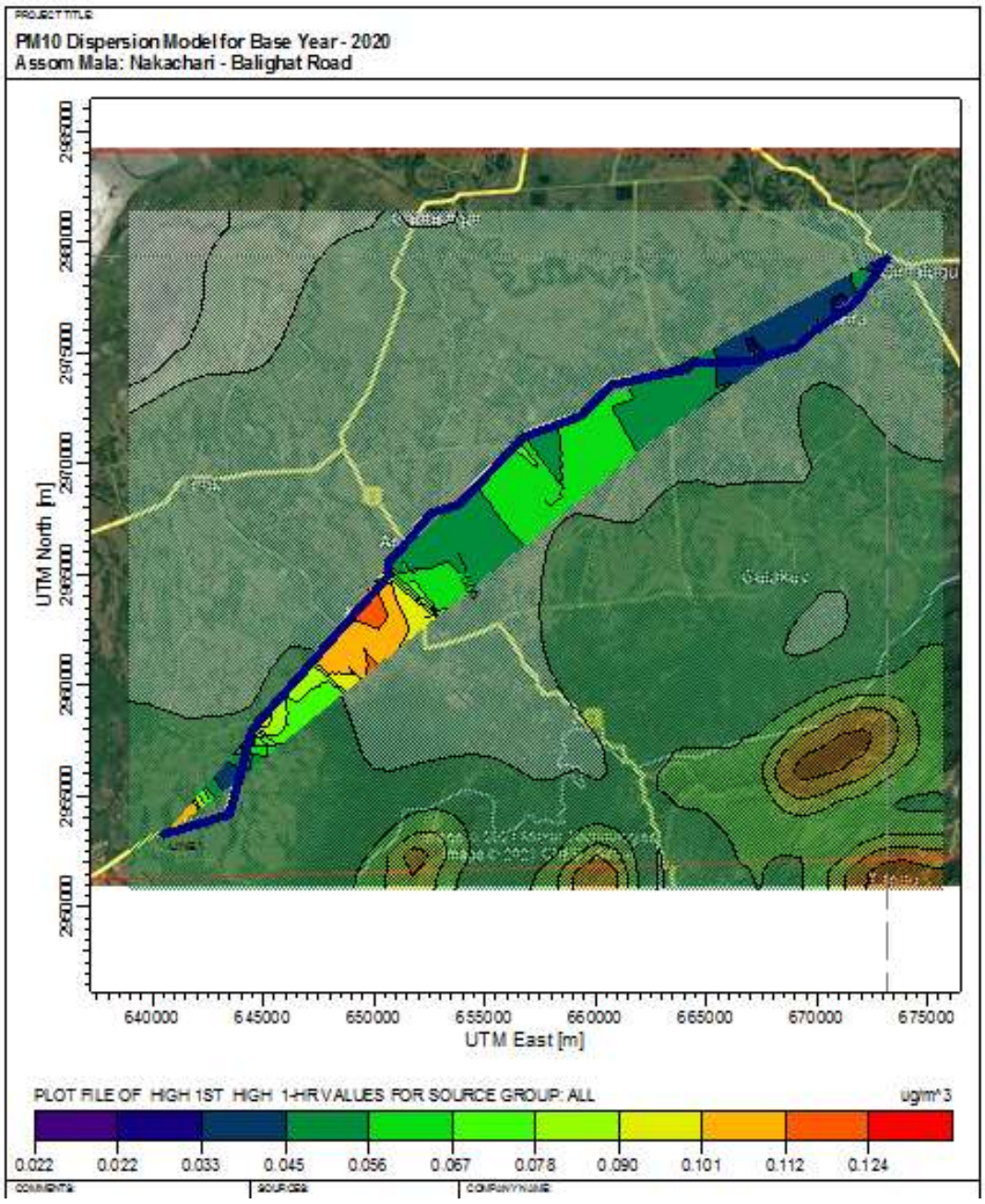


Figure 5-1: Predicted 1-hr Average PM10 Concentration due vehicular emission during Year 2020

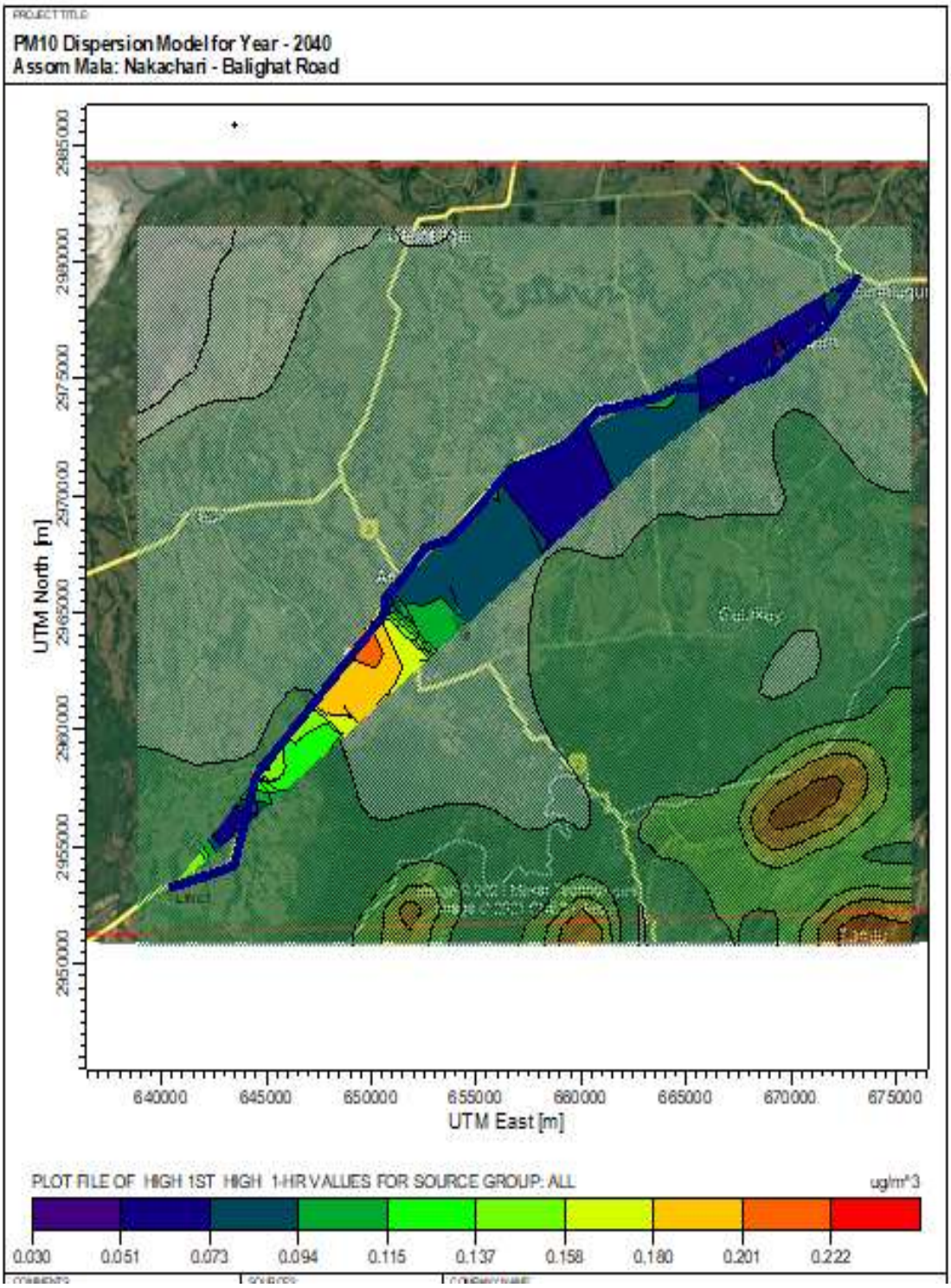


Figure 5-2: Predicted 1-hr Average PM10 Concentration due vehicular emission during Year 2040

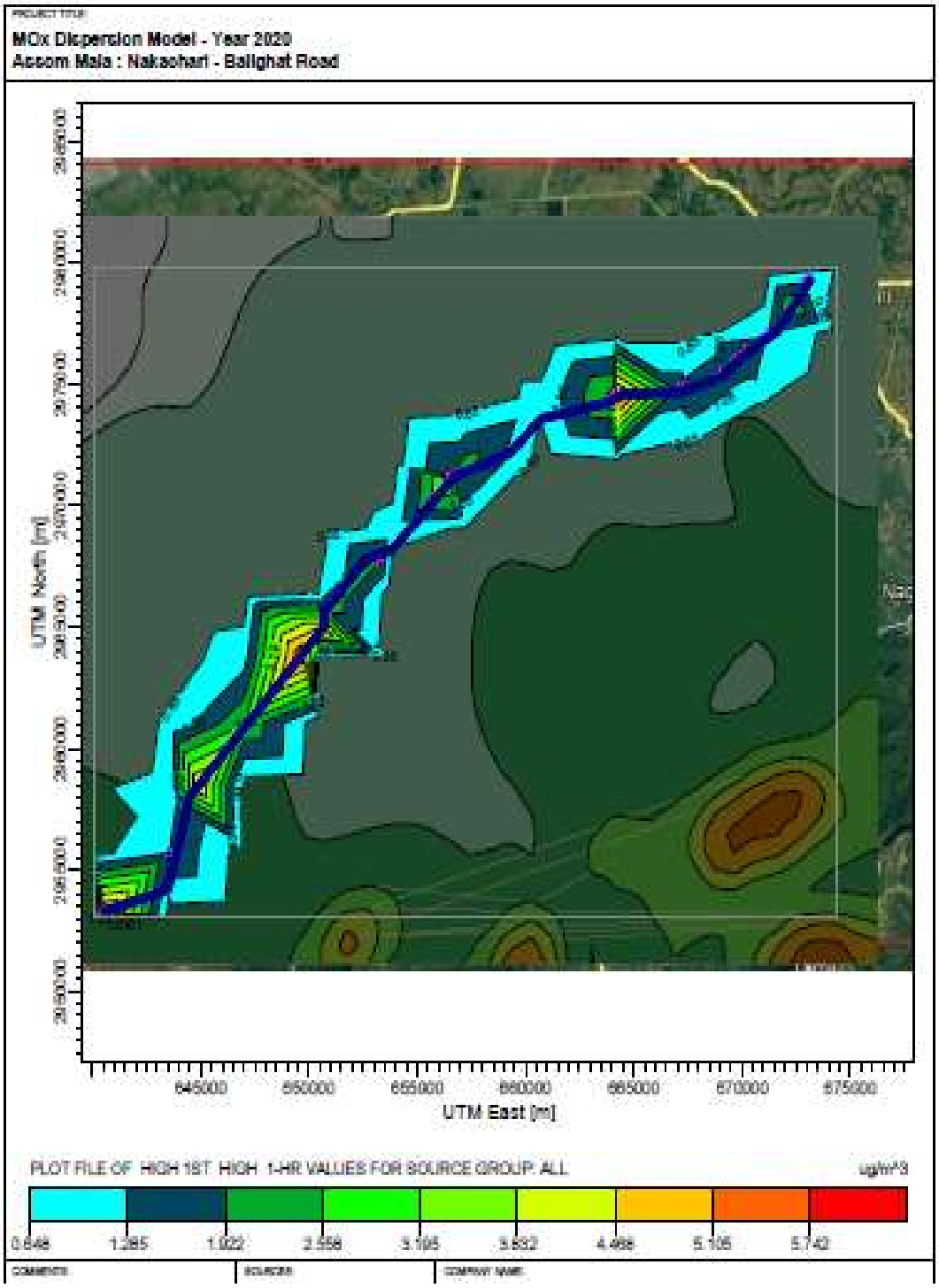


Figure 5-3: Predicted 1-hr Average NOx Concentration due vehicular emission during Year 2020

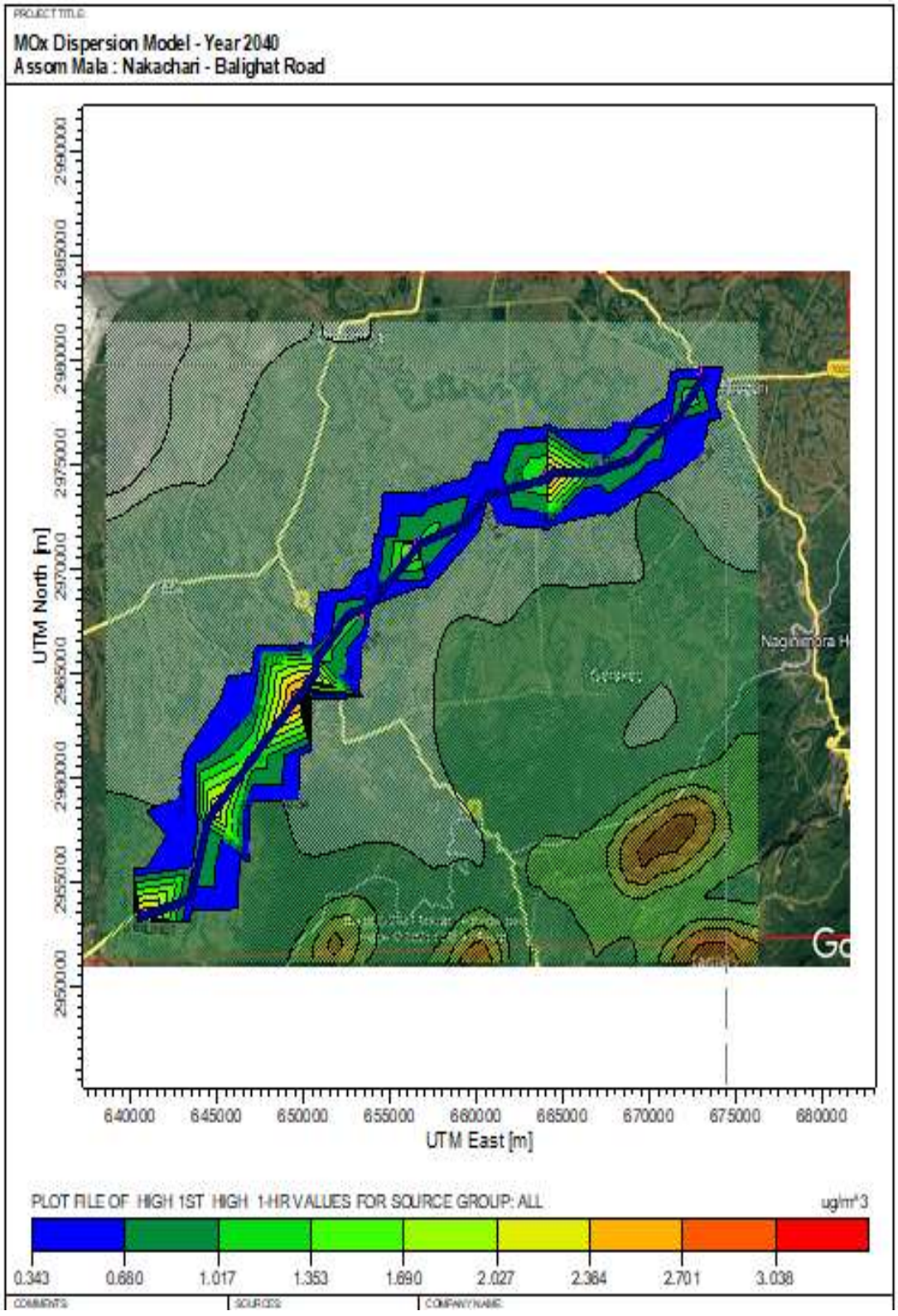


Figure 5-4: Predicted 1-hr Average NOx Concentration due vehicular emission during Year 2040

Mitigation Measures:

- Taxi mode of the vehicles should not be allowed near sensitive receptor like school, college, hospitals, residential area. Etc.
- Plantation should be carried out within the hospital, school, college, housing colony and free plantation should be distributed. This planted rows along the boundary of sensitive receptor would act as attenuation to prevent dust air and dust pollution.
- The state government should make regulation not to allow heavy vehicles inside the residential area during peak traffic hours.
- Road side sweeping in the built-up area should be accrued out by the contractor during maintenance phase.

5.6.2 Noise & Vibration

To assess the noise levels at the various sensitive receptor locations along the corridor during operation phase, the prediction of noise levels has been made for the horizon years 2019, 2035 and 2043, using the FHWA Transport Noise Model version 3.0. TNM computes incremental highway traffic noise at nearby receivers. As sources of noise, it includes noise emission levels for the following vehicle types:

- Automobiles: all vehicles with two axles and four tires -- primarily designed to carry nine or fewer people (passenger cars, vans) or cargo (vans, light trucks) – generally with gross vehicle weight less than 4,500 kg (9,900 lb);
- Medium trucks: all cargo vehicles with two axles and six tires -- generally with gross vehicle weight between 4,500 kg (9,900 lb) and 12,000 kg (26,400 lb);
- Heavy trucks: all cargo vehicles with three or more axles -- generally with gross vehicle weight more than 12,000 kg (26,400 lb);
- Buses: all vehicles designed to carry more than nine passengers; and
- Motorcycles: all vehicles with two or three tires and an open-air driver / passenger compartment

The procedure for prediction of noise levels involves the following steps:

- Identification of various receivers,
- Assemble input parameters, and
- Application of the model.

Input Data used to run the model are as following:

- Traffic Volume - average hourly traffic volume and type data from traffic survey (Refer Chapter 3, Section 3.4). In noise propagation model vehicles are classified onto 5 categories namely: Automobile, Medium Trucks, Heavy Trucks, Buses, and Motorcycles.
- Background noise such as noise generated due to anthropogenic activities, industrial activities, movement/ operation of other noise generating sources, such as trains, aero planes, etc. was not considered in the model as background noise level at all sensitive receptors was not available.
- During the pre-project scenario (Year 2020), average speed was considered as 55 kmph and 40 kmph for buses and heavy vehicles during day time. Furthermore, for other vehicle categories same is considered as 60 kmph during day time. Though the design speed of the project road is 80 kmph, however as a conservative approach, post project speed for heavy

vehicles is considered as 55 kmph during daytime, whereas for other vehicles same is considered as 80 kmph.

- The receptor site condition in terms of existing tree zone, barrier (boundary walls) is also incorporated
- The prediction of noise propagation has considered following three assessment years based on the traffic projections provided in the DPR.
  - 1st Prediction- (Year 202O, i.e. current operation)
  - 2n d Prediction- Year 2030
  - 3rd Prediction- Year 2041

  In order to assess the impact on ambient noise during the operation phase comparisons are made between the baseline noise level and predicted noise level for the year 2020, 2030 and that in year 2041. The outcome of the modeling exercise is presented below.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Tem 1.800-1	**Temple**	642214.52	2953908.5	62.2	69.4	71.7	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 3.900-2	Temple	643554.62	2955148.2	64.0	67.8	70.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 7.000-3	Temple	644439.53	2958107.8	62.4	69.7	70.4	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 10.100-5	Temple	646604.34	2960279.8	53.7	66.9	69.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 12.300-6	Temple	648047.38	2961946.1	54.1	67.9	70.5	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 13.100-8	Temple	648564.72	2962555.4	54.6	68.8	71.0	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
							• The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 14.550-9	Temple	649513.43	2963659.3	57.2	68.7	71.0	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 14.800-10	Temple	649683.45	2963847.9	57.4	68.4	72.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA. • The difference between 2030 and 2041 is more than 3 dBA.
Tem 16.100-11	Temple	650520.85	2964855.8	56.4	70.6	71.2	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 17.300-12	Temple	650994.2	2965783.4	57.9	71.2	72.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 17.350-13	Temple	651033.92	2965836.3	59.6	68.9	72.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA. • The difference between 2030 and 2041 is more than 3 dBA.
Tem 17.700-14	Temple	651210	2966133.3	55.6	70.7	72.8	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				• The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 17.850-15	Temple	651304.48	2966245.8	58	67.5	70.7	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA. • The difference between 2030 and 2041 is more than 3 dBA.
Tem 19.500-16	Temple	652243.49	2967587.1	64.2	70.6	72.9	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 20.500-17	Temple	653179.45	2967808	65.4	72.3	71.7	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 22.800-18	Temple	654813.51	2969372.8	56.3	65.9	68.2	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Msq 25.800-1	Masque	656951.84	2971450.1	58.6	68.9	71.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Msq 27.000-2	Masque	658090.9	2971845.4	58.4	67.6	69.9	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 27.650-19	Temple	658700.62	2972079	59.3	69.8	72.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 30.750-20	Temple	661099.75	2973796	59.3	68.2	70.9	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 31.400-21	Temple	661733.5	2973911.6	58.9	70.0	72.2	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Msq 32.100-3	Masque	662427.21	2974043.8	59.4	70.1	72.8	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Msq 32.800-4	Masque	663108.65	2974154.4	58.8	70.8	73.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
							• The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Eid 34.000-1	Eidga	664169.68	2974610.2	58.6	69.5	70.7	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Msq 34.500-5	Masque	664656.03	2974675.7	58.9	65.1	67.0	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 34.930-22	Temple	665056.79	2974686.3	58.9	70.8	67.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 36.350-23	Temple	666503.54	2974730.3	59.8	66.6	68.2	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 36.550-24	Temple	666701.42	2974759.4	61.2	66.3	68.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 38.600-25	Temple	668681.97	2975296	59.1	74.8	74.2	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
							• The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 38.900-26	Temple	668952.19	2975440.3	59.9	69.7	71.9	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Msq 40.700-6	Masque	670388.53	2976504.3	60.9	69.6	72.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 43.100-27	Temple	672161.15	2978065.2	61.9	67.4	70.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA. • The difference between 2030 and 2041 is more than 3 dBA.
Tem 43.100-28	Temple	672161.23	2978079.1	60.5	67.0	69.5	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 43.230-29	Temple	672232.24	2978139.6	59.8	66.8	70.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA. • The difference between 2030 and 2041 is more than 3 dBA.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Tem 43.400-30	Temple	672354.51	2978286.3	55.8	68.4	70.4	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Msq 43.600-7	Masque	672584.75	2978511.5	64	72.0	73.4	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 43.700-31	Temple	672576.34	2978497.3	64.4	70.8	74.0	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA. • The difference between 2030 and 2041 is more than 3 dBA.
Eid 43.850-2	Eidga	672663.1	2978637.2	65.1	69.1	71.6	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Tem 44.500-32	Temple	672912.66	2979192.7	64.2	72.2	74.3	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
PHC 0.100-1	Public Health Centre	640597.02	2953336.89	52.1	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
							• The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 0.200-1	School	640694	2953367	51.9	54.4	56.7	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 2.150-2	School	642548.26	2953955.9	51.4	53.9	56.2	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 2.550-3	School	642929.91	2954076.08	51.6	54.1	56.4	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 4.430-4	School	643695.48	2955620.57	51.6	54.2	56.4	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 4.700-5	School	643792.47	2955894.41	53.0	55.6	57.8	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 5.950-6	School	644145.8	2957096.44	52.7	55.3	57.5	• The difference between the 2020 noise level and predicted noise level in 2030 the difference

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
							between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 6.500-7	School	644277.97	2957632.67	52.1	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 7.600-8	School	644907.41	2958451.35	52.1	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 8.250-9	School	645339.93	2958935	52.0	54.5	56.8	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 8.900-10	School	645839.78	2959342.37	52.9	55.4	57.7	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 9.450-11	School	646148.72	2959807.94	52.1	54.6	56.8	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Sch 10.100-13	School	646590.29	2960295.15	52.1	54.1	56.4	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 13.250-14	School	648636.49	2962674.89	52.2	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 14.750-15	School	649637.8	2963811.27	52.1	54.7	57.0	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 16.050-16	School	650476.07	2964801.84	52.4	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 17.100-17	School	650824.27	2965662.41	52.4	54.9	57.2	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 17.530-18	School	651108.18	2965970.31	51.5	54.1	56.3	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Sch 19.800-19	School	652475.31	2967774.71	51.9	54.4	56.7	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 20.500-20	School	653159.41	2967798.03	52.7	55.2	57.5	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 22.800-21	School	654760.56	2969406.76	52.2	54.7	57.0	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 22.800-22	School	654799.28	2969359.6	53.3	55.8	58.1	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 23.950-23	School	655617.66	2970170.18	52.0	54.5	56.8	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Clg 24.100-1	College	655731.22	2970268.79	50.9	53.4	55.7	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Sch 24.300-24	School	655865.6	2970417.13	51.2	53.7	55.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 25.100-26	School	656387.68	2971024.27	49.9	52.4	54.7	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 25.500-27	School	656685.87	2971285.26	51.3	53.8	56.1	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 29.450-28	School	660121.88	2973087.79	53.0	55.5	57.7	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 30.450-29	School	660788.96	2973772.16	52.3	54.8	57.0	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 31.100-30	School	661431.76	2973840.36	52.4	54.9	57.2	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Sch 32.100-31	School	662409.63	2974063.11	52.1	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 33.700-32	School	663857.41	2974492.64	52.4	54.9	57.2	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Mds 33.850-1	Madrassa	664020.31	2974542	51.4	53.9	56.2	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 35.050-33	School	665185.4	2974745.81	54.1	56.6	58.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 36.950-34	School	667090.78	2974788.2	52.1	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 37.100-35	School	667232.6	2974846.97	52.1	54.2	56.4	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

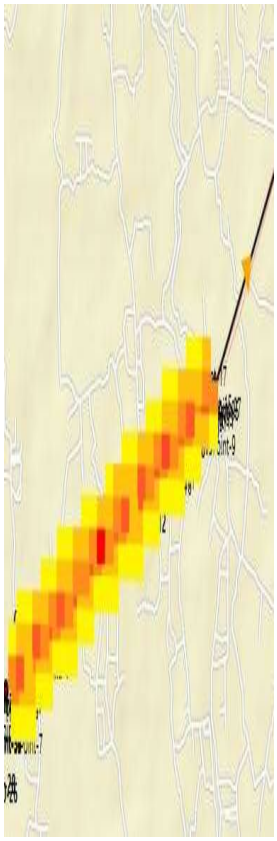
Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
Sch 38.350-36	School	668409.61	2975253.79	51.7	55.1	57.4	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 38.950-37	School	668961.23	2975440.16	52.6	55.6	57.9	• The difference between the 2020 noise level and predicted noise level in 2030 is 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 39.400-38	School	669336.38	2975693.09	53.1	54.6	56.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 39.800-39	School	669640.98	2975958.23	52.1	53.9	56.1	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 40.400-40	School	670123.91	2976311.19	51.3	55.8	58.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 41.350-41	School	670877.77	2976884.73	53.3	54.2	56.5	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB.

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2020	Predicted Noise Level in 2030	Predicted Noise level in 2041	Remarks
		Easting	Northing				
							• The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 41.650-42	School	671122.56	2977072.03	51.7	55.8	58.1	• The difference between the 2020 noise level and predicted noise level in 2030 is more than 3dB. • The difference between the noise level in 2030 and 2041 is less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Hsp 43.150-1	Hospital	672204.07	2978085.93	53.3	53.7	56.0	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Sch 43.300-43	School	672299.54	2978196.33	51.2	53.7	56.0	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.
Clg 44.700-2	College	672982.77	2979366.95	51.2	53.7	55.9	• The difference between the 2020 noise level and predicted noise level in 2030 the difference between the noise level in 2030 and 2041 are both less than 3dB. • The predicted noise level in 2020, 2030 and 2041 exceeds the limit i.e. 50dBA.

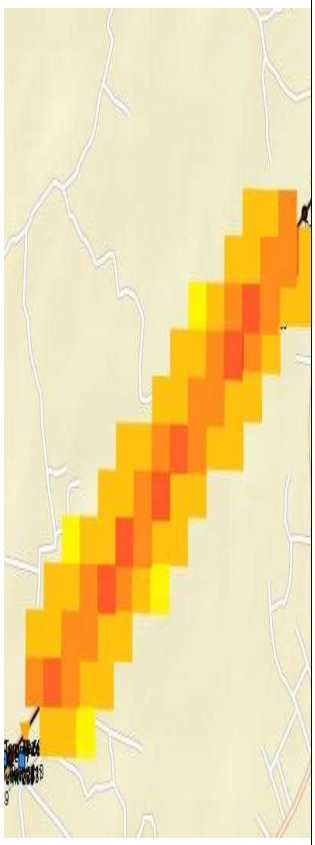
Noise levels (Leq) near the receivers are found to be marginally higher than desired levels for the respective categories. The maximum predicted value 74.3 dB(A) is recorded at the receiver located at chainage 44.500 km. It is evident from the above tables that there will be significant increase in the noise levels due to increase in traffic intensity as well as average speed of vehicles over the road's design life.

The predicted noise level across the project road for the model years are also presented below:

Grid Noise Assessment along the Project Roads in 2020



Grid Noise Assessment along the Project Roads in 2030



Grid Noise Assessment along the Project Roads in 2041

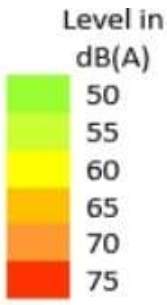


Figure 5-5: Grid Noise Assessment

noise level for the base year (2020) is mostly above 50 dB(A) and likely to be in non-compliance with the statutory limit for various land use category. This is in conformance with the baseline noise monitoring results presented Sec. 4.2.8. Also, during the model years 2030 and 2041, the ambient noise level near the road will be above 50 dB(A) and likely to exceed the prescribed noise levels. In certain locations, as indicated in the table above, although the noise level may not exceed the statutory limit but IFC definition of significant noise impact i.e. increase in noise level by more than 3dB(A) is anticipated in all locations.

Mitigation Measure

To reduce noise and vibrations, noise barriers in the form of compound wall is proposed. In case ofspace crunch, the use of concrete screens is also suggested. The noise barrier wall shall beconstructed by excavation of foundation, laying of brick masonry wall up to a height of 2m aboveground, plastering and coping as per the direction of the engineer and as laid in the specification. Creepers and paints shall be used in consultation with the affected community to give an aestheticlook. Shade and flowering trees shall be planted within the boundary of the

sensitive receptor, between the building line and the compound wall, wherever space shall be available, 5m center tocenter.

The measures adopted for noise attenuation is given below

- Plantation within the premises if space available for plantation
- Raising of existing boundary wall / construction of new wall up to 2m height
- Planting creepers to provide aesthetic view

In urban areas the boundary wall can be painted with posters to provide aesthetic views. Theoption of posters or creepers shall be agreed by the school / hospital administrator.

Impactof/on	severity	Duration	Extent of Impact (after Mitigation)
Noise Environment	**Minor**-Few Exceedance of Statutory or prescribed limits but assessed to be ALARPN complaint from third parties or governmental body	**Transient**	**Δ**

Mitigation Measures for Operation Phase

Noise level is likely to increase due to increased traffic. Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch and speed limitation and honking restrictions may be enforced near sensitive locations. The effectiveness of noise mitigation should be monitored and if need be, solid noise barrier shall be placed.

5.6.3 Land and Soil

Better access can lead to the conversion of agriculture land for residential and commercial purposes close to roads and especially in a rural and urban area.

Mitigation Measures: The EA may explore the feasibility of restricting about 30 m area either side of the road as no development zone on the line restriction is imposed for National Highways Authority of India.

5.6.4 Soil Erosion

No impact on soil is anticipated during the operation phase of the project except bridge approaches where unexpected rainfall may erode the embankment formation and deterioration of borrow areas if not rehabilitated properly.

Mitigation measures: Embankment stabilization shall be check periodically during the operation stage and suitable stabilization measures shall be taken wherever any erosion is identified. Borrow areas will also be rehabilitated following the guidelines given inAnnexure8.

5.6.5 Ground Water

No impact is anticipated on groundwater due to the project during the operation phase of the project hence, no specific mitigation measure is proposed.

5.6.6 Surface Water Bodies

No major or long-term impact is anticipated during the operation phase on the surface water bodies due to the project implementation activities. Oil contaminated runoff from the road during monsoon will have minimal impacts considering their low concentration.

5.6.7 Hydrology and Drainage

Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions will be regularly conducted.

5.6.8 Impact on Biological Environment

Terrestrial ecology

Most of the project road stretch passes through agricultural areas and built-up areas and there are no National Parks, Wildlife Sanctuaries and other eco-sensitive areas nearby. No Presence of Endangered/ Schedule - I species in the project area confirm by site visit as well as consultation with community and Forest/Wildlife department.

The nearest protected area from the project road is the Gibbon Wildlife Sanctuary which is at a distance of 6 km (approx.) from the project road. The traffic – animal conflicts during the operation stage shall be resolved by implementing speed calming mitigation measures such as road humps, rumble strips, speed limits, sign boards etc.

The acquisition of productive agricultural land at some stretches is inherent to the road development projects. The loss of crops on productive agricultural land is inevitable during construction stage due to operating heavy vehicles.

It is essential to make provisions for the transportation of agricultural equipment and animal crossing wherever necessary by providing service roads, speed breakers (road humps, rumble strips, signboards, etc.). Although situation does not warrant for the provision of exclusive underpasses, all possible efforts shall be made to avoid animal- traffic conflict arising out of proposed improvement of project roads.

There is a scope of slight impact to local domestic animals, which graze in the area especially after the road is constructed. Increased vehicle movement in the area might lead to accidents involving animals. Apart from this, micro-ecosystems developed on the roadside with the birds, animals and insects using the plantation over the years would be lost due to loss of their habitat.

Road widening option is made is such a way as to minimize the cutting of trees. Compensatory plantation in 1:10 ratio with preference to fast-growing local species has been proposed under the project to address this impact.

Elephant Movement

The project road lies at a distance of approx. 6 km from the Gibbon wildlife sanctuary which is a seasonal home to aprrox 30-40 elephants. The team carried out survey and found there is no movement of elephants in the proposed road section which is also confimed by forest officials and local community.

Mitigation Measures:

- The Contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal.
- Mandatory / Regulatory sign for entire section of project road for every 2 km at alternate side is proposed.
- The compensatory plantation shall act as the new habitat for the birds, animals and insect species
- If any animal is found near the construction site at any point of time, the contractor shall immediately upon discovery thereof contact authorized wildlife rescuer or Forest Dept for rescue of snakes or other distressed wildlife.
- Special care of Ponds shall be taken since the wildlife and Public dependent on these water bodies.
- The team suggest installation of few signage at roads falling close to protected area.

Aquatic Ecology

No impact is envisaged during the operation phase of the project and hence no mitigation proposed. However, periodic surveillance shall be conducted to check erosion and siltation in major water bodies.

5.6.9 Community Health and Safety

During the operation phase, the increase in the number of motorized road users traveling at higher speeds also increases the chances of injuries and fatalities from road crashes.

Mitigation Measures: Adequate caution signage near the school, sensitive locations, speed control, caution notes shall be fixed at appropriate locations. These shall be preferable of PCC with Retro-reflective paints. Steel base signage shall be avoided to prevent theft of the same. Crash barriers shall also be installed at appropriate locations particularly near the school to provide safety to school children. The provision of speed breakers shall be made near schools and religious places.

5.7 Cumulative and Induced Impacts

Cumulative impact is described as: “The combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/ or beneficial impacts that cannot be expected in the case of a stand-alone project.

Induced Impacts are the adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur at later or at a different location.

The improved road will provide better connectivity to NH-702C and NH-2. The road improvement work will provide improved access from Nakachari to Balighat and improved

road conditions will reduce the travel time. With better connectivity to Nakachari and Balighat the people of nearby villages will get access to better health care and educational facilities.

Economic activities supporting transport like fuel stations, automotive repair shops, lodging, and restaurants are expected to increase with increase of traffic and induce development in the project area. Increase in agro-industrial activities are also expected to take advantage of improved access to urban centers where there are higher demand and better prices for agricultural products. Further the increased industrial activities will significantly reduce migration. The improved road will provide better connectivity and result in (i) Reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, educational and other infrastructural facilities (iv) enhanced tourism activities in the area and state which in many terms will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

In terms of environment precaution issues the improved road surface is expected to result in less dust and noise due to traffic plying on the damaged roads. However, the increased traffic due to the improved road will generate more air pollution due to vehicle exhaust and noise. The smoother road conditions will also result in increase of traffic speeds, hence creating more risks for accidents amongst traffic users as well as the local communities in the subproject area of Jorhat and Sivasagar district.

For addressing the impacts of air pollution and noise, regular maintenance of the road surface, maintenance and monitoring of newly planted trees and installation of noise barriers where necessary have been included in the ESMP for implementation during operation stage. For addressing safety related impacts, regular maintenance of the road furniture includes safety related furniture, enforcing rules against encroachment of structures and sensitive structures inside the ROW and implementation of the emergency management system has been included in the ESMP for implementation during operation stage.

The cumulative impact is sum of the impact expected by the project discussed in this EIA report and other project which is planned or under implementation in the study area. The cumulative impact is sum off all the environmental components i.e. for e.g. total number of tree felling involve in all projects, land acquisition, total forest area effect etc. need to be addresses. The cumulative impact expected by all the project area is highlighted in **Table 58**.

Table 58: Cumulative Impact Expected Due to Project Development

Sr. No.	Features Affected	Name of Project	Cumulative Impact
1	No of tree Felling Involve	A20_1 (Sivasagar to Chumoni)	578
2	Agricultural Land Affected	A20_1 (Sivasagar to Chumoni)	The details will be provided after Social Impact Assessment Report is prepared
3	Forest Land Affected	A20_1 (Sivasagar to Chumoni)	No forest land will be affected due to the proposed project development
4	Increase in emission rate	A20_1 (Sivasagar to Chumoni)	The CO_2 emission rate will increase by 16,914.59 tons/year
5	Influx of labor	A20_1 (Sivasagar to Chumoni)	200 labors

Sr. No.	Features Affected	Name of Project	Cumulative Impact
6	Structure Affected	A20_1 (Sivasagar to Chumoni)	The details will be provided after Social Impact Assessment Report is prepared
7	Incremental load due to NO2, SO2, PM 2.5 and CO	A20_1 (Sivasagar to Chumoni)	The widened road, particularly in the present more congested urban sections together with the improved road surface, will reduce congestion. This will have the impact of encouraging a more regular and uniform speed. With the same traffic flows at this increased speed, emission levels and noise levels will be reduced. However, the projected increase in traffic flows may have the impact of increasing the overall vehicle emissions and noise levels.
8	Land Acquisition	A20_1 (Sivasagar to Chumoni)	The details will be provided after Social Impact Assessment Report is prepared
9	Forest Area Affected	A20_1 (Sivasagar to Chumoni)	No forest area will be affected due to the proposed project development

5.8 Potential Environmental Enhancement/ Protection Measures

5.8.1 Traffic Management Plan

A traffic management plan is site-specific and needs to cover the design, implementation, maintenance and assure temporary traffic management measures while the work or activity is being carried out along the road corridor. It explains how road users - including cyclists and pedestrians - will be directed around a work site, or other temporary road disruption, to minimize inconvenience while providing safe conditions for both the road user and those carrying out the activity.

Any traffic management plan must contain the specifics of the work being done, such as the specific location, date/times of works, who is doing the work, the work methodology, temporary speed limit information (as needed), contact details, as well as a traffic management diagram, and it must comply with the Code of Practice for Temporary Traffic Management.

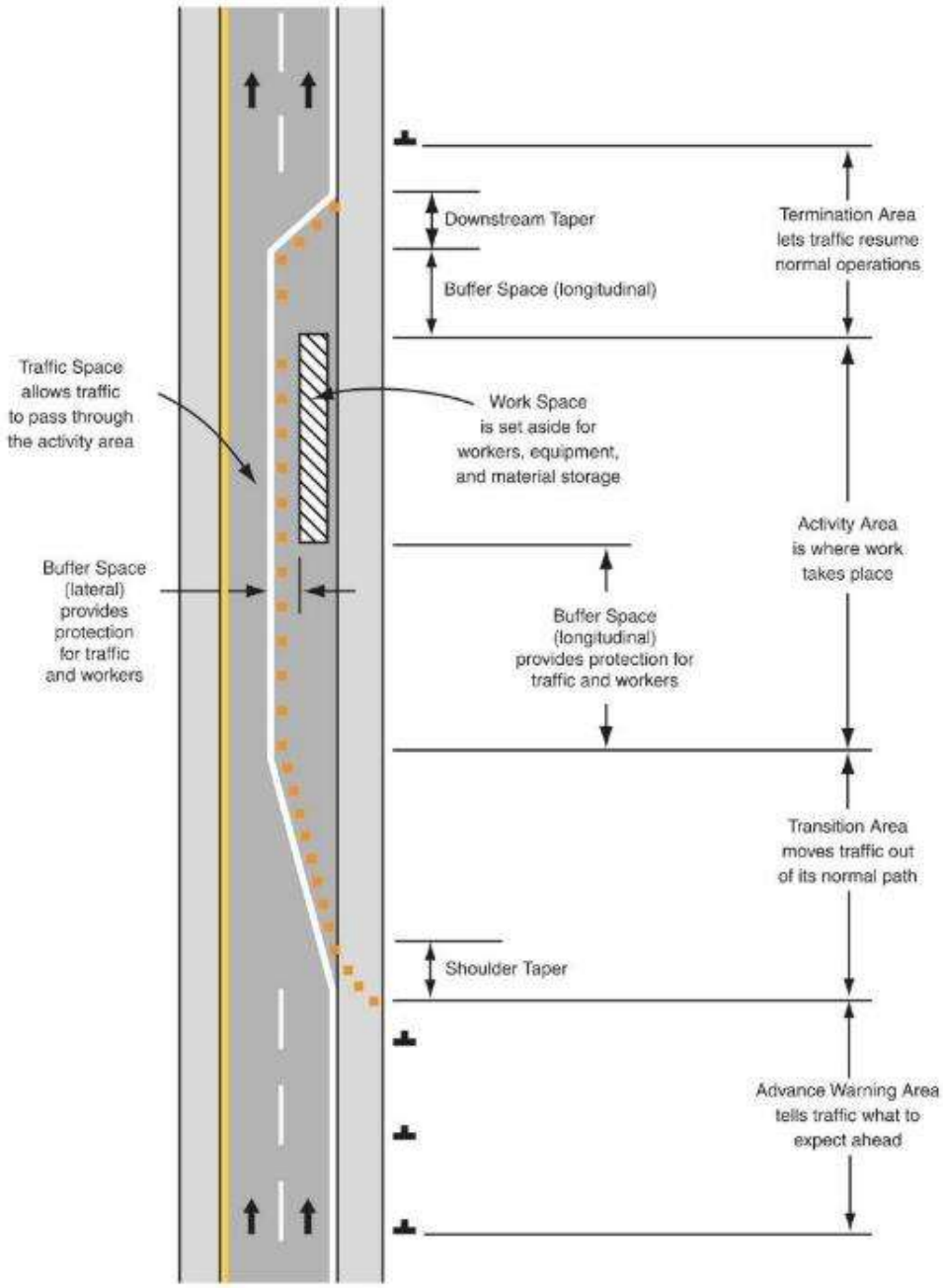


Figure 5-6: Traffic Management Diagram

5.8.2 Road Safety Plans – (During Construction)

A work zone is an area of a highway where road user operating conditions are changed because of construction and maintenance activities. The construction and maintenance activities would involve movement of workers and construction equipment requiring dedicated space for performing the activities and moving materials for the activities. The presence of regular traffic and works traffic makes the work zone a potential zone of conflict

resulting in disruption to normal traffic and hazards. A work zone is typically distinguished by the presence of signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating flashing or oscillating or strobe lights installed on roadside or a vehicle-mounted sign posted to indicate the work zone, and continues to delineate the channelized vehicle paths till up to the end road work sign.

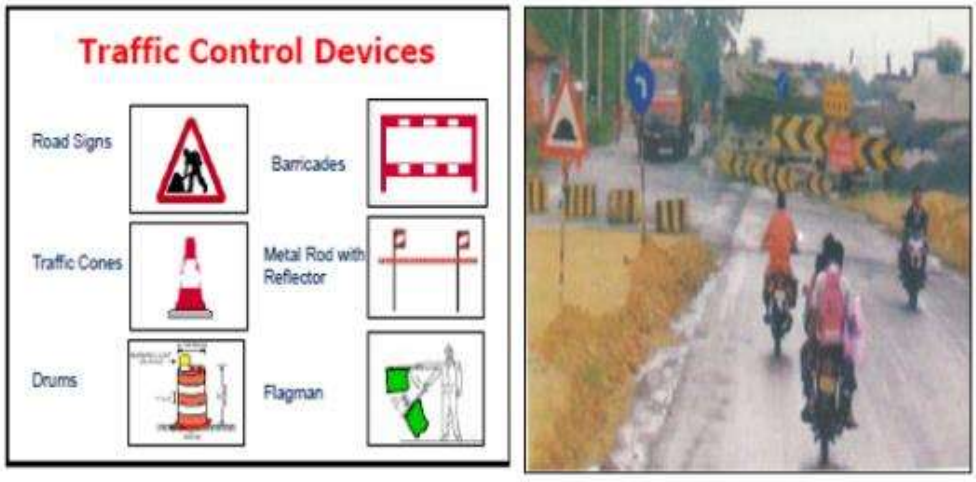


Figure 5-7: Traffic Control Devices at traffic diversion locations

5.8.3 Road Safety Plans – (Post Construction)

At this stage the observations are given for the checking of Whatever the provision and improvement recommended during Road safety Audit at various stages i.e. Existing audit stage, Preliminary design stage and Detailed design stage and execution of same during construction stage. On the basis of this observations the appropriate recommendations are provided as final improvement proposal at post construction/ pre-opening stage.

5.8.4 Health and Safety Plan for COVID19 Pandemic

5.8.4.1 Introduction

- This document is intended to supplement formal Health & Safety policies, procedures and plans that the contractor has in place for its employees and staff working on Asom Mala project. Hence, this document is not intended to replace any formalized procedures currently in place for the Contractor. Where this guideline does not meet or exceed the standards put forth by the Contractor, the Contractor shall abide by the most stringent procedure available.
- This approved project-specific Health and Safety Plan (H&SP) shall be modified to require that the COVID-19 Officer2 (supervised by the contractor's environmental and health and safety officer) at the Contractor's worksite (appointed by Contractor and agreed by PIU) submit a written daily report to the Client's Representative (PIU Head). The COVID-19 Officer shall certify that the Contractor and all subcontractors are in full compliance with these guidelines.

- The COVID-19 officer (The existing safeguards officer OR health & safety officer OR supervisor of the contractor can be designated as COVID-19 officer) should be present on-site at all times by undergoing the training available at:
  - https://www.who.int/emergencies/diseases/novel-coronavirus-2019/training/online-training
  - https://openwho.org/courses/eprotect-acute-respiratory-infections,
  - https://openwho.org/courses/COVID-19-IPC-EN
- Any issue of non-compliance with these guidelines shall be a basis for the suspension of work. The Contractor will be required to submit a corrective action plan (on the next day or immediately as per the nature of issue) detailing each issue of non-conformance and a plan to rectify the issue(s). The Contractor will not be allowed to resume work until the plan is approved by the Client (PIU). Any additional issues of non-conformance may be subject to action against the Contractor's as health & safety/safeguard clauses of the contract.
- Construction sites operating during the Covid-19 pandemic need to ensure they are protecting their workforce and minimizing the risk of spread of infection.
- This guidance is intended to introduce consistent measures on sites of all sizes in line with the Government's recommendations on social distancing.
- These are exceptional circumstances and the industry must remain abreast of and comply with the latest Government advice on COVID-19 at all times.
- The health and safety requirements of any construction activity must also not be compromised at this time. If an activity cannot be undertaken safely due to a lack of suitably qualified personnel being available or social distancing being implemented, it should not take place.
- It is to be noted that emergency services are also under great pressure and may not be in a position to respond as quickly as usual.
- Sites should remind the workforce at every opportunity of the Worksite Procedures which are aimed at protecting them, their colleagues, their families and the Assam population.

If a worksite is not consistently implementing the measures as mentioned in the health & safety plan, it may be required to shut down.

5.8.4.2 Principles of Worker Protection

- Consistently practice social distancing
- Cover coughs and sneezes
- Maintain hand hygiene
- Clean surfaces frequently

5.8.4.3 Maximum Precaution for Persons/Labourers Reporting to Work

- IF SICK, STAY HOME!
- IF SICK, GO HOME!
- IF SOMEONE SICK, SEND THEM HOME!

Contractor to provide face masks (of the type approved by Government for use to protect persons from COVID-19) to all persons working in or visiting the worksite. This along with

procedures set out in this document is for maximum precaution to protect all persons/labourers at all times.

5.8.4.4 Covid-19 Typical Symptoms

- Fever
- Cough
- Shortness of Breath
- Sore Throat

All persons at the worksite should have their temperature screened by COVID-19 officer with Infrared Thermometer (handheld non-contact).

5.8.4.5 Self-Attestation by Persons/Labour Prior to Work

Prior to starting a work (on daily basis), each labour/ worker will self-attest to the supervisor:

- No signs of COVID-19 symptoms within the past 24 hours.
- No contact with an individual diagnosed with COVID-19. (contact means living with a positive person, being within 6 ft of positive person OR sharing things of positive person)
- Not undergone quarantine or isolation (in case of any labourer /worker who has been quarantined or isolated previously, the engagement shall be only after obtaining the requisite clearance)

The engagement of workers falling in the high-risk category such as workers over the age of 55 years, with underlying medical conditions or health issues, etc. should be done only after obtaining the requisite clearance from trained and registered medical practitioners.

The self-attestation would be verified in collaboration with trained and registered medical practitioners deployed at site through discussions with laborers /workers and/or preliminary checks such as temperature checks, etc. prior to their engagement at site.

In addition, the Contractor shall mandatorily follow all medical test requirements for the workers prior to their engagement and/or mobilization at site as per the guidelines issued by the Central and State government agencies and WHO from time to time.

Persons/Labourers showing COVID-19 symptoms or not providing self-attestation shall be directed to leave the work site and report to the fever clinic/quarantine centre immediately. Labour not to return to the work site until cleared by fever clinic/quarantine centre.

5.8.4.6 General Direction

- No handshake, Only Namaste
- Non-essential physical work that requires close contact between workers should not be carried out
- Work requiring physical contact should not be carried out
- Plan all other work to minimize contact between workers
- Wash hands often (every 1-2 hrs. or frequently as possible) with soap for at least 20 seconds
- Use hand sanitizer
- No person should enter the work site other than the authorized persons mentioned by supervisor during start of work

- All must implement social distancing by maintaining a minimum distance of 6-feet from others at all times to eliminate the potential of cross contamination.
- Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing i.e., 6 ft from others.
- Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion
- All individual work group meetings/ talks should follow social distancing
- At each job briefing/toolbox talk, employees are asked if they are experiencing any symptoms, and are sent home if they are
- Each worksite should have laminated COVID-19 safety guidelines and handwashing instructions
- All restroom/toilet facilities should be cleaned (min twice a day), and handwashing facility must be provided with soap, hand sanitizer and paper towels
- All surfaces should be regularly cleaned, including mobiles, tabletops /surfaces, door handles, laptops, records, etc.
- All common areas and meeting areas are to be regularly cleaned (min twice a day) and disinfected at least twice a day
- All persons to maintain their own water bottle, and should not be shared.
- To avoid external contamination, it is recommended everyone bring food from home
- Please maintain Social Distancing separation during breaks and lunch.
- Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough /sneeze into your upper sleeves or elbow. Do not cough or sneeze into your hands.
- Clean your hands after coughing or sneezing thoroughly by using soap and water (minimum for 20 seconds). If soap and water are not available, please use a hand sanitizer. The Contractor shall ensure adequate quantities of sanitizer and soap are made available at all locations including site offices, meeting rooms, corridors, washrooms /toilets, etc. as appropriate.
- Avoid touching eyes, nose, and mouth with your hands
- To avoid sharing germs, please clean up after Yourself. DO NOT make others responsible for moving, unpacking and packing up your personal belongings
- If you or a family member is feeling ill, stay home!
- Work schedules are adjusted to provide time for proper cleaning and disinfecting as required.

5.8.4.7 Work-Site Prevention Practices

- At the start of each shift, confirm with all employees that they are healthy and inform all workers of reusable and disposable PPE.
- Outside person(s) should be strictly prohibited at worksite
- All construction workers will be required to wear cut-resistant gloves or the equivalent.
- Use of eye protection (reusable safety goggles/face shields) is recommended. The supply of eye protection equipment to the workers is considered as a standard part of PPE during construction works.

- In work conditions where required social distancing is impossible to achieve, such employees shall be supplied with standard face mask, gloves, and eye protection.
- All employees shall drive to work site as per the prevailing guidelines of the Government.
- When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant (with 1% sodium hypochlorite solution daily) prior to entry. Adequate quantity of the disinfectant shall be provided by the Contractor at all such site-specific locations.
- Workers should maintain separation of 6' from each other.
- Multi person activities will be limited where feasible (two persons lifting activities)
- Gathering places on the site such as sheds and/or break areas will be eliminated, and instead small break areas will be used with seating limited to ensure social distancing.
- Contact the cleaning person of the worksite and ensure proper COVID-19 sanitation processes. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning.
- The Contractor shall make available adequate supply of PPE and chemicals while the threat of COVID-19 continues.
- Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops and vehicles
- All employees to maintaining good health by getting adequate sleep; eating a balanced, healthy diet, avoid alcohol; and consume plenty of fluids.
- Continuation of works in construction project with workers available on site and no workers to be brought in from outside
- The site offices shall have adequate ventilation. The air conditioning or ventilation systems installed at the site offices would have high-efficiency air filters to reduce the risk of infection. The frequency of air changes may be increased for areas where close personal proximity cannot be fully prevented such as control rooms, elevators, waiting rooms, etc.
- The Contractor shall carry out contactless temperature checks for the workers prior to site entrance, during working hours and after site works to identify persons showing signs of being unwell with the COVID-19 symptoms.

5.8.4.8 Washing Facility

- All worksites should have access to toilet and hand washing facility.
- Providing hand cleaning facilities at entrances and exits. This should be soap and water wherever possible or hand sanitizer if water is not available
- Washing facility with hot water, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees
- All onsite workers must help to maintain and keep stations clean
- If a worker notices soap or towels are running low or out, immediately notify supervisors. Proactively supervisor should make sure shortage situation never occurs.
- Garbage bins will be placed next to the hand wash facility for discarding of used tissues/towels with regular removal and disposal facility (end of each day)

5.8.4.9 Cleaning Procedures

Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning.

Each worksite should have enhanced cleaning and disinfection procedures that are posted and shared including sheds, gates, equipment, vehicles, etc. and shall be posted at all entry points to the sites, and throughout the project site. These include common areas and high touch points like

- Taps and washing facilities
- Toilet flush and seats
- Door handles and push plates
- Handrails on staircases and corridors
- Lift and hoist controls
- Machinery and equipment controls
- Food preparation and eating surfaces
- Telephone equipment / mobiles
- Keyboards, photocopiers and other office equipment

Re-usable PPE should be thoroughly cleaned after use and not shared between workers

5.8.4.10 Labour Camp

Contractor shall follow a zero-tolerance policy on wearing of masks.

Masks to be provided to all the persons/labourers for use at the camp site as well as at the worksite. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with disposable gloves, gown and face mask for each cycle of cleaning.

Toilet Facility

- Restrict the number of people using toilet facility at any one time e.g. appoint one welfare attendant among the labours.
- Wash hands before and after using the facilities
- Enhance the cleaning regimes for toilet facilities particularly door handles, locks and the toilet flush
- Portable toilets should be avoided wherever possible, but where in use these should be cleaned and emptied more frequently
- Provide suitable and sufficient rubbish bins for hand towels with regular removal and disposal.

Eating/snacks Arrangements

- With eateries having been closed (restricted) across Assam, providing permanent (till society is safe from COVID-19) on-camp/ off-camp cook/ helpers can be implemented. Make sure that the “Guidelines for food handling, preparation and distribution during COVID-19” and its regular updates are being followed.
- Whilst there is a requirement for construction camps to provide a means of heating food and making hot water, these are exceptional circumstances and where it is not possible to introduce a means of keeping equipment clean between use, etc. must be removed from use.
- Contractor to arrange all daily need items and grocery at site itself and no worker is allowed to go to shops for daily need items.

- Dedicated eating areas should be identified on camp to reduce food waste and contamination
- Break times should be staggered to reduce congestion and contact at all times
- Hand cleaning facilities or hand sanitizer should be available at the entrance of any room where people eat and should be used by workers when entering and leaving the area
- Workers should sit "6 feet" apart from each other whilst eating and avoid all contact
- Where catering is provided on camp, it should provide pre-prepared and wrapped food only
- Payments should be taken by contactless options wherever possible
- Crockery, eating utensils, cups etc. should be avoided wherever possible
- Drinking water should be provided with enhanced cleaning measures of the tap mechanism introduced
- Tables should be cleaned between each use
- All rubbish should be put straight in the bin and not left for someone else to clear up; only covered pedal operated bins should be used and the bins should be cleared and cleaned regularly, with strict adherence to safety protocols for disposal and hygiene maintenance (including proper PPE's such as gloves, mask and apron worn by the waste handler/cleaner and disposal at a designated place);
- All areas used for eating must be thoroughly cleaned at the end of each break and shift, including chairs, door handles, etc.

Changing Facilities, Showers and Drying Areas

- Introduce staggered start and finish times to reduce congestion and contact at all times
- Introduce enhanced cleaning of all facilities throughout the day and at the end of each day
- Consider increasing the number or size of facilities available on camp if possible
- Based on the size of each facility, determine how many people can use it at any one time to maintain a distance of two meters
- Provide suitable and sufficient garbage bins in these areas with regular removal and disposal.
- Visitor log should be strictly maintained that the labour camp.

COVID-19 officer will ensure compliance with prevention issues at the labour camp(s).

5.8.4.11 Updates on Covid-19

The Contractor shall be in touch with the Department of Health & Family Welfare and Labour Department to identify any potential worksite exposures relating to COVID-19, including:

- Strictly follow the guidelines issues by Ministry of health and OSHA
- Other workers, vendors, inspectors, or visitors to the worksite with close contact to the individual
- Labour Camps / Work areas such as designated workstations or rooms/sheds
- Work tools and equipment
- Common areas such as break rooms, tables and sanitary facilities

Also refer the following websites from time to time for regular updates.
https://www.mohfw.gov.in/
https://covid19.assam.gov.in/

5.8.4.12 Training

- PIU to ensure all workers get training on above requirements before start of any construction activity
- During construction period frequent visual and verbal reminders to workers can improve compliance with hand hygiene practices and thus reduce rates of infection. Handwashing posters should also be displayed at work site and labour camps

5.8.4.13 EMERGENCY CONTACT

- Provide emergency contact number(s) at work site and labour camp for reporting COVID-19 symptoms

Ensure all staff and personal use the Aarogya Setu app, recommended by GOI for tracking COVID-19 patients.

6. Climate Change Impacts and Risks

A rapid increase in the number of motor vehicles on road in Assam has been observed over the past decade. Due to the lack of adequate public transport systems where buses comprise only 1% of the total population of vehicles on road, and due to the availability of easy loans, most of the people are aspiring to buy their vehicles. As a result, two-wheelers are 57% of the total vehicle mix in the State, and cars follow suit with a 21% share in 2013-14. The road transport sector is a direct consumer of fossil fuel, emits GHG into the atmosphere. With an increase in population and per capita rise in the number of personal vehicles, GHG emissions are likely to rise. The use of the public transport system needs to control future emissions in the future and to ease off the pressure of vehicles on the roads, hence. This would require policy changes in the way lending is done by banks, enabling fuel mix with biofuels, and behavioral changes of the population whereby they use more and more non- motorized transport at short distances and public transport for long distances. The Guwahati city is already in the process of developing the Bus Rapid Transit system, but further development of the public transport system is required. Other major cities also need to embrace the same for an orderly functioning road transportation system in the cities of Assam.

6.1 Climate Change Mitigation

The Transport Emissions Evaluation Model for Projects (TEEMP) developed by Clean Air Asia was utilized to assess the CO_2 gross emissions with and without the project improvements. The main improvement from the project that was considered for the model are better surface roughness with initially 6 m/km which may deteriorate over a period but not less than 2 m/km and widening of roads from the single/intermediate lane (3.5/5.5 m) to two lanes with paved shoulder (7 m). These were translated into impacts on traffic speed and hence fuel consumption. The model also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes, and volume/capacity saturation limit.

Information that was fed into the model for projecting the CO_2 emissions were:

- The project will rehabilitate and widen approximately 45.000 km of the Major District Road in the State of Assam.
- The road configuration will change from anintermediate lane to two lanes with a carriageway width of 7 m with 1.5 m hard shoulder on both sides. The road will have an asphalt concrete surface.
- The surface road roughness is mostly 6 m/km and will be improved to 2.0 m/km, which may further reach up to 3.5 m/km during 5 years of road operations. Resurfacing of the road would be required after 5 years.
- The design life of the road is 20 years.
- Other improvements include the repair or reconstruction and improvement of culverts, longitudinal and cross drains, and removal of irregularities on the existing vertical profile and road safety appurtenances.

Table 59: Traffic Composition

Vehicle Type	Traffic Composition (%)
Two Wheelers	48.21
3 Wheelers	3.22
Car/ Vans/ Jeeps	20.00
Mini Buses	0.16
Standard Buses	0.50
LCV	7.09
2-Axle	3.04
3-Axle	0.18
Multi-Axle	0.04
Tractor with Trailer	0.01
Tractor Without Trailer	0.01
Cycle	17.30
Cycle Rickshaw	0.08
Hand Cart	0.15
Bullock Cart	0.00
Horse Cart	0.00
Total	100

Source: Traffic Study

Road capacity of 3,496 PCU/lane/day for was adopted for this project based on projection at the end of design year (2043). Emission factors were mostly taken from the CPCB/MOEF (2007) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health, Relevant Emissions from in-Use Indian for three-wheelers rickshaw as presented in **Table 60**. Emission factors were taken from the CPCB/MOEF&CC (2007) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as shown in **Table 60.**

Table 60: CO_2 Emission Factors

VehicleType	*Petrol*	*Diesel*	*LPG/CNG*
2-Wheel	*1.37kg/l*		
3-Wheel	*2.12kg/l*	*2.58kg/l*	*3kg/l*
Cars/bus	*2.24kg/l*	*2.58kg/l*	

1. *All 2-wheel vehicles are run onpetrol; average fuele conomy:50km/litres*
2. *All3-wheelvehicles are run on diesel; average fuele conomy:30km/litres*
3. *50%of the cars/bus are run on petrol while the remaining are run by diesel; average fuel economy:15km/litres*

For 45.000 km of road construction would result in emission of approximately 4635 tCO2eq. (Source: Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation - A Toolkit for Developing). This value if based on estimation of materials required to upgrade /construct of rural road which include cement, steel, gasoline, diesel, and bitumen etc.

Estimated carbon emissions:

Construction Phase

The GHG emissions during a road construction project involve the following major sources:

- *Transport emissions owing to transportation of man and material*
- *Material emissions owing to extraction/production of construction materials*
- *Machines emissions owing to consumption of fuel by engines used in construction*

A detailed study conducted for the World Bank titled "Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation- A Toolkit for Developing Countries" established the typical GHG emission rate in terms of ton CO_2eq per km of road construction. According to this study, for Rural Road-DBST, GHG emissions due to material production is based on estimation of materials required to upgrade /construct of rural road which include cement, steel, gasoline, diesel, and bitumen etc. are the main contributor.

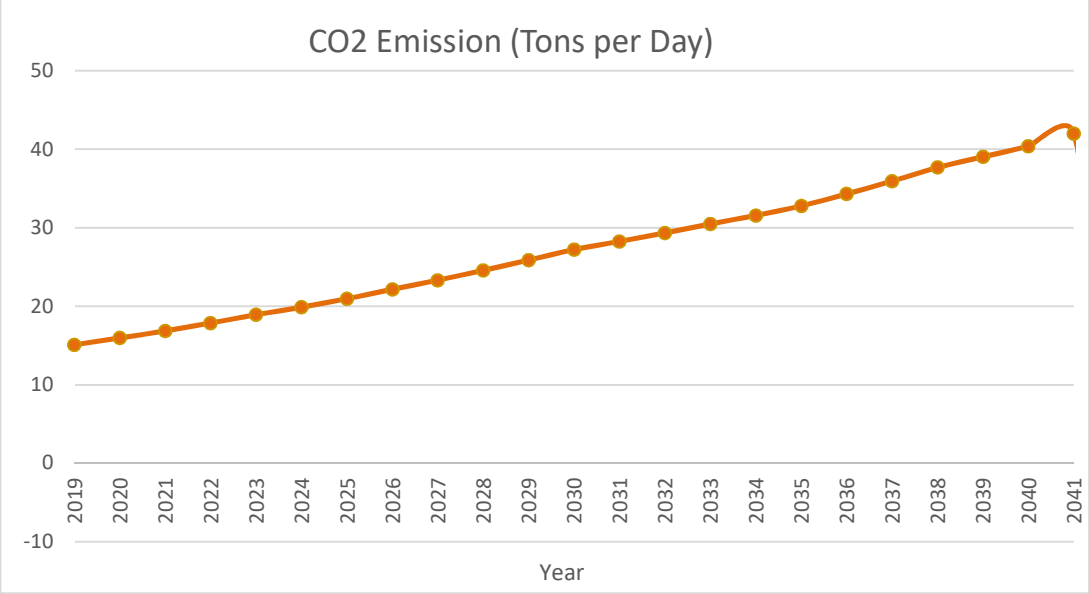
Type ofRoad	Transport emissions	Material emissions	Machines emissions	Total (t $C0_2$ eq.)
Rural Road—DBST	26	62	14	103

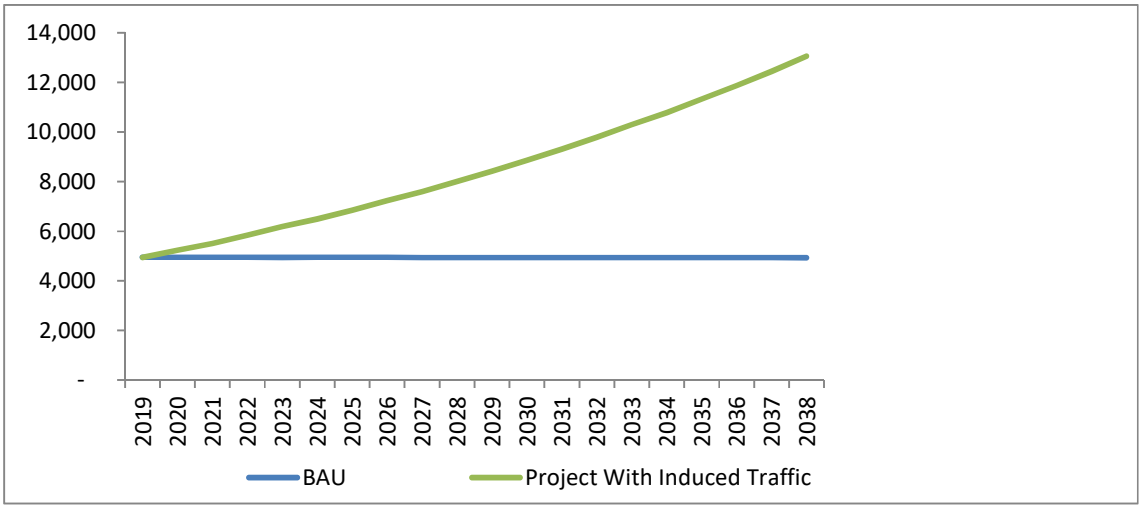
Source: Green house Gas Emissions Mitigation in Road Construction and Rehabilitation-A Toolkit for Developing Countries

Therefore, for 45.00 km of road construction would result in emission of approximately 4635 tonCO2eq.

Operation Phase

The design life of the project road is 20 years. Total annual emission for each year starting from the base year -2019(i.e. without the project) till year 2043 is presented in the figure below.





The with-project scenarios will be having higher CO2 emissions. Furthermore, with project scenarios (both without and with induced traffic), there will be an increase in the CO_2 emission levels over the time due to the increase in the traffic volume, however, the emissions will be controlled by maintaining the road roughness below 3.0 m/km during the entire project life as well as the enhanced capacity of the road. This will result in annual CO_2 emissions of the project road much below the threshold limit of 100,000 tons/year.

Climate Change Impacts & Risks

In today's world, climate change is considered the most serious global challenge. Changes in the atmosphere have been detected that could drastically alter the climate system and the balance of ecosystems. Atmospheric changes are linked to an increase in greenhouse gases (GHGs), chiefly on account of anthropogenic releases attributed to fossil fuel consumption, land-use changes, deforestation, etc. Research has established that carbon dioxide (CO_2) levels in the atmosphere have risen by 35% since the pre-industrial era. Rising CO_2 concentrations increase the energy retention of Earth's atmosphere, leading to a gradual rise in average temperatures and global warming. Sector-specific climate risk screening has been done based on secondary sources to analyze the impact on road components due to likely change in climatic variables, mainly temperature and precipitation.

Temperature & Precipitation: With the "Tropical Monsoon Rainforest Climate", Assam is temperate (summer max. at 35–39°C and winter min. at 5–8°C) and experiences heavy rainfall and high humidity. The climate is characterized by heavy monsoon downpours, which reduce summer temperatures, enable the formation of foggy nights and mornings in winters. Spring (Mar-Apr) and autumn (Sept-Oct) are usually pleasant with moderate rainfall and temperature. For ascertaining long term climate trends, State level climate data for the period 1951 to 2010 has been analyzed by the India Meteorological Department. This analysis is based on 282 stations for temperature and 1451 stations for rainfall across the country. In Assam, the analysis is based on data collected from 6 Stations for temperature

and 12 Stations for rainfall. The analysis indicates that the mean temperature in the State has increased by +0.01°C/year. There is also an increase in seasonal temperatures across seasons with pronounced warming in post-monsoon and winter temperatures. The annual rainfall has also decreased by -2.96 mm/year during the same period.

Table 61: Climate trends in Assam between 1951 and 2010

	Annual	Winter	Summer	Monsoon	Post Monsoon
Mean Max Temp (°C/year)	0.02	0.02	No Trend	0.02	0.02
Mean Min Temp (°C/year)	0.01	0.02	0.02	0.02	0.02
Mean Temp (°C/year)	0.01	0.02	0.02	0.02	0.02
Rainfall (mm/year)	-2.96	0.08	-0.56	-2.19	-0.75

Source: Assam State Action Plan on Climate Change

Increased temperature and precipitation will have the following impacts:

- **High Precipitation Impacting Roads /Bridge /Embankment**: Heavy rains can cause disruption of the road networks, decreased accessibility, erosion of roads and embankments, surface water drainage problems, slope failures, landslides, among others. Increased river flow resulting from precipitation and storminess may result in damages to bridges, pavements, and other road structures. Bridge/culvert capacities are reduced or exceeded, causing upstream flooding to occur.
- **High Temperature Impacting Road Stability**: Extreme heat, combined with traffic loading, speed, and density can soften asphalt roads, leading to increased wear and tear. There would likely be concerns regarding pavement integrity such as softening, traffic-related rutting, embrittlement, migration of liquid asphalt. Additionally, thermal expansion in bridge expansion joints and paved surfaces may be experienced.
- **Earthquake**: The project road is situated in the Zone V (having high seismic intensity) of the Seismic Map of India (as per IS: 1893, Part I, 2002) and therefore has a high risk of potential damage due to earthquake. Relevant IS codes have been adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone V.
- **Drought**: The southern part of Nagaon district in central Assam valley and adjoining parts of Karbi Anglong form a rain-shadow zone where annual rainfall is as low as 800-1200 mm. Water scarcities are a potential constraint for the people living in this rain shadow zone and the absence of effective irrigation systems or water harvesting practices adds to the vulnerability of the people. But what is of immediate concern is that rainfall in this zone is decreasing slowly as found in Lumding where rainfall is on the decline at a rate of 2.15 mm per year (Das, 2004). As a result, the water crisis might aggravate in this region in the coming years.
- **Cyclone**: It can be concluded from the analysis of past meteorological data that cyclone; dust storms are extremely rare in the study area. The impact of the cyclone

is likely to below.

- **Flood**: This is a concern in the plains as floods devastate horticulture produce. In hilly areas flash floods due to heavy precipitation will lead to heavier soil erosion. The most recent examples of such flash floods originating from extreme rainfall are two events that occurred in the north bank of the Brahmaputra River and caused significant damage to human life and property. The first of the two events occurred during the monsoon season on June 14th, 2008 due to heavy rainfall on the hills of north of Lakhimpur District causing flash floods in the rivers of Ranganadi, Singara, Dikrong and Kakoi that killed at least 20 people and inundated more than 50 villages leading to the displacement of more than 10,000 people. The other that occurred in the post-monsoon season on October 26 affected a long strip of the area of northern Assam valley adjoining foothills of Bhutan causing flash flooding in four major rivers (all are tributaries of the river Brahmaputra) and several smaller rivers. This episode of flash floods caused by heavy downpour originated from the Tropical Depression 'Rashmi', (a depression over the West Central Bay of Bengal adjoining Andhra coast) and affected mainly the catchments of the rivers Puthimari (Assam- Bhutan border), Jia-Bharali, Ranganadi, and the Subansiri. The study area does not have a flood problem. CWC in association with IMD and Ministry of Jal Shakti has prepared Flood Estimation Reports for small and medium catchments for each hydrometeorologically homogeneous 22 sub-zones. The project area is falling in subzones 2(a) and 2(b). All structures have been designed for 50 years return period with an anticipated risk of rarer flood generally of next higher frequency *i.e.* 100-year return period flood on the designed structures. Roadside toe drains shall be provided to receive a discharge from the embankment surface and countryside runoff and carry it safely to the nearest outfall point ensuring safety to the embankment toe, which is the area most vulnerable to erosion/failure.

Key engineering measures taken to address flood risks in the design are:

- Increase in embankment height,
- Construction of new side and lead away drains,
- Construction of new culverts and widening of existing ones and iv) widening of bridges.

Cross drainage structures, embankment, and Roadside drains would have been considered anyway in the conventional design as the issue of flooding is a threat to the sustainability of the road. However, these measures also contribute to the adaptation of the roads for future increases in precipitation. This risk screening and risk identification exercise have helped to ensure that the project road with climate risks have adequate risk mitigation or adaptation measures. Provisions have also been made in the bidding documents for the Contractor to prepare contract package-specific EMP's based on the final detailed design to address a range of issues including climate-related risks and vulnerabilities.

Possible Climate Events, Risks and Adaptation Measures in Road Transport Infrastructure

The design objective included ensuring that current infrastructure assets are protected from the long term and acute effects of climate change, and wherever necessary upgrading to new infrastructure systems fit for changing climate conditions have been taken into serious consideration. Those adaptive measures to counter possible risks and their likely effects on project road infrastructure as incorporated in the DPRs are summarized in **Table 62.** It must be noted that all these events either simultaneously or in isolation can generate severe disastrous impacts on road infrastructure.

Table 62: Possible Climate Events, Risks, and Adaptation Measures

Sr. No.	Climate Change Events	Risks to the Road Infrastructure	Adaptation Measures incorporated in Detailed Design of Project Roads
1	Extreme rainfall events	i. Overtopping and wash away ii. Increase of seepage and infiltration pass iii. Increase of hydrodynamic pressure of roads iv. Decreased cohesion of soilcompaction v. Traffic hindrance and safety	a. Certain critical sections affected by overland flooding of the road raised (vertical alignment, embankmentimprovement) to be free from the onslaught of flooding events under intense precipitation. b. Road asset survey has considered certain critical road sections where the sub-grade strength and integrity were found to be compromised; the sub-grade strength specification meeting the recent-most IRC specifications has been adopted. c. Thehighest assessment of design discharge for sizing culverts and bridges from among the several discharge methods as outlined in recent IRC guidelines has been adopted. d. In terms of floodwater conveyance to prevent stagnation, closed concrete drains in settlement pockets have been provided. e. Improved cross-drainage capacities required for the quick conveyance of floodwater by replacing small diameter pipes with box culverts with higher discharge openings has been considered. f. The bottom of the sub-grade has been kept 0.6m above HFL, to avoid over topping, water-logging of the road surface.
2	Changes in seasonal and annual average rainfall	i. Impact on soil moisture levels, affecting the structural integrity of roads, culverts, bridges standing water on the road base ii. Risk of floods from runoff, landslides, slope failures and damageto roads if changes occur in the precipitation pattern	
3	Increased maximum temperature and a higher number of consecutive hot days (heat waves)	i. Concerns regardingpavement integrity, e.g., softening, traffic-related rutting, cracking, fracture, etc. ii. Thermal expansion inbridge expansion joints and paved surfaces Temperature break soilcohesion and increase dust volume which caused health and trafficaccidents	a. An adequate binding layer thickness has been proposedto offset the wear, surface fatigue, and rutting under climate stresses. b. In terms of pavement integrity, the choice of viscosity grade VG30 has been maintained.
4	Extreme wind speed under cyclonic conditions	i. The threat to the stability of bridge decks ii. Damage to signs, lighting fixtures and supports	Business as usual

7. Public Consultation

Public consultation has been taken up as an integral part of environmental impact assessment process of the Project. Public consultation has been viewed as a continuous two-way process, involving promotion of public understanding of the processes and mechanisms through which developmental problems and needs are investigated and solved. Consultation was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions were made. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted.

This participatory process helped in reducing the public resistance to change and enabled the participation of the local people in the decision-making process. The involvement of likely affected people and other stakeholders have been ensured in this project with the objectives of minimizing probable adverse impacts of the project through alternate design solutions (alignment and cross-sectional) and to achieve speedy implementation of the project through bringing in awareness among the community on the benefits of the project.

Different categories of Consultations planned in this project are a) Village Consultations, b) Focus Group Discussions (FGD), c) Consultation with Women, d) Consultation with Vulnerable groups and e) Consultations with Traders etc. With the help and efforts of “Gaonbhura”, 5 village consultations and FGDs with women groups, ST PAPs and owners of commercial properties were carried out.

7.1 Objectives of the Public Consultation

Stakeholder Engagement Plan (SEP) is an integral part of the project planning and design. The consultations are carried out to develop community /stakeholder’s ownership and support for the project; integrate and address their concerns through suitable measures in the project design and implementation. The objectives of undertaking public consultations are listed below.

- Dissemination of information to build awareness amongthem
- To incorporate community concerns in the project designs for minimizing potential conflicts and resultant delays inimplementation
- To document road safety related issues for developing possible mitigation measures
- To appraise gender issues and accordingly incorporate views of women into the project design
- To understand specific issues related to tribal people and those of vulnerable sections
- To facilitate development of appropriate and acceptable entitlement options
- To understand the priorities / concerns of the communities and the likely adverse and positive socio-economic impacts
- To create a sense of ownership of the project for its sustainability.

7.2 Methodology for Consultations

Both formal and informal modes of consultation were used in the public consultation process for the project. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. In addition, focused ground discussions (FGDs) and personal discussions with officials, on-site discussion with project affected stakeholders, and reconnaissance visits have also been made to the project area. The attempts were made to encourage participation in the consultation

process of the government officials from different departments that have relevance to the project. Same way, local people from different socio-economic backgrounds in the villages as well as urban areas along the road alignment and at detours, women, residents near the existing road, local commuters, and other concerned were also consulted.

Identification of Stakeholders

Stakeholders were identified to ensure as wide coverage as possible of the project area as follows

1. Households in the project area including potential Project Affected Persons, Women groups,
2. Local, regional and international voluntary organizations /non-government organizations (NGOs), Government agencies, and Community leaders.

Questionnaire survey/ discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders, women group sand experts.

Table 63: Place of Consultation and Number of Participants

Sl. No.	Type of Consultation	Number	No. of Attendant
1	FGD	4	66
2	FGD-Female	1	7
3	SES	335	-
4	Census Survey	510	-

Source: Socio-Economic Survey on Aug-Oct 2021

7.3 Stakeholder Consultations

7.3.1 Project Stakeholders

Stakeholder analysis typically classifies stakeholders or all those who have an interest in the project, into three categories:

i. Primary stakeholders are those who are directly or indirectly affected by a project, such asthe project beneficiaries and the people who are likely to be adversely affected by a project.
ii. Secondary stakeholders are those who are involved in the delivery of the project outputs, such as the government, the implementing agency, the executing agency (e.g., contractors, consultants), if any and NGOs, etc.
iii. External stakeholders are those who are the ambit of the project activities, but who can influence the outcome of the project, such as the media, politicians, religious leaders and other opinion leaders.

Stakeholders and their level of interest may change as the project progresses, depending on the impacts associated with each stage of planning, construction and post-construction. **Table 64** provides a list of specific stakeholder's involvement and their level of impact and interest during project lifecycle.

Table 64: Consultation Methods

Sl.	Categories of Stakeholders	Involvement of Stakeholders			Pre-Construction	
		Planning	Construction	Postconstruction	Level of Impact	Level of Interest
1	Displaced Persons (TH & NTH)	Frequent	Occasional	On required basis	High	Low
2	Local Communities	Frequent	Occasional	On required basis	High	Low
3	Village Headmen & Gram Panchayat members (local elected representatives)	Frequent	Occasional	On required basis	High	Low
4	Women's belonging to various socio-economic groups	Frequent	Occasional	On required basis	High	Low
5	Other vulnerable groups	Frequent	Occasional	On required basis	High	Low
6	Local Elected Members	Occasional	On required basis	On required basis	Low	High
7	Concerned Officials from Government	Frequent	Occasional	On required basis	Low	High
8	NGOs and CBOs	Occasional	frequent	As and when required	Low	High

The different methods/tools that will be employed for stakeholder engagement to consult with each of the identified key stakeholder groups under the primary and secondary categories will be either one of the tools listed below or a combination of some of these depending on the category of stakeholders and the requirement of the project. The methods that will be used for obtaining the feedback of the different stakeholders are:

- Face to face discussions with individual stakeholders
- Public meetings/open house community forums like Gram Sabha, local health centers or the schools
- Formal closed-door meetings with the elected representatives or government functionaries
- Public notices through print in the form of flyers, posters, banners and public announcements.
- Formal correspondence through telephone or email

Engaging in an appropriate way and communicating adequately is fundamental for a good relationship. Engagement methods have been tailored according to the needs and influence of the two categories of stakeholders. A summary of the proposed level of engagement with stakeholders has been presented in **Table 65.**

Table 65: Consultation Methods

No.	Stakeholders	Dialogue Level	Issues for discussion	Frequencyof Engagement	Form of Engagement
1	Landowner households	Proactive Information	Issues related to procurement of land on lease and resultant impacts like access, payment of lease rent, temporary employment opportunities etc.	Monthly	Open Dialogue with the affected households
2	Agricultural laborers	Proactive Information	Issues related to livelihood and livelihood and training opportunities in the project and through other programs under CSR	Monthly	Open Dialogue with the affected persons

No.	Stakeholders	Dialogue Level	Issues for discussion	Frequencyof Engagement	Form of Engagement
3	Women and Girls	Direct Contact and discussions	Issues related to GBV, safety, sanitation, and hygiene. Vocational training for women empowerment	Monthly	Open discussions with women and girls through the ANM and school authorities
4	Indigenous people (ST Community)	Contact through the Gram Pradhan	Common interest with that of the local community	Quarterly	Open Dialogue
5	Contractors and Sub-contractors	Regular Direct Contact	Issues of common Interest in the day-to-day functioning of the project.	weekly	Regular Direct Contact
6	Unskilled and semi-skilled local labour	Regular contact through the labour supplier	Issues related to employment opportunities and payments	monthly	Information dissemination and redressal of payments related complaints raised by the laboures.
7	Surrounding Community	Regular Direct Contact	Common Interest on social and environmental issues	Monthly	Community event and open dialogue
8	Gram Panchayat	Regular Direct Contact	Common Interest on employment, livelihood trainings, CSR activities, and social & environmental issues	Monthly	Information dissemination and suggestions and feedback.
9	Tehsil/District Officials	Occasional Direct Contact	Documentation of land deeds and local permits	As required	Formal meetings
10	Central and State Level authorities	Occasional Direct Contact	Permits and clearances	As required	Formal meetings
11	Local Political groups	Occasional Direct Contact	Common interest with that of the local community and administrative issues	As required	Information dissemination
12	NGOs and CBOs	Occasional Direct Contact	Common interest with that of the local community	As required	Information dissemination

Source: Socio-Economic Survey on 2021

7.3.2 Consultation with Local People and Beneficiaries

The informal consultation was generally started with explaining the project, followed by an explanation of potential impacts. Participant's views were gathered with regard to all aspects of the environment which may have a direct or indirect impact on local people. Key Issues discussed are:

- Awareness and extent of the project and development components;
- Benefits of the project for the economic and social upliftment of community;
- Labour availability in the project area or requirement of outside labour involvement;
- Local disturbances due to project construction work;

- The necessity of tree felling etc. at project sites;
- Impact on water bodies, water-logging, and drainage problem if any;
- Environment and health
- Flora and fauna of the project area
- Socio-economic standing of the local people.

Table 66: Consultation Conducted on Proposed Road

Sr. No.	Village	Date	Participants	Male	Female
1	Nakachari Bazar	26/09/2021	6	3	3
2	PWD Office, Mariani Tutorial	27/09/21	16	16	0
3	Hemlay	28/09/21	16	9	7
4	Paddmali	30/09/2021	17	17	0
5	Amguri town 3 no	1/10/2021	18	18	0
6	Gibbon Bit office	3/10/2021	4	4	0
Total			**73**	**67**	**10**

The project has immense acceptability among the local people. They perceive that in addition to providing all-weather connectivity, the subproject road will bring positive socioeconomic changes in the area. Local people mainly discussed the issues related to flooding, rehabilitation, resettlement, and road safety issues.

The Details of Participants and Public Consultation photographs are attached in **Annexure 4.** Also, information on the GRM procedures and formats in local language i.e., Assamese was shared with the local people as provided in **Annexure 5.**

Table 67: Details of Public Consultation at Nakachari Bazar

Date	Issues Discussed	Response	Participant
26/09/2021	➢ Overall design should safe and reduce accident as much as possible ➢ Skill development training should be provided to all youths other than the affected persons. ➢ Most of the construction jobs to be provided to the local people. ➢ Construction of concrete drains for the development of the sewage system of the town. ➢ PMAY or another scheme should be made available to the Shop owners. ➢ Demanding footpath for proposed road.	➢ It was assured that the design will ensure safer movement of traffic. ➢ Training will be imparted to the Affected Persons as per their Eligibility and Entitlement. ➢ The Contractor will be persuaded to induct the local people as per their skills. ➢ Drain is a part of the road design for rain water but not sewage of the households. ➢ PMAY is under the discretion of the local government and the DC.	Total = 6 Male = 3 Female = 3

Figure 7-1: Public Consultation at Nakachai Bazar

Table 68: Details of Public Consultation at PWD Office, Mariani Tutorial

Date	Issues Discussed	Response	Participant
27/09/2021	➢ The impact of the residential structures at the Villages should be minimized. ➢ The details of the compensation should be presented before construction. ➢ Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss. ➢ The road accident will increase. ➢ The people are anxiously waiting for the completion of the road and the project should not be kept in waiting for years. ➢ Demanding Street lights for safety of area. ➢ Women Safety and women work engagement due to the project.	➢ The EA assured to minimize the impact on the structures during actual implementation. ➢ The Compensation and assistance as per the laws and policies they are eligible was discussed. ➢ The Affected Persons were made aware of the various benefits including training that are associated with the project other than the compensation and assistance. ➢ It was assured that the design will ensure safer movement of traffic. ➢ The project is expected to be completed by two and half years. ➢ As per the Provision of utility arrangements on proposed road the demands of street light will be fulfilled.	Total = 16 Male = 16 Female = 0

Figure 7-2: Public Consultation at PWD OFFICE, Mariani Tutorial Road

Table 69: Details of Public Consultation at Hemlay

Date	Issues Discussed	Response	Participant
28/09/2021	➢ The Affected Shopkeepers were anxious to know about the compensation. ➢ The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods. ➢ Women Safety & Children Welfare	➢ They are eligible for Compensation and assistance as per the laws and policies. ➢ The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons. ➢ Women safety will be the main part to be look after and also for children welfare.	Total = 16 Male = 9 Female = 7

Figure 7-3: Public Consultation at Hemlay

Table 70: Details of Public Consultation at Paddmali

Date	Issues Discussed	Response	Participant
30/09/2021	➢ Most of the construction jobs to be provided to the local people. ➢ Construction of concrete drains for the development of the sewage system of the town. ➢ Rash Driving should be taken care of	➢ The Contractor will be persuaded to induct the local people as per their skills. ➢ Drain is a part of the road design for rain water but not sewage of the households. ➢ Caution board would be provided super sensitive location.	Total = 17 Male = 17 Female = 0

Figure 7-4: Public Consultation at Paddmali

Table 71: Details of Public Consultation at Amguri Town No 3

Date	Issues Discussed	Response	Participant
1/10/2021	➢ Demanding Signal system at Amguri market area. ➢ Job facility during construction period to eligible candidate.	➢ As per the Provision these safety issues will take care of. ➢ The Contractor will be persuaded to induct the local people as per their skills.	Total = 18 Male = 18 Female = 0

Figure 7-5: Public Consultation at Amguri Town No. 3

Table 72: Details of Public Consultation at Gibbon Bit Office

Date	Issues Discussed	Response	Participant
03/10/2021	➢ About elephant crossing. ➢ Other animals crossing probability along the project road.	➢ No elephant movement along the project road ➢ Also, there is no other animal movement along the project road	Total = 4 Male = 4 Female = 0

Figure 7-6: Public Consultation at Gibbon Beat Office

7.4 Public Opinion/ views survey

To access the existing environment and likely impacts on the surrounding population, an interview was carried out. A sample of the population was interviewed through a designed questionnaire. Precaution has been exercised during the survey to ensure that the sample interviewed is truly representative of the affected groups and the questions are worded so as not to generate a bias response.

Public Consultation Questionnaire

Name of Project:			
Name of Project Road:			
Project package no.:			
Chainage:		**Date:**	
Place:		**District:**	
No of Participants			

Questions to be Asked?

1. **How is the Water quality of rivers, ponds, wells, and canals?**
   Positive: **Negative:** **No Response:**
2. **Status of Noise quality in the area?**
   Positive: **Negative:** **No Response:**
3. **How is the Air quality in the area?**
   Positive: **Negative:** **No Response:**
4. **Are there any Archaeological sites in the vicinity?**
   Positive: **Negative:** **No Response:**
5. **Any history of Natural disasters?**
   Positive: **Negative:** **No Response:**
6. **Any Rare species of animals and birds found in the area?**
   Positive: **Negative:** **No Response:**
7. **Are there any Cultural sites in vicinity?**
   Positive: **Negative:** **No Response:**

Figure 7-7: Public Consultation Questionnaire

It is observed from the interview survey that there is increased environmental awareness among the people. It can also be seen from **Table 73** that about most of the people are in the opinion that the environmental condition of the area is good. Poor road condition and

vehicular emissions are the major sources they feel responsible for this. People are unaware of the presence of archaeological, historical, and cultural sites. There is no major history of natural disasters in the region and local people have mixed responses about natural disasters. Overall, the general environmental conditions in the region are good and people have increased environmental awareness. **Table 73** shows the result of the public opinion survey carried out in the region.

Table 73: Peoples' Perception of Environmental Scenario

Sr.No.	Question Asked About	No. of People Interviewed	Positive Response	Negative Response	No Response
1	Water quality of rivers, ponds, wells, and canals	81	20	61	0
2	Noise quality of the area	81	81	0	0
3	Air quality of the area	81	81	0	0
4	Archaeological sites	81	0	81	0
5	Natural disaster	81	63	18	0
6	Rare species of animals and birds found	81	35	37	9
7	Cultural sites, market, melas	81	40	23	18

Source: From Public Consultation Response

Overall, most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, tourism, boost economic development, and thereby provide direct, or indirect benefits to them. Construction camps may however put stress on local resources and infrastructure nearby especially on water resources. The construction camps that will be installed during construction will exert more demand on the existing water source and would pose a threat to the quality of water bodies and groundwater resources. To prevent such problems contractor needs to provide camps with proper drinking water and sanitation facility.

The following are the consultants' initial findings regarding likely positive and negative impacts.

Positive Impacts:

- Improved road conditions will reduce travel time, fuel consumption, and emissions from base traffic volumes.
- Economic development and access will be stimulated.
- Access to Health, agriculture, and education facility will be improved.

Negative Impacts:

- Disturbance to existing traffic during the construction phase.
- Fugitive dust emissions during the construction stage thus harming the air quality. Similarly, noise quality can be affected during construction as well as operation stage.

Based on available information, field visits throughout the project, discussions with project authorities, and other discussions amongst project team and local officials it has been concluded that overall, the project will be beneficial, all negative impacts during and post-construction can be properly mitigated.

7.5 Disclosure

7.5.1 State Level

PMU and the PIUs shall disclose this entire EIA Report and all Safeguards related documents and mitigation plans at their website.

7.5.2 District Level

PMU will also arrange to disclose the final versions of the EIA and ESMP in English and Executive Summary in Assamese, in all the District Collectors Offices, PIUs and the local offices of the implementing agencies. These would be in place once the final versions are ready. When this document is updated, then the copies in the different locations would also be updated.

7.5.3 Disclosure requirements of AIIB

The Bank requires the Client to disclose: (a) draft environmental and social assessment reports, ESMPs, ESMPFs, resettlement plans, RPFs, Indigenous Peoples plans and IPPFs, or other approved forms of documentation; and (b) other documents described above, as soon as they become available. The Bank also requires the Client to disclose any material changes to the disclosed environmental and social information for the Project as soon as they become available.

7.5.4 Disclosure by AIIB

The AIIB will disclose the EIA and ESMP for reference to interested parties. During the implementation phase, all the subproject EIA report shall be disclosed by PMU and the PIUs both at the local level and at the state level.

8. Grievance Redress Mechanism

A project-specific Grievance Redress Mechanism (GRM) will be established to receive, acknowledge, evaluate and facilitate the resolution to the complainant with corrective actions proposed using understandable and transparent processes on the social and environmental aspects that are gender responsive, culturally appropriate and readily accessible to all segments of the affected people. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. Records of grievances received, corrective actions taken and their outcomes shall be properly maintained. The complainant may take recourse to the Court of law, if dissatisfied with the verdict of the GRM.

A. Mechanism for Grievance Redressal

The GRM shall be established at four levels viz. Site Level (First Level Grievance), PIU Level (Second Level Grievance), PMU Level (Third Level Grievance) and Court of Law (Third Level Grievance) to address grievances/ complaints. The grievance redress mechanism is given in **Figure 8-1**. The project-specific GRM is not intended to bypass the government's own redress process; rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people, and is scaled to the risks and impacts of the project.

First Level: When grievances arise, complainant will first need to contact the respective person of the Contractor, CSC and the site engineers. The site level resolution of complaints shall be done within 2 weeks. The Contractor will maintain the records of complaints and the outcome of the solutions.

Second Level: The complainant will need to contact PIU to file complaints on non-resolution at the site level. The address and contact number of the PMU office will be provided in the project information leaflet. The PIU, supported by CSC, is the second tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The Environmental officer of PIU, supported by CSC, will be designated as the key officers for grievance redress. Resolution of complaints will be done within 2 weeks. At this stage, Environmental officer will inform the PMU for additional support and guidance in grievance redress matters, if required. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, etc.). Grievances will be documented and personal details of the complainant (name, address, date of complaint, etc.) will be included, unless anonymity is requested. A tracking number will be assigned to each grievance. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within 2 weeks. The contractor will have observer status on GRC.

Third Level: The Environmental Officer of each PIU will activate the second tier of GRM by referring the unresolved issues (with written documentation) to the PMU, who will pass unresolved complaints upward to the Grievance Redress Committee (GRC). A hearing will be called by the GRC, if necessary, where the affected person may present his/her concern/issues. The process will facilitate resolution through mediation.

Fourth Level: Alternatively, the affected person can also seek alternative redress through the appropriate court of law. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

The PMU and PIUs, supported by CSC, will make the public aware of the GRM through public awareness campaigns. The grievances can be raised through various methods:

- Modules in e-portal/ website of Asom Mala.
- Dropping complaints in grievance boxes placed in the offices of a) PMU, b) respective PIUs and c) Site offices/ CSC.
- E-mails to respective email address.
- SMS or WhatsApp to respective mobile number(s) dedicated for GRM.
- Using the complaint register and complaint forms available at the office of PMU/ PIU/ Site offices/ CSC.

All the documents will be made available to the public including information on the contact number, e-mail addresses, addresses of the respective offices of PMU/ PIU/ Site offices/CSC/AE/ RP Implementing Agency and contact person for registering grievances, and will be widely disseminated throughout the project area by the safeguard officers in the PMU and PIUs supported by the CSC/AE/RP Implementing Agencies.

B. Grievance Redress Committee (GRC)

A Grievance Redress Committee (GRC) will be established at the PWRD state level and at the PIU level to assure accessibility for APs. The GRCs are expected to resolve grievances within a stipulated time period of 2 weeks each at the Site level and PIU level, and one month at the PMU level. If the displaced person is not satisfied with the decision of the GRC, the complainant can approach the court of law. At any point in the redressal process the aggrieved person can approach the Land Acquisition and Resettlement and Rehabilitation Authority.

The PMU level GRC will comprise of the:

- Chief Engineer (EAP), PWRD, GoA or any authorised person, who should not below the rank of Executive Engineer
- Nodal Officer, Asom Mala – Member Secretary
- Resettlement Officer, PMU supported by RP Implementation Agency and/ or PCMC
- Environmental Officer, PMU supported by CMC and/ or PCMC
- Representatives from local person of repute and standing in the society or elected representative from Panchayat/ Zilla Parishad /District Council
- Representative from the PIU, supported by RP Implementation Agency
- A representative from IP community for IP related issue, if any
- Representative from local forest authority, if grievances of forest aspects
- Representative from Pollution Control Board, if grievances of environmental aspects
- Representative of the Land Revenue department, if grievances of land related issues

The PIU level GRC will comprise of the:

- Representative of PIU, above the rank of Sub-Divisional Officer
- Resettlement Officer, PIU supported by RIA
- Environmental Officer, PIU supported by CSC/AE
- A representative from local person of repute and standing in the society or elected representative from Panchayat/ Zilla Parishad /District Council.
- A representative for women from a relevant agency which could be from the government, or RP Implementation Agency or local community
- A representative from Vulnerable DPs
- A representative of the local Deputy Commissioners office (land), if the grievance is of acquisition land related issues
- A representative of local Pollution Control Authority (for environmental issues related grievances)
- A representative from IP community for IP related issue, if any.

The functions of the GRC are as follows: (i) resolve problems quickly and provide support to affected persons arising from various issues of water supply, waste disposal, traffic interference and public safety as well as social and resettlement related issues such as land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons, categorize and prioritize them and aim to provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

C. Grievance Redressal Process

The Grievance Redress Process is presented in **Figure 8-1**.

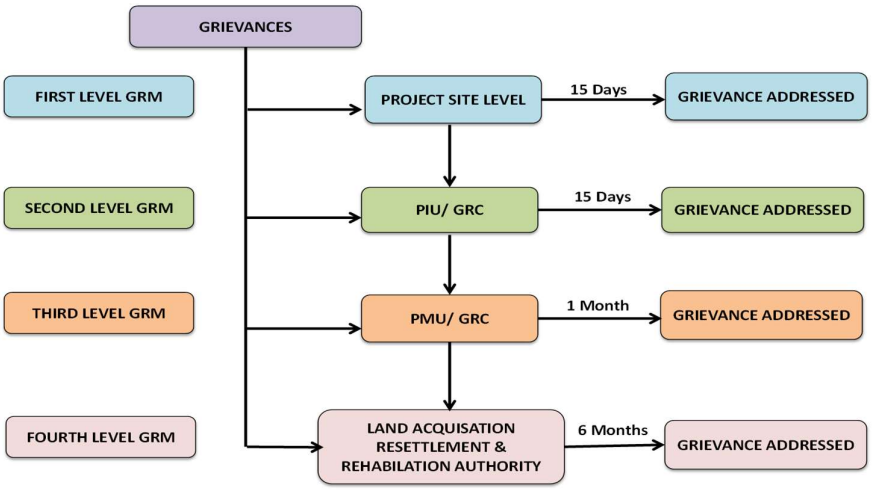


Figure 8-1: Environmental and Social Grievance Redressal Process

The grievances will be documented and personal details (name, address, date of complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned to each grievance, including the following elements:

- initial grievance sheet (including the description of the grievance) with an acknowledgement of receipt given to the complainant when the complaint is registered;
- grievance monitoring sheet with actions taken (investigation, corrective measures); and
- closure sheet, one copy of which will be handed over to the complainant after he/she has agreed to the resolution and signed off.

The updated register of grievances and complaints will be available to the public at the PMU office. Should the grievance remain unresolved, the person can seek alternative redress through the appropriate court of law which will be the last level recourse or the AIIB's redress mechanism.

During preparation of EIA or at least during pre-construction stage local communities in project areas shall be informed on grievance redress procedure and contact persons for lodging complaint/s. All the parties involved in project implementation i.e. contractor, CSC/AE, and PIU shall maintain complaint registers at their respective offices.

Environment Safety Officer of contractors and Construction Supervision Consultant shall promptly investigate and review environmental complaints and implement appropriate corrective actions to mitigate cause of the complaints. However, in all cases, it shall be responsibility of contractors to act immediately upon receiving any complaint related to construction activities at site and camps.

The GRC meeting shall be conducted within 30 days of constitution and subsequently it shall be conducted every month to review status of pending cases.

The PMU, with the assistance of the PCMC will be responsible for processing, maintaining database of complaints, recording decisions, issuing minutes of the meetings, and monitoring to see that formal orders are issued and the decisions carried out.

The monitoring reports of the ESMP implementation will include the following aspects pertaining to progress on grievances: (i) number of cases registered with the PIU, at what level of jurisdiction, number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared, with details such as name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance(i.e., open, closed, or pending).

All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) shall be borne by the PMU.

9. Environmental and Social Management Plan

9.1 Introduction

The environmental impacts associated with any development project are eliminated or minimized to an acceptable level through the development of appropriate mitigation measures based on the most suitable techno-economic options. The Environmental and Social Management Plan (EMP)is a well-established tool to ensure effective implementation of the recommended mitigations measures throughout the project development stages. The ESMP also ensures thatthe positive impacts are conserved and enhanced. An ESMP provides location and time-specific actions to be taken with defined responsibility. It also provides measures for institutional strengthening and effectiveness assessment through a defined monitoring plan, reporting corrective & preventive action planning.

9.2 Objectives of Environmental and Social Management Plan

A sub-project road-specific Environment and Social Management Plan has been formulated which consists of a set of mitigation; monitoring and institutional measures applicable to the design, construction, and operation stages of the project. The components of this ESMP includes (i) mitigation of potentially adverse impacts (ii) monitoring of impacts and mitigation measures during project implementation and operation (iii) institutional capacity building and training (iv) compliance to statutory requirements (v) integration of ESMP with project planning, design, construction, and operation.

9.3 Impacts and Mitigation Measures

The identified environmental, social health, and safety issues and recommended mitigation measures with institutional arrangements for implementation, supervision, and monitoring have been provided in **Table 74.** The Biodiversity Monitoring plan is given in **Table 75**. The Environment Monitoring is given in **Table 76**.

Table 74: Environmental, Social, Health and SafetyManagement Plan

1. Environment

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
Pre-Construction and Design Stage			
Tree Cutting			
Reduction in forest cover, hence deterioration in climatic conditions. Increase in Green House effect/climate change impact	Geometric adjustments made to minimize tree cutting. Widening to be accommodated within available ROW such that minimal tree cutting is required Obtain tree cutting permission from forest/Revenue department as the case may be. Compensatory plantation with respect to trees cut (8389) with preference to fast growing species as per the orders of Forest department. Additional Plantation of 83890 trees on both side of the road in non-residential areas will be done with 5m center to center spacing between two trees as per the order of Forest department	Project areas	PWRD, ASSAM/ Forest Department
Joint Field Verification			
	The Engineer - Incharge of Supervision Consultant and the Contractor shall carry out joint field verification to ascertain the necessity of saving trees, environmental and community resources wherever such representations or suggestions in writing have been received and forwarded by the Employer/Authority or by the Engineer in accordance with the local situations. The complaints/suggestions together with the observations and expert opinion of the joint verification team containing the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the ESHS shall be summarized in a written document containing all the details with date, time, place and signature of the individuals involved and this shall be sent to PIU/PMU for approval.	RoW / CoI / Project influence areas	Contractor; Environmental Officer of CSC
Construction Stage			
Procurement of Machinery - Crushers, Hot-mix Plants & Batching Plants			

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
Air, noise and water Pollution	Specifications of crushers, hot mix plants and batching plants (existing or new) shall comply with the requirements of the relevant current emission control legislations. The Consent to Establish (CTE) & Consent to Operate (CTO) shall be obtained from the SPCB, Assam for the establishment and operation of these plants. Only Crushers licensed by the State Pollution Control Board (SPCB) shall be used. The Contractor shall submit a detailed layout plan for all such sites and seek prior approval of Engineer - Incharge of CSC before entering into formal agreement with a land owner for setting-up such sites.	Crushers, Hotmix plants & Batching Plants	Contractor
Procurement of Other Construction Vehicles, Equipment and Machinery			
Air, noise and water Pollution	The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery to be procured for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of ASPCB. Noise limits for construction equipment's to be procured such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A), when measured at one-meter distance from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced to the PIU for verification whenever required. Ambient Air Quality monitoring has to be performed by the Contractor as per the Environmental Monitoring Program and in accordance with the general and specific condition of CTO.	Throughout the project area	Contractor
Air Quality			

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
Emission of air pollutants (HC, SO2, NOx, CO etc.) from vehicles due to traffic congestion and use of equipment and machinery	Regular maintenance of machinery and equipment. Batching and asphalt mixing plants and crushers at downwind direction (1 km) from nearest settlement. Only licensed crushers be used. DG sets with stacks of adequate height should be used. Ambient air quality monitoring Following traffic management Construction work should be carried out in non-peak hours. LPG should be used as fuel source in construction camps instead of wood Contractor to prepare traffic management and dust suppression plan duly approved by PWD. The contractor shall maintain a separate file and submit PUC certificates for all vehicles/ equipment/ machinery that are being used for the project	Built-up-Stretches are: Debarapar, Abhoipuria Gaon, Heloichi gaon Hemlai Samtal, Gabhru Tiniali. Koliapani, Rahadhal , Podumani , Amguri, Lalimchiga , Samguri, Belimukhiya Tiniali , Dikshu Mout Village , Ksanakar, Namti Charali, Mezenga , Bortal, Nazira.Sensitive Receptors in close vicinity are:School 0+200 (L), 2+150 (R), 5+810 (R), 9+450 (L), 9+700 (L), 11+830 (R), 10+100 (R), 13+250 (L), 19+800 (R), 20+500 (R), 22+800 (R), 23+950 (L), 25+500 (L), 25+100 (L), 29+450 (L), 30+450 (L), 31+100 (R), 33+850 (L), 36+950 (R), 37+100 (L), 39+400 (R), 39+800(L) PHC 0+100 (L) Hospitals 43+150 (R)	Contractor
Land and Soil			
Land use Change and Loss of productive/ top soil	No agricultural areas to be used as borrow areas to the extent possible. Land for temporary facilities like construction camp, storage areas etc. shall be brought back to its original land use. If using agricultural land, top soil to be preserved and laid over either on embankment slope for growing vegetation.	Throughout project section and borrow areas Land identified for construction camp	Contractor
Slope failure and soil erosion due to construction activities, earthwork and cut and fill stockpiles etc.	Care should be taken that the slope gradient shall not be steeper than 1V:2H. Earth stockpiles to be provided with gentle slopes to avoid soil erosion.	Throughout the project road	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
Borrow area management	Non-productive barren land shall be used for borrowing earth with the necessary permissions/consents. Depths of borrow pits to be regulated and sides not steeper than 25%. The 15 cm topsoil to be stockpiled within the site of identified borrow area for use at the rehabilitation stage as preventive measure. The stockpiles shall be covered with gunny bags / tarpaulin. Follow IRC recommended practice for borrow pits (IRC 10: 1961) for identification of location, its operation and rehabilitation Borrow areas not to be dug continuously Redevelopment of borrow areas shall be taken up in accordance with the plans approved by the Engineer	Borrow site location as identified in DPR or any selected borrow area	Contractor
Quarry Operations	No quarry and/or crusher units shall be established, which is within 1000m from the residential/ settlement locations, forest boundary, wildlife movement path, breeding and nesting habitats and national parks/sanctuaries. Aggregates should be sourced from existing licensed quarries. Copies of consent/approval/ rehabilitation plan for new quarry or use of existing quarries should be sought. The contractor will develop a quarry redevelopment plan as per mining rules of state. Obtain environmental clearance from DEIAA in case of opening new quarry. Contractor shall work out haul road network to be used for transport of quarry materials and report to Engineer who shall inspect and approve the same.	Location specified as per DPR or another quarry source selected.	Contractor
Contamination of soil due to leakage/spillage of oil, bituminous debris generated from demolition and road construction	Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil. Fuel storage and refueling sites to be kept away from drainage channels. Unusable debris shall be dumped in ditches and low-lying areas.	Fueling station, construction sites, construction camps and disposal location	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	To avoid soil contamination Oil-Interceptors shall be provided at wash down and refueling areas. Waste oil and oil-soaked cotton/ cloth shall be stored in containers labelled 'Waste Oil' and 'Hazardous' sold off to MoEF&CC/SPCB authorized vendors Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit. Bituminous wastes shall be disposed of in identified dumping sites approved by State Pollution Control Board. Soil quality monitoring		
Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil Fuel storage and refueling sites to be kept away from drainage channels Unusable debris shall be dumped in ditches and low-lying areas To avoid soil contamination Oil-Interceptors shall be provided at wash down and refueling areas Construction vehicles, machinery and equipment to be stationed in the designated ROW to avoid compaction. Approach roads/haul roads shall be designed along the barren and hard soil area to reduce the compaction Transportation of quarry material to the dumping site through existing major roads to the extent possible to restrict wear and tear to the village roads. Land taken for construction camp and other temporary facility shall be restored to its original facility.	Parking area, haulage roads and construction yards	Contractor
Water Resources			
Sourcing of water during construction	Requisite permissions shall be obtained for abstraction of groundwater if used. Water availability to nearby communities should remain unaffected. Water intensive activities not to be carried out during summer	Throughout the project site especially construction sites/camps.	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	Provision of water harvesting structures to augment groundwater condition in the area		
Disposal of water during construction	Provisions shall be made to connect road side drains with existing nearby natural drains. The Contractor shall take all precautionary measures to prevent the generated wastewater from entering into streams, water bodies or the irrigation channels arising due to construction activity Contractor shall avoid construction works close to the streams or water bodies during monsoon.	Throughout the Project section	Contractor
Alteration in surface water hydrology due to embankment	Existing drainage should be maintained and enhanced. Provision shall be made for adequate size and number of cross-drainage structures esp. in the areas where land is sloping towards road alignment. Culverts reconstruction shall be done during lean flow period. In some cases, these minor channels may be diverted for a very short period and shall be brought back to its original course immediately after construction Road level shall be raised above HFL level as per IRC MORTH guidelines	Waterways streams/nallahs along the section	Contractor
Siltation in water bodies due to construction activities/earthwork.	Embankment slopes to be modified suitably to restrict the soil debris entering water bodies Provision of Silt fencing shall be made at water bodies. Earthworks and stone work to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system. Silt and sediments shall be collected and stockpiled for possible reuse. Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated Earthwork should be prevented from impeding natural flow of rivers, streams for existing drainage system.	Major ponds along the entire project stretch	Contractor
Deterioration in surface water quality due to leakage from vehicles	No vehicles or equipment should be parked or refueled near water bodies to avoid contamination from fuel and lubricants.	Major ponds along the entire project stretch	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
and equipment and wastes from construction camps.	Oil and grease traps and fueling platforms to be provided at re-fueling locations All chemicals and oil shall be stored away from water bodies. and concreted platform with catchment pit for spills collection All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors Construction camps shall be sited away from water bodies. Wastes must be collected, stored and taken to approve disposal site only. Water quality to be monitored periodically.		
Flora and Fauna			
Vegetation loss due to site preparation and construction activities.	Compensatory plantations in the ratio as per Assam Government's policy and their maintenance. Plantation of 83890 nos. trees on both sides of the road with 5m center to center distance in non-residential areas along the stretch on both sides. Trees should be offset 1m back from the ultimate edge of the roadway to prevent safety hazard and provide adequate sight distance. Use of LPG for cooking in camps to avoid tree cutting Integrate vegetation management (IVM) with the carriage way completely clear of vegetation Controlled use of pesticides and fertilizers.	Throughout the project corridor	PWRD, ASSAM/ Forest Department
Construction Camps/ Occupational Health			
Impact associated with location	Layout of camps shall be prepared by contractor and reviewed by PWD. All camps should be established with prior permission from PCB. Construction camps shall not be proposed within 1000m of Ecologically sensitive areas Location's for stockyards for construction materials shall be identified at least 1000 m from watercourses. The waste disposal and	Construction camps	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	sewage system for the camp shall be designed, built and operated such that no odour is generated. Layout of the campsite shall be approved by the CSC prior to its establishment Top soil shall be preserved as mentioned in the Clause 12		
Dismantling of Bridgework / Culverts			
Generation of C & D waste, air and water pollution	Bridges and culverts shall be planned for demolition during dry season when the flows are lowest. In case of perennial streams, water shall be diverted away from the work area temporarily and water way shall be protected from contamination through silt fencing. Prevent earthwork, stonework, materials and appendage from impeding cross-drainage at rivers, streams, water canals and existing irrigation and drainage systems	Bridge and Culvert locations	Contractor
Management of Construction Debris			
Selection of dumping site	Contractor to submit a waste/spoil disposal plan and get it approved by AE and EA. Create controlled dumping sites with a non-permeable lining incorporated in the pit design to avoid leachate seepage into the soil, which may later affect ground water quality. Unproductive/ waste land shall be selected for dumping sites away from residential areas and water bodies. Dumping sites must be having adequate capacity equal to the number of debris generated. Public perception and consent from the village Panchayats has to be obtained before finalizing the location.	Throughout the project corridor	Contractor
Reuse and disposal of construction and dismantled waste	All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. Unusable and non-bituminous debris materials should be suitably disposed of at pre-designated disposal locations, with approval of the concerned Engineer.	Throughout the project corridor	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal, MORTH guidelines should be followed. Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.		
Site Restoration and rehabilitation			
Clean-up Operations, Restoration and Rehabilitation	Contractor will prepare site restoration plans, which will be approved by the 'AE'. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. All construction zones including culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the AE. All the opened borrow areas will be rehabilitated and 'AE' will certify.	Throughout the project corridor, construction camp sites and borrow areas	Contractor
Operation Stage			
Air Quality			
Air pollution due to vehicular movement.	Compensatory tree plantations considered as roadside plantation shall be maintained as prescribed by Assam Governments' Policy. Regular maintenance of the road will be done to ensure good surface condition Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken. Signages shall be provided reminding the drivers/road users to properly maintain their vehicles to economize on fuel consumption. Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment. Ambient Air Quality monitoring	Throughout the corridor	Operation and Maintenance Agency
Noise			
Noise due to movement of traffic	Effective traffic management and good riding conditions shall be maintained	Sensitive receptors	Operation and Maintenance Agency

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	The effectiveness of the measures should be monitored and if need be, solid noise barrier shall be placed. Ambient Noise Quality monitoring.		
Land and Soil			
3.1 Soil erosion at embankment during heavy rainfall.	Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures Necessary measures to be followed wherever there are failures	At embankment slopes and other probable soil erosion areas	Operation and Maintenance Agency
Water resources			
Siltation	Regular visual checks shall be made to observe any incidence of blockade of drains. Regular checks shall be made for soil erosion. Monitoring of surface water bodies	Near surface water bodies	Operation and Maintenance Agency
Water logging due to blockage of drains, culverts or streams	Regular visual checks and cleaning (at least once before monsoon) of drains to ensure that flow of water is maintained through cross drains and other channels/streams. Monitoring of water borne diseases due to stagnant water bodies	Near water bodies and cross drainage structures and side drains	Operation and Maintenance Agency
Flora			
5.1 Vegetation	Planted trees, shrubs, and grasses to be properly maintained. The tree survival audit to be conducted at least once in a year to assess the effectiveness	Project tree plantation site	Operation and Maintenance Agency

2. Social

Social Issues	Measures to be adopted	Locations	Implementation Responsibility
Pre-Construction and Design Stage			
Loss of Land and Assets			
Livelihood loss to affected persons	Road improvement work to be accommodated within available ROW to the extent possible Social Impact Assessment and Resettlement Plan to be undertaken as per State, National Act, Rules & policy and AIIB guidelines	Land Acquisition involved along the project road. Details to be provided in Social Assessment report	PWRD, ASSAM

Social Issues	Measures to be adopted	Locations	Implementation Responsibility
	Complete all necessary land and property acquisition procedures prior to the commencement of civil works in that stretch. Adherence to land acquisition procedure, Compensation and assistance in accordance to approved Resettlement Plan (RP) Implementation of Rehabilitation & Resettlement as per approved RP.		
Relocation of Cultural Property			
Loss of heritage	In case there is an impact on religious and/ or cultural properties, they will be relocated at suitable locations, as desired by the community before construction starts. For partially impacted structures enhancement measures shall be applied at the same sites before construction begins, depending on the availability of space, requirement of the communities and fund availability. As far as possible, the architectural elements of the structure should be conserved/ reflected/ translated into the design of new structures in accordance with consultations with the community Meaningful Community meetings shall be conducted to discuss relocation aspects, siting of structures etc. Relocation sites for all cultural properties shall be selected in consultation with concerned communities, local administrative authorities/departments as the case may be.	Throughout project corridor, if any	Civil Construction Contractor
Construction Stage			
Labour Codes			
Labour	All the Labour Codes and Acts in effect will have to be maintained properly. No Child labour (person below 14 years of age) will be allowed to work in any capacity in the construction.	Construction site, offices, Labour Camp etc.	Contractor
Procurement of Machinery - Crushers, Hot-mix Plants & Batching Plants			
Air, noise and water Pollution	Hot-mix and batching plants shall be sited sufficiently away (1000m) away from residential / settlement locations, forest areas, wildlife movement areas and commercial establishments, preferably in the downwind direction.	Crushers, Hotmix plants & Batching Plants	Contractor

Social Issues	Measures to be adopted	Locations	Implementation Responsibility
	Hot mix plant should be fitted with dust extraction unit. DG sets with stacks of adequate height and use of low sulphur diesel as fuel.		
Flora and Fauna			
2.1 Vegetation loss due to site preparation and construction activities.	Preference to locals in plantation activities Regular maintenance of all trees planted.	Throughout the project corridor	Contractor with Forest Department
Construction Camps/ Occupational Health			
3.1 Impact associated with location	Construction camps shall not be proposed within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.	All construction camp	Contractor
Operation Stage			
Noise			
Noise due to movement of traffic	Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction measures while constructing a building near road.	Sensitive receptors	Operation and Maintenance Agency

3. Health

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
Construction Stage			
Air Quality			
Dust Generation due to construction activities, transport, storage and handling of construction materials	Contractor to submit location and layout plan for storage areas of construction materials approved by Authorities Transport, loading and unloading of loose materials through covered vehicles. Storage areas to be located downwind of the habitation area. Dust Suppression/ water spraying using tankers on earthworks, unpaved haul roads and other dust prone areas twice a day using minimum four tankers a day, during construction period.	Throughout the project corridor	Contractor

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	Provision of PPEs to workers.		
Noise			
Noise from construction vehicles, equipment and machinery.	The contractors will provide prior notification to the community on the schedule of noisy construction activities. All equipment to be timely serviced and properly maintained. Timing of noisy construction activities shall be done during night time and weekend near schools, Implement noisy operations intermittently to reduce the total noise generated Bottlenecks to be removed. Construction equipment and machinery to be fitted with silencers and maintained properly. Only IS approved equipment to be used for construction. Construction activities should be carried out in non-peak hours. High noise producing machineries should be placed at least 500 m away from residences. Contractor shall provide noise barriers to the suggested locations of identified schools/ Temples/health centers prior to commencement of work. Honking restrictions near sensitive areas. Noise monitoring as per EMOP, based on the monitoring results, the Engineer, if required, shall recommend any additional noise mitigation measures required to be implemented by the Contractor.	Built-up-Stretches are: Debarapar, Abhoipuria Gaon, Heloichi gaon Hemlai Samtal, Gabhru Tiniali. Koliapani, Rahadhal ,Podumani , Amguri, Lalimchiga , Samguri, Belimukhiya Tiniali , Dikshu Mout Village , Ksanakar, Namti Charali, Mezenga , Bortal, Nazira.Sensitive Receptors in close vicinity are:School 0+200 (L), 2+150 (R), 5+810 (R), 9+450 (L), 9+700 (L), 11+830 (R), 10+100 (R), 13+250 (L), 19+800 (R), 20+500 (R), 22+800 (R), 23+950 (L), 25+500 (L), 25+100 (L), 29+450 (L), 30+450 (L), 31+100 (R), 33+850 (L), 36+950 (R), 37+100 (L), 39+400 (R), 39+800(L) PHC 0+100 (L) Hospitals 43+150 (R)	Contractor
Land and Soil			
Borrow area management	Transportation of earth materials should be done in covered vehicles. Borrow area shall be levelled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond to prevent it from mosquito breeding.	Borrow site location as identified in DPR or any selected borrow area	Contractor

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
Construction Camps/ Occupational Health			
Impact associated with location	Unless otherwise arranged by the local sanitary authority, arrangements for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by Engineer shall be provided by the contractor	All construction camp	Contractor
Worker's Health in construction camp	The location, layout and basic facility provision of each labor camp will be submitted to AE and approved by EA. The contractor will maintain necessary living accommodation and ancillary facilities in hygienic manner. Adequate water and sanitary latrines (separate for males and females) with septic tanks and soak pits shall be provided. Preventive medical facilities including health personal in camp along with tie ups with nearest hospital or health facility Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations. No liquor or prohibited drugs will be imported to, sell, give and barter to the workers of host community. Awareness raising to immigrant workers/local community on communicable diseases such as COVID-19 and sexually transmitted diseases such as HIV, AIDs and others. No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the „ Engineer".	All construction camp	Contractor

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
Covid-19 Health & Safety (General Directions to the workers)	Avoid handshake, Only Namaste Non-essential physical work that requires close contact between workers should not be carried out Work requiring physical contact should not be carried out Plan all other work to minimize contact between workers Wash hands often (every 1-2 hrs. or frequently as possible) with soap for at least 20 seconds Use hand sanitizer No person should enter the work site other than the authorized persons mentioned by supervisor during start of work All must implement social distancing by maintaining a minimum distance of 6-feet from others at all times to eliminate the potential of cross contamination. Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing i.e., 6 ft from others. Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion All individual work group meetings/ talks should follow social distancing At each job briefing/toolbox talk, employees are asked if they are experiencing any symptoms, and are sent home if they are Each worksite should have laminated COVID-19 safety guidelines and handwashing instructions All restroom/toilet facilities should be cleaned (min twice a day), and handwashing facility must be provided with soap, hand sanitizer and paper towels All surfaces should be regularly cleaned, including mobiles, tabletops /surfaces, door handles, laptops, records, etc. All common areas and meeting areas are to be regularly cleaned (min twice a day) and disinfected at least twice a day	All construction camp	Contractor

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	All persons to maintain their own water bottle, and should not be shared. To avoid external contamination, it is recommended everyone bring food from home Please maintain Social Distancing separation during breaks and lunch. Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough /sneeze into your upper sleeves or elbow. Do not cough or sneeze into your hands. Clean your hands after coughing or sneezing thoroughly by using soap and water (minimum for 20 seconds). If soap and water are not available, please use a hand sanitizer. The Contractor shall ensure adequate quantities of sanitizer and soap are made available at all locations including site offices, meeting rooms, corridors, washrooms /toilets, etc. as appropriate. Avoid touching eyes, nose, and mouth with your hands To avoid sharing germs, please clean up after Yourself. DO NOT make others responsible for moving, unpacking and packing up your personal belongings Work schedules are adjusted to provide time for proper cleaning and disinfecting as required.		
Workplace prevention practices (Safety measures for ongoing Covid-19 Pandemic)	At the start of each shift, confirm with all employees that they are healthy and inform all workers of reusable and disposable PPE. Outside person(s) should be strictly prohibited at worksite All construction workers will be required to wear cut-resistant gloves or the equivalent. Use of eye protection (reusable safety goggles/face shields) is recommended. The supply of eye protection equipment to the workers is considered as a standard part of PPE during construction works.	All construction camp	Contractor

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	In work conditions where required social distancing is impossible to achieve, such employees shall be supplied with standard face mask, gloves, and eye protection. All employees shall drive to work site as per the prevailing guidelines of the Government. When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant (with 1% sodium hypochlorite solution daily) prior to entry. Adequate quantity of the disinfectant shall be provided by the Contractor at all such site-specific locations. Workers should maintain separation of 6' from each other. Multi person activities will be limited where feasible (two persons lifting activities) Gathering places on the site such as sheds and/or break areas will be eliminated, and instead small break areas will be used with seating limited to ensure social distancing. Contact the cleaning person of the worksite and ensure proper COVID-19 sanitation processes. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning. The Contractor shall make available adequate supply of PPE and chemicals while the threat of COVID-19 continues. Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops and vehicles All employees to maintaining good health by getting adequate sleep; eating a balanced, healthy diet, avoid alcohol; and consume plenty of fluids. Continuation of works in construction project with workers available on site and no workers to be brought in from outside		

4. Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	The site offices shall have adequate ventilation. The air conditioning or ventilation systems installed at the site offices would have high-efficiency air filters to reduce the risk of infection. The frequency of air changes may be increased for areas where close personal proximity cannot be fully prevented such as control rooms, elevators, waiting rooms, etc. The Contractor shall carry out contactless temperature checks for the workers prior to site entrance, during working hours and after site works to identify persons showing signs of being unwell with the COVID-19 symptoms.		

5. Safety

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
Pre-Construction and Design Stage			
Alignment			
Risk due to constricted sections, pavement damage due to use of unsuitable sub-grade material and inadequate drainage provisions in habitat area	CBR value of subgrade adopted in consistent to MORTH guidelines Increase in vent size of cross drains with inadequate waterways Maintain road level above HFL as per site conditions and MORTH guidelines Provision of new cross drainage structures Cover drains in built up area Side drains on hill side in Ghat section and open lined drain in open areas all along the alignment	Geometric improvement of curves Geometric improvement of curves 64 CD structures proposed for improvement Covered drain = 9.094 km	DPR Consultant during preliminary and detailed design
Safety along the proposed alignment	Horizontal and vertical profile to be improved as per MORTH/IRC specifications considering land availability. Speed limitations near built up sections and sensitive locations by installing rumble strips/speed breakers etc.	Built-up-Stretches are: Debarapar, Abhoipuria Gaon, Heloichi gaon Hemlai Samtal, Gabhru Tiniali. Koliapani, Rahadhal ,Podumani , Amguri, Lalimchiga , Samguri,	DPR Consultant during preliminary and detailed design

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	Provision of side-walks in built up sections over cover drains. Provision of cautionary and warning signs, boards near built up sections, sensitive receptors and forest areas Provision of safety kerb at all bridges. Signs and marking viz. delineators, object markers, safety barriers at hazardous locations. Improvement of all major junctions as per MORTH guidelines Provision of Solar blinkers and Solar street lights	Belimukhiya Tiniali , Dikshu Mout Village , Ksanakar, Namti Charali, Mezenga , Bortal, Nazira.Sensitive Receptors in close vicinity are: School 0+200 (L), 2+150 (R), 5+810 (R), 9+450 (L), 9+700 (L), 11+830 (R), 10+100 (R), 13+250 (L), 19+800 (R), 20+500 (R), 22+800 (R), 23+950 (L), 25+500 (L), 25+100 (L), 29+450 (L), 30+450 (L), 31+100 (R), 33+850 (L), 36+950 (R), 37+100 (L), 39+400 (R), 39+800(L) PHC 0+100 (L) Hospitals 43+150 (R)	
Natural Hazards			
Damage to pavement integrity like rutting, embankment softening and migration of liquid asphalt.	Design considers the risk of climate change in the region and accordingly uses asphalt specifications	Entire stretch	DPR Consultant
Earthquake	Relevant IS codes have been adopted in designing the structures to sustain the magnitude of earthquake corresponding to seismic zone of the project area	Entire stretch	DPR Consultant during preliminary and detailed design
Flooding/Water Logging	CD structures designed and improved for 50-year return period Roadside drains improved 64 CD structures to be reconstructed/ improved	Anticipated water logging location as per TCS Type II Anticipated water logging and flood prone location as per TCS Covered drain = 9.094 km	DPR Consultant during preliminary and detailed design
Shifting of Utilities and common property resources			
Disruption of utility services and common property resources to local community	Geometric adjustments made to minimize shifting needs or loss to any facilities All telephone and electrical poles/wires, underground cables/pipelines should be shifted before start of construction.	Throughout project corridor	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	Necessary permissions and payments should be made to relevant utility service agencies to allow quick shifting and restoration. Local people must be informed through appropriate means. about the time of shifting of utility structures and potential disruption of services if any Relocation of. wells, hand pumps at suitable locations with consent from local community. Early completion of works for schools, colleges and health centres including shifting of gates and construction of boundary walls shall be planned during holidays so that the risk of accidents and disturbance to day-to-day activity of such institutions are minimized. Proper placement (as per codes) of passenger shelters/bus stops shall be ensured to prevent distress to the commuters and passengers. Relocation sites for all CPRs shall be selected in consultation with concerned communities, local administrative authorities/departments. Concerned authority, local body and public must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any, so as to ensure that work does not get affected.		
Construction Stage			
Noise			
Noise from construction vehicles, equipment and machinery.	PPEs to workers	Built-up-Stretches are: Debarapar, Abhoipuria Gaon, Heloichi gaon Hemlai Samtal, Gabhru Tiniali. Koliapani, Rahadhal , Podumani , Amguri, Lalimchiga , Samguri, Belimukhiya Tiniali, Dikshu Mout Village, Ksanakar, Namti Charali, Mezenga , Bortal, Nazira.Sensitive	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
		Receptors in close vicinity are:School 0+200 (L), 2+150 (R), 5+810 (R), 9+450 (L), 9+700 (L), 11+830 (R), 10+100 (R), 13+250 (L), 19+800 (R), 20+500 (R), 22+800 (R), 23+950 (L), 25+500 (L), 25+100 (L), 29+450 (L), 30+450 (L), 31+100 (R), 33+850 (L), 36+950 (R), 37+100 (L), 39+400 (R), 39+800(L) PHC 0+100 (L) Hospitals 43+150 (R)	
Land and Soil			
Borrow area management	No borrow areas shall be opened within 500m of wildlife movement zones and forest areas. The borrow areas shall be atleast 300m from schools and village access roads.	Borrow site location as identified in DPR or any selected borrow area	Contractor
Flora and Fauna			
Vegetation loss due to site preparation and construction activities.	Restrict tree cutting up to toe line considering safety to road users Roadside trees to be removed with prior approval of competent authority.	Throughout the project corridor	Contractor with Forest Department
Traffic Management and Safety			
Management of existing traffic and safety	Traffic Management Plan shall be submitted by the contractor and approved by the AE. The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is done during least number of people and other vehicles on the road. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.	Throughout the project corridor	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "AE". Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.		
Safety of Workers and accident risk from construction activities	Contractors to adopt and maintain safe working practices. Usage of fluorescent and retroflector signage, in local language at the construction sites. Training to workers on safety procedures and precautions. Mandatory appointment of safety officer. All regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe entry and egress shall be complied with. Provision of PPEs to workers. Provision of a readily available first aid unit including an adequate supply of dressing materials. The contractor shall not employ any person below the age of 18 years for any work and also declare at site. Use of hazardous material should be minimized and restricted. Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies. Accident Prevention Officer must be appointed	Construction sites	Contractor
Accident risk to local community	Restrict access to construction sites only to authorized personnel. Physical separation must be provided for movement of vehicular and human traffic.	Throughout the project corridor, construction sites	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	All measures for the safety of traffic during construction viz. signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings shall be taken. Provision of temporary diversions and awareness to locals before opening new construction fronts. Alternate access facility to common properties near construction zones Speed limitation wherever animal movement is anticipated.		
Pedestrians, cattle movement	Temporary access and diversion, with proper drainage facilities. Access to the schools, temples and other public places must be maintained when construction takes place near them. Speed Limitation wherever cattle movement is expected. If any wild animal is found near the construction site at any point of time, the contractor shall acquaint the Engineer and execute the Engineer's instructions for dealing with the same. The Engineer shall report to the nearby forest office (range office) and shall take appropriate steps/ measures in consultation with the forest officials.	Near habitation on both sides of schools, temples, hospitals, graveyards, construction sites, haulage roads, diversion sites.	Contractor
Operation Stage			
Noise			
Noise due to movement of traffic	Speed limitation and honking restrictions near sensitive receptors locations.	Sensitive receptors	Operation and Maintenance Agency
Maintenance of Right of Way and Safety			
Accident Risk due to uncontrolled growth of vegetation	Maintain shoulder completely clear of vegetation. Minimum offset as prescribed in IRC: SP:21-2009 to be maintained Regular maintenance/trimming of plantation along the roadside No invasive plantation near the road.	Throughout the corridor especially near accident prone curves and forest areas	Operation and Maintenance Agency

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	Ensure no fuel accumulation and clearances of vegetation by burning near forest areas to avoid forest fires		
Accident risks associated with traffic movement	Traffic control measures, including speed limits, will been forced strictly. Further encroachment of squatters within the ROW will be prevented. No school or hospital will be allowed to be established beyond the stipulated planning line as per relevant local law Monitor/ensure that all safety provisions included in design and construction phase are properly maintained Highway patrol unit(s) for round the clock patrolling. Help lines for accident reporting and ambulance services with minimum response time for rescue of any accident victims, if possible.	Throughout the Project route	Operation and Maintenance Agency
Transport of Dangerous Goods	Existence of spill prevention and control and emergency responsive system Emergency plan for vehicles carrying hazardous material	MI: Status of emergency system – whether operational or not PT: Fully functional emergency system	Operation and Maintenance Agency

Table 75: Biodiversity Management Plan

	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
	Pre-construction Stage					
1.	Disturbance to Natural Vegetative community	• Prior to clearing and grubbing work, the Biodiversity Specialists will conduct pre-construction checks, to avoid accidental injury or death to sensitive species. • The Biodiversity Specialists will prepare a monitoring report and sensitive map/ area showing sensitive locations. This will be shared with workers through toolbox talks, regular awareness campaigns so that sensitive areas can be avoided or bespoke mitigation implemented	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
2.		• Pre-construction checks will include bird nesting within hollow trees and other places of shelter on trees in corridor of impacts. • Identification of sites and peak visiting period for migratory birds in the project area of influence.	Avifauna (Birds)	Throughout the project stretch	Contractor	CSC/ PIU
3.		• Prior to construction, it is important to determine the area, locations which are preferentially used by Wild animal (large mammals & Amphibians, reptiles, Arboreal) during feeding time possibly Morning and evening near the buffer area of PAs, close to Project areas, so that conservation effort can be focused on these locations.	Overall Sensitive Fauna	Throughout the project stretch	Contractor	CSC/ PIU
4.	Debris Management	• Debris management plan as suggested in EIA should be followed strictly at site	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
5.	Location of Labour camp	• Labour camps should be prohibited in protected and high-biodiversity areas / Buffer areas/Reserve Forest	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
Construction Stage						
6.	Sensitivity among worker and project staff	• Workers will be made aware of the ecological sensitivities of the areas and will be trained in mitigation for any unforeseen events, including the presence of uncommon habitats and species. • Hunting and gathering by Project staff will be prohibited, Hunting by Project staff should be viewed as a serious violation	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
7.	Disturbance due to excess light in eco sensitive areas	• Work during night time will be kept to a minimum where possible. Wherever lighting required, lights will be kept away from areas of woodland and hedges and lighting will be directed to where it is needed with marginal light spillage.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
8.	Waste Management Issue	• A waste management plan will be implemented. Waste disposal facilities will be operated in a manner that includes the regular covering of exposed refuse with soil or gravel. This will reduce risk of exposure of birds such as Vulture, kites that regularly forage in waste dumps to potentially damaging waste products.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
9.	Dust Issues	• Vehicle speeds on access and haul roads will be controlled to minimise dust emissions and the risk of mortality of animals. • Water sprinkling shall be practised at construction sites, earthen access and haul roads.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
10.	Labour sensitivity	• Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Waste water from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
11.	Construction Activity	• Temporary construction material sites, quarries, borrow pits, and storage areas can also have an effect on habitat loss and degradation. Such sites shall be rehabilitated as appropriate, following their use but before construction is completed.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
12.	Overall Safety Measure	• To minimize harm to biodiversity during road construction (or improvement, rehabilitation, or maintenance), it is important to regulate the behaviour of workers in the field. Specifically, workers under the projects should be prohibited from hunting, fishing, wildlife capture (including for pets), plant collection, or burning of vegetation, anywhere in or near the project area.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
Post Construction Phases						

	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
13.	Monitoring of sensitive species (reported during detailed survey along the corridor)	• Monitoring must take place under the direction of an appropriately qualified person and the results of the monitoring must be kept in a written record	Overall	Throughout the project stretch	Contractor	PIU
14.	Landscaping & compensatory afforestation	• Landscaping and green belt along the corridor will utilize predominantly native vegetation endemic to the region, sourced and consulted from local area. This will attenuate the negative impact originated from construction activities. • All re-vegetation carried out for the Project will be carefully reviewed and monitored to avoid accidental introduction of invasive alien species	Overall	Throughout the project stretch	Contractor	PIU
15.	Accidental discharge in water	• To avoid Accidental discharge; leakage from oil receptors, refuelling of vehicle, washing of vehicles should follow the approach of routine and periodical maintenance • Oil interceptor shall be installed at plant and vehicle workshop	Fishes	At bridge construction locations	Contractor	PIU
16.	Overall Management oil contamination	• Automotive workshop establishment shall be avoided and discouraged along the corridor especially which is undergoing commercial activities without maintaining preventive measure of oil contamination/spillage.	Overall species	At bridge construction locations	Contractor	PIU
17.	Sensitivity among project people, locals etc.,	• Awareness programme as training, workshop shall be organized to spread the awareness for protection of endangered species and provisions of punishment against poaching or disturbing as per WPA 1972 under GOI.	Overall species	Throughout the project stretch	Contractor	PIU

	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
18.	Road safety Treatment	• Wildlife warning signages with flashing lights and variable message boards have the potential to be more effective than static warning signs (As per World Bank Report). Such signs are most effective if employed during peak wildlife crossing periods (e.g., migration, morning, evening) or are associated with animal-activated detection systems that trigger flashing and/or message signs only when animals are present.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
19.		• Solar-powered flashing lights (with batteries for night-time operation) can be attached to static signs for operation during key periods such as elephant migration.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
20.		• To effectively reduce wildlife-vehicle collision incidence, lower design speed considerations will be integrated into road design and construction. Specific design speeds are used to engineer various geometric design features into a roadway, with minimum standards applied for different design speeds.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
21.		• Traffic calming managements, such as curb extensions, raised medians, rumble strips in the pavement, speed bumps, Reduced speed warning shall be undertaken by contractor for stretch close to sensitive areas	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
22.		• The Endangered species as listed in table will be monitored throughout the Project and additional mitigation implemented if necessary.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
23.		• To prevent animal casualty during operation phase, care has to be taken by the APWRD in consultation with the wildlife official and DFO. One forest check post has to be erected on both the end of roads falling close to protected area – **Hollongapar Gibbon WLS**. Forest guards or CCTV cameras has to be installed at both the end and in between to keep eye on the plying vehicles.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU

	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		Sign Board 500 meters ahead of Wildlife Area has to be placed for traveller's information. • No honk zone & speed limits of 20-30km/hr sign board has to be erected at every 500 meters on the roads falling near ecological-sensitive area • Sign board of animal's movement zone and CCTV Surveillance zone has to be installed before the check posts and in between the road. • The death of animals if happening has to be reported along with locations. If repetitive deaths are happening at the same location or area, then PWRD has to take some preventive measures like adding animal's underpass or animal's accident zone sign board with speeds breakers.				

Table 76: Environmental Monitoring Plan

Attribute	Project Stage	Parameter	Special Guideline	Standards	Frequency & Duration	Location	Implementation
Air	Construction	PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO	Respirable Dust Sampler to be located 50 m from the selected locations in the downwind direction. Use CPCB specified method	Ambient Air quality standards CPCB	24 hr. continuous for three seasons in a year for 2 years (once in a season)	Monitoring near all hot mix plant locations approved by the Engineer Monitoring at construction sites near sensitive locations (32 Samples)	Contractor through approved monitoring agency
	Operation				24 hr. continuous, for two seasons for a year (once in a season)	Ambient Air Quality Monitoring (At 2 location where environmental monitoring during baseline data generation done) (12 Samples)	

Attribute	Project Stage	Parameter	Special Guideline	Standards	Frequency & Duration	Location	Implementation
Noise	Construction	Noise levels as Leq in dB	IS:4954-1968 as adopted by CPCB for identified study area CPCB/IS:4954-1968 Using Noise Level Meter	National Ambient Noise Standard specified in EPA,1986	24 hr. continuous (once in a month) for three seasons in a year for 2 years	At equipment yards/ Hot mix plants/ Construction Camps & Sensitive areas (32 Samples)	Contractor through approved monitoring agency
	Operation				24 hr. (once in a month) for three seasons in a year for 1 year	Near Sensitive and residential/Commercial areas as directed by the Engineer (12 Samples)	
Water Quality	Construction	pH, BOD, COD, Turbidity, Total Hardness, SS and others.	Grab Sample collected from source and analyzed as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	Once in a Season for three seasons in a year for 2 years	Surface Water Quality (16 Samples) Discharge Water Quality (As per suggestion in monitoring plan) (6 Samples)	Contractor through approved monitoring agency
	Operation				Once in a Season for three seasons in a year for 1 year		
Soil Quality	Construction	NPK (ICAR Standards)	As approved by Authority Engineer	ICAR standards	Once in a Season for three seasons in a year for 2 years	At productive agricultural lands abutting traffic detours and traffic diversions, to be identified by the Engineer (16 Samples)	Contractor through approved monitoring agency
	Operation				Once in a Season for three seasons in a year for 1 year	At accident/spill locations involving bulk transport carrying hazardous material (6 Samples)	

Attribute	Project Stage	Parameter	Special Guideline	Standards	Frequency & Duration	Location	Implementation
Drainage Congestion	Construction	As approved by Authority Engineer	Visual Checks	None Specific	Throughout the Project Corridor especially Probable drainage congestion areas	Once in a year before rainy season	Contractor
	Operation			None Specific		Once in a year before rainy season	Contractor
Borrow Areas	Construction	IRC guidelines	Visual Checks	IRC guidelines + Compliance conditions of SEIAA	Borrow areas to be operated	Once in a month	Contractor with approval from PWD, Assam.
	Operation	Rehabilitation as per IRC guidelines	Visual Checks		Closed Borrow Areas	Quarterly for 1 year	PWD, Assam / AE
Construction sites and labour camps	Construction	Rapid audit as per reporting format	Hygiene, drainage Medical Facilities Etc.	IRC guidelines	Construction Sites and Camp	Quarterly during construction period	Contractor with approval from PWD, Assam
Tree Plantation	Construction	Surveillance monitoring of trees felling		As approved by Authority Engineer	Throughout the Project Section	During site clearance in construction phase	Compensatory: PWRD, Assam / Local Forest Departments
	Operation	Audit for survival rate of trees plantation		IRC: SP:2009	Throughout the Project Section		The Engineer will be responsible for monitoring up to the Defect Liability Period in any particular stretch. After this period PWRD, Assam will be responsible for monitoring additional plantation
Record of Accident	Construction		Type, nature and cause of accidents. Methodology as	As approved by Authority Engineer	Throughout the stretch including construction	Occurrence of accidents	Contractor

Attribute	Project Stage	Parameter	Special Guideline	Standards	Frequency & Duration	Location	Implementation
			approved by Authority Engineer		sites, crusher, diversions, Hot Mix Plant, earthwork, demolition site etc.		
	Operation			-	Throughout the stretch	Occurrence of accidents	Road Safety unit of PWRD, Assam with support from local police

9.4 Chance Find Procedure

The Contractor shall immediately upon discovery of a chance find of archaeological Property/ remains stop the work and inform PWRD of such discovery and carry out the PWRD instructions for dealing with the same, awaiting which all work will be stopped. The PWRD shall seek direction from the Archaeologist at the Department of Archaeology before instructing the Contractor to recommence work on the site. The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing.

9.5 Environmental and Social Monitoring and Reporting Program

The purpose of the environmental monitoring program is to ensure that the envisaged objectives of the project are achieved and result in desired benefits. To ensure the effective implementation of the mitigation measures and the Environmental and Social Management Plan (EMP), an effective monitoring programme must be designed and carried out. The broke objectives of environmental monitoring plan are:

- To evaluate the performance of mitigation measure proposed in the EMP,
- To evaluate the adequacy of Environmental Assessment
- To suggest improvements in the management plan, if required,
- To assess change in environmental quality,

A comprehensive monitoring plan has been prepared for all stages of the project. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost, and responsibility for implementation and supervision. The monitoring program is designed for monitoring during construction and operation stages with details on budget and responsible agencies:

- Construction Stage: (two years of construction period)
- Monitoring shall be carried out by the Contractor
- Six Monthly monitoring by the external agency shall be arranged by PIU from the Project cost budget. The monitoring report will be submitted by the agency to PWRD.
- Monitoring Programme and schedule for Key Performance Indicators (Physical, biological, and environmental and social management components identified as of its significance) are given in the following section:

9.5.1 Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters recommended for monitoring road development projects are $PM_{2.5}$, PM_{10}, Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Sulphur Dioxide (SO_2). These are to be monitored, right from the commencement of construction activity at selected locations of plants and machinery, crushers on sites, excavation works, etc. Data should be generated once in a season for 3 seasons in a year excluding monsoon at the monitoring locations in accordance with the revised National Ambient Air Quality Standards formulated by MoEF&CC. (Annexure-1).

9.5.2 Water Quality Monitoring

The physical and chemical parameters recommended for analysis of water quality relevant to road development project are pH, total solids, total dissolved solids, total suspended solids, and oil & grease. The monitoring of the water quality is to be carried out at all identified locations in accordance with the Indian Standard Drinking Water Specification – IS 10500: 2012 (Annexure 3). The locations, duration, and pollution parameters to be monitored are detailed in the Environmental Monitoring Plan.

9.5.3 Noise Levels Monitoring

The measurements for monitoring noise levels would be carried out at designated locations in accordance with the ambient Noise Standards formulated by the Ministry of Environment Forests and Climate Change (MoEF&CC) as given (Annexure 2). The noise level would be monitored on a twenty-four hours basis. Noise should be recorded at "A" weighted frequency using a slow time response mode of the measuring instrument. The measurement location, duration, and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan.

9.5.4 Tree Plantation

The survival of tree-plantation shall be monitored for three years of the operation phase. If the survival rate is found below 75%, additional compensatory plantation shall be done by the agency responsible for plantation and its maintenance. The survival rate monitoring shall be again taken up after 1 year. This cycle should continue until the 75% survival rate is achieved. Tree plantation would be done through the forest department, monitoring shall be carried out byPWRD.

9.5.5 Soil Erosion and Drainage Congestion

No significant soil erosion problem is anticipated due to the project either in the construction phase or in the operation phase. However, in the construction phase, some localized soil erosion may be noticed owing to construction activities. However, if soil erosion is noticed during the construction and operation phase, the corrective action shall be initiated and the frequency of check be increased to assess the tendency of occurrence.

9.5.6 Social Monitoring

The most crucial components/ indicators to be monitored are specific contents of the activities and entitlement matrix. The Resettlement Action Plan will contain indicators and benchmarks for achievement of the objectives under resettlement program. These indicators and benchmarks are of three kinds:

- Process indicators including project inputs, expenditures, staff deployment, etc.
- Output indicators indicating results in terms of numbers of displaced people compensated and resettled, training held, credit disbursed, etc. and
- Impact indicators related to the longer-term effect of the project on people's lives.

9.6 Environmental and Social Reporting System

The monitoring plan covering various performance indicators, frequency, and institutional arrangements of the project in the construction and operation stages, is summarized in the Environmental Monitoring Plan.

The reporting system will operate linearly with the contractor who is at the lowest rank of the implementation system reporting to the CSC's Engineer, who in turn shall report to the PIU of PWRD, Assam. All reporting by the contractor and CSC's Engineer shall be every Monthly/quarterly. The PIU shall be responsible for preparing targets for each of the identified ESMP activities.

The environmental compliance monitoring and the progress reports on environmentalcomponents may be clubbed together and submitted to the PIU quarterly during the implementation period. The operation stage monitoring reports may be annual or biannual provided the Project Environmental Completion Report shows that the implementation was satisfactory. Otherwise, the operation stage monitoring reports will have to be prepared as specified in the said Project Environmental Completion Report.

Responsibilities for overseeing ESMP implementation will rest with the CSC's Engineer staff reporting to the PIU. Capacity to quantitatively monitor relevant ecological parameters would be an advantage but monitoring will primarily involve ensuring that actions taken are in accordance with contract and specification clauses, and specified mitigation measures as per the EMP.

During the implementation period, a compliance report may include a description of the items of ESMP, if not complied by the responsible agencies. It would also report to the management about actions taken to enforce compliance. It may, however, be noted that certain items of the ESMP might not be possibly complied with for a variety of reasons. The intention of the compliance report is not to suppress these issues but to bring out the circumstances and reasons for which compliance was not possible (such as jurisdictional issues). This would help in reinforcing the implementation of the EMP.

Photographic records will also be established to provide useful environmental monitoring tools. A full record will be kept as part of normal contract monitoring. Reporting and Monitoring Systems for various stages of construction and related activities have been proposed to ensure timely and effective implementation of the EMP.

The reporting system has been prepared for each of the stages of road constructionnamely:

- Preconstruction stage
- Construction Stage
- Operation Stage

This reporting shall be done through:

- Reporting by the Contractor to the CSC's Engineer
- Reporting by CSC's Engineer to PIU.
- Reporting by PIU to PMU.
- Reporting by the PMU to AIIB

Table 77: Detailed stage-wise reporting system

Format No.	Item	Contractor	Construction Supervision Consultant		PWRD, Assam PIU	
		Implementation and Reporting to Construction Supervision Consultant	Supervision	Reporting to PIU	Oversee/ Field Compliance Monitoring	Reporting to Environment Officer of PIU
C1	Monitoring of construction site and construction camp	Before the start of work	-	Quarterly	-	Quarterly
C2	Target sheet for pollution monitoring	-	As required	After Monitoring	-	After Monitoring
C3	Target sheet for roadside plantation	-	Monthly	Quarterly	Quarterly	Bi-Annual
C4	Target sheet for monitoring of cleaning water bodies	-	Monthly	Quarterly	Quarterly	Bi-Annual
O1	Target sheet for pollution monitoring	-	-	-	As per Monitoring plan	After Monitoring
O2	Target sheet for survival reporting of roadside plantation	-	-	-	Quarterly	After Monitoring
O3	Target sheet for monitoring of cleaning water bodies	-	-	-	Quarterly	After Monitoring

Formats will be developed and provided by CSCto the contractor.

Social Reporting Requirements

Project Division Office responsible for supervision and implementation of the Resettlement Action Plan will prepare monthly progress reports on resettlement activities and submit to PWRD. PWRD will submit semi-annual reports to AIIB.

The external monitoring expert responsible for monitoring of the Resettlement Action Plan implementation will submit a semi-annual review report to PWRD to determine whether resettlement goals have been achieved, more importantly whether livelihoods and living standards have been restored/ enhanced and suggest suitable recommendations for improvement.

The Independent Monitor for process monitoring under land being purchased under Mutual consent. The report shall be prepared and submitted to PWRD and AIIB on requirement basis till the process for purchase is complete.

9.7 Institutional Arrangement

Public Works Roads Department (PWRD), Government of Assam will be the executing agency. The Chief Engineer (EAP) will be the Project Director (PD) of state level Project Management Unit (PMU). PD PMU will be assisted by an Assistant Executive Engineer as Nodal Officer of Asom Mala Program. **Figure 9-1** shows the implementation arrangement for Asom Mala Program.

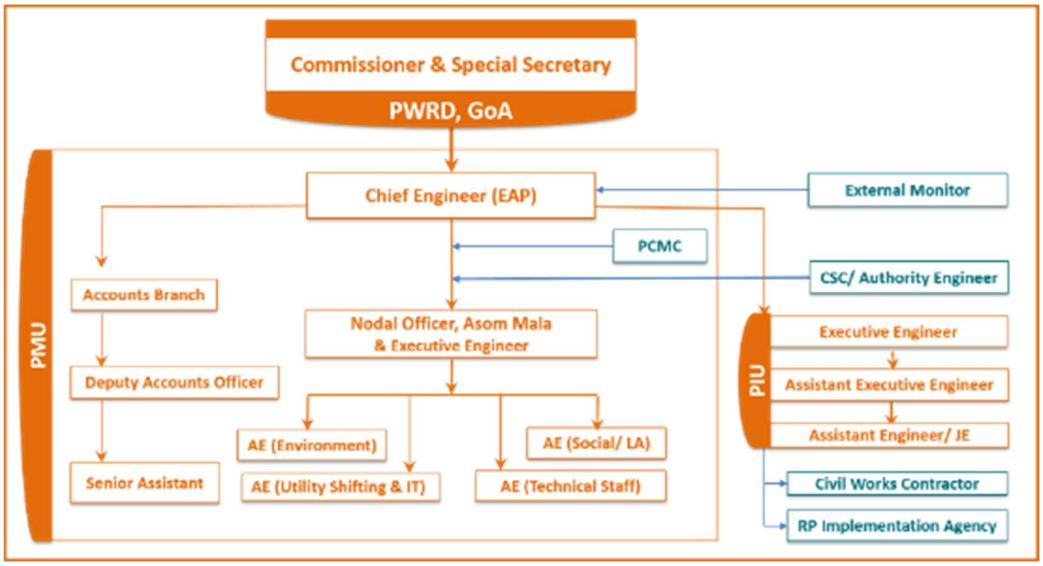


Figure 9-1: Institutional Arrangement for Implementation of ESMP

9.7.1 Responsibilities of the Program Management Unit (PMU)

The PMU will oversee overall execution and technical supervision, monitoring, and financial control of the project. The PMU shall be assisted by Program Coordination and Management Consultant (PCMC). The PMU will be responsible for the following:

i. appointing Independent External Monitors, RP Implementing Agencies, Authority Engineers, Contract Supervision Consultants, Civil work contractors, other

Implementing Agencies for PIU level/ Contract level/ Sub-project level/ PMU level, as and when where required;

ii. Liaising with district administration for direct purchase or land acquisition
iii. Preparation of ESMPF, Resettlement Planning Framework (RPF), Indigenous Peoples Planning Framework (IPPF) for ASRIP projects of Asom Mala program;
iv. Review and approving of Resettlement Plan (RP), Environmental and Social Management Plan (ESMP) and all other social and environmental safeguards documents and reports;
v. Ensuring timely disbursement of compensation and assistance to the displaced persons in close coordination with the concerned line departments;
vi. Monitoring of implementation and monitoring of RP and ESMP;
vii. Proactive and timely measures to address all social and environment safeguards including measures and clearances;
viii. monitoring, addressing and resolving grievances;
ix. ensuring availability of budget for implementation activities; and
x. ensuring disclosure of relevant frameworks, implementation and management plans and monitoring documents.

The PMU will seek government clearances for submission and disclosure of the environmental, social and resettlement report to AIIB. It will also coordinate with national and state agencies to resolve inter-departmental issues, if any.

9.7.2 Responsibilities of the Project Implementation Units (PIUs)

The PWRD had already established separate state road divisions in each district. These will be responsible to implement all the project related activities in their respective districts/ divisions including the road strengthening and widening works, implementation of road rehabilitation works, land acquisition and forest clearances, data-collection, preparation and implementation of contracts and coordination with local administration and local communities to seek their support.

The PWRD's Superintending Engineers (SEs) in the field will closely monitor and guide the field divisions in implementing all the project related activities in their respective jurisdiction. The SEs will undertake quarterly management meetings with the contractors; coordinate with district administration, forest department, water supply, electricity, and revenue departments to resolve any land acquisition, site readiness, material availability, and law and order or social issue. The PIUs will be supported by CSC and RP Implementation Agency (RIA) to implement environmental and social safeguards activities. The PIU will undertake internal monitoring and supervision and record observations throughout the project period to ensure that the safeguards and mitigation measures are provided as intended.

9.7.3 Responsibilities of the Project Coordination and Support Consultant (PCMC)

A PCMC has been mobilized to provide high quality technical advice and implementation support to PWRD for all the project components under Asom Mala program. The PCMC shall support the Program Management Unit (PMU) for all aspects of Asom Mala program. An Environmental Specialist shall also be appointed as part of the PCMC team to (i) prepare

ESMPF for sub-project roads under ASRIP; (ii) review the Environmental Assessment and ESMP prepared by the DPR Consultants in the planning phase; (iv) assist in the monitoring and supervision of ongoing subprojects and ESMP implementation; (v) monitor the implementation of ESMP carried out by the PIU level; and (vi) ensure all subprojects meet safeguard requirements as agreed in the loan covenant and in line with this ESMPF. In addition, (s)he shall play a central role in ensuring capacity building on environmental management of the PMU, RP Implementation Agencies and line departments through capacity development support and training.

9.7.4 Responsibilities of Construction Supervision Consultant (CSC)/ Authority Engineer (AE)

The CSC is the supervising authority for contractors following item rates and the AE is the supervising authority for contractors that follow the EPC modality. They are also responsible for reviewing and approving the detailed engineering design prepared by the EPC contractor. Other than the difference mentioned above, the following are the responsibilities of the CSC and AE:

xi. Review the environmental and social reports and management plans to understand the background issues of the respective project corridor
xii. Review and approve the revised ESMP and other required sub-plans such as traffic management plan, health and safety plan, waste management plan etc. prepared by the contractor
xiii. Conduct regular site inspections and monitor implementation of the ESMP and EMOP by the contractor
xiv. Provide on-site training and technical guidance to the contractor workers as necessary
xv. Review the monthly reports prepared and submitted by the contractor
xvi. Where necessary identify the need for corrective actions and issue official notices to the contractor to implement the corrective actions with clear timeline
xvii. If there are any complaints or grievances, facilitate consultations with the respective complainant and ensure the grievances are addressed in accordance with the GRM system
xviii. Regularly convene meetings to discuss progress or issues on environment safeguards to ensure that all parties (contractor, PIU, PCMC) are on the same page on requirements and milestones for environment safeguards
xix. Based on site inspections and review of reports submitted by the contractor prepare semi-annual (for category A project corridors) and annual (for category B project corridors) Environmental Monitoring Reports for review and approval by the PMU/PCMC. These reports shall be further forwarded to AIIB for disclosure on their website

9.7.5 RP Implementation Agency (RIA)

An RP Implementation Agencies will be hired to assist PIU to, (i) implement the Resettlement Plans and Indigenous Peoples Plan, if any (ii) conduct consultations and create public participation in the project and conduct verification surveys and (iii) update respective

Resettlement Plan and Indigenous Peoples Plan, if required, in line with the Resettlement Planning Framework and Indigenous Peoples Planning Framework, respectively.

9.8 Capacity Building and Training

The Environmental and Social officer of the PMC will provide the basic training required for environmental and social awareness. Specific modules customized for the available skill set will be devised after assessing the capabilities of the members of the Training Programme and the requirements of the project. The entire training would cover basic principles of environmental and social assessment and management; mitigation plans, implementation techniques, monitoring methods and tools. The proposed training program along with the frequency of sessions is presented in **Table 78**.

Table 78: Environmental and Social Training Modules

Sr. No.	Training Program	Duration	Target Group	Responsibility
1	Workshop on: ➢ Introduction to Environment and Society: ➢ Basic Concept of surrounding ➢ Environment and Society ➢ Environmental and Social Regulations and Statutory requirements as per Govt. of India and AIIB	¼ Working Day	PWRD & Contractor	Environmental and Social officer of the PMC
2	Environmental and Social management, environmental provisions, implementation arrangements, methodology of assessment, good engineering practices to be integrated into contract/ bid documents	¼ Working Day	PWRD & Contractor	Environmental and Social officer of the PMC
3	Roles and Responsibilities of officials/contractors/consultants towards protection of environment	¼ Working Day	PWRD & Contractor	Environmental and Social officer of the PMC
4	Monitoring and reporting system to the target audience such as Engineers and staff of implementing agencies (PWRD, Assam)	¼ Working Day	PWRD & Contractor	Environmental and Social officer of the PMC
5	Orientation of contractors at the time of issuing work orders on the implementation of SMF	¼ Working Day	PWRD & Contractor	Environmental and Social officer of the PMC
6	Overview of Land Securing and Entitlement Provisions ➢ Direct Acquisition ➢ Gift Deed / MoU ➢ Relocation of Common Property Resources ➢ Avoidance of encroachments during the post-construction scenario	¼ Working Day	PWRD, Contractor & Revenue officials	Environmental and Social officer of the PMC

9.9 Environmental and Social Management Budget

An environmental and social management budget of **INR 18,97,72,416** has been estimated for the implementation of the environmental and social management plan. This budget also includes the cost of environmental monitoring and associated training. A detail of the environmental and social management budget is given in **Table 79** (Civil Cost) and **Table 80** (Non-Civil Cost).

Table 79: Environment and Social Management Costs (Civil Cost)

Sr. No.	SOR Item No.	Ref. of MoSRT&H	Description	Unit	Quantity	Rate (INR)	Amount (INR)
1			**Environmental Monitoring Costs**				
1.1			Ambient air quality monitoring along the project road for particulate matter (PM2.5 and PM10), sulphur dioxide (SO2), oxides of nitrogen (NOX); and carbon monoxides (CO) using standard analysis technique in accordance with the National Ambient Air Quality Standards formulated by MoEF&CC and the World Bank (IFC) Air Quality. Standards				
			Near all hot mix plant locations approved by the Engineer	No. of Samples	16	2500	40,000
			Construction sites near sensitive locations	No. of Samples	16	2500	40,000
			At 2 locations during operation stage where monitoring had been done during construction stage	No. of Samples	12	2500	30,000
1.2			Sound Pressure Level (SPL) measurements along the project road using standard analysis technique in accordance with the National Ambient Air Quality Standards in respect of noise formulated by MoEF&CC and the World Bank (IFC) Air Quality. Standards				
			At equipment yards/ Hot mix plants/ Construction Camps	No. of Samples	16	1000	16,000
			Near known nesting sites - as directed by the Engineer	No. of Samples	16	1000	16,000
			During Operation Stage as directed by the Engineer	No. of Samples	12	1000	12,000
1.3			Water Quality Testing for parameters as per IS: 10500-2012 along the road in accordance with CPCB norms				
			Surface Water Quality testing during Construction Stage	No. of Samples	16	4000	64,000
			Discharge Water Quality testing during Operation Stage	No. of Samples	6	4000	24,000
1.4			Soil Quality Testing along the project road in accordance with CPCB norms				
			During Construction stage at productive agricultural lands abutting traffic detours and traffic diversions, to be identified by the Engineer	No. of Samples	16	4200	67,200
			During Operation stage at accident/spill locations involving bulk transport carrying hazardous material.	No. of Samples	6	4200	25,200
	Total monitoring Cost						**3,34,400**

Sr. No.	SOR Item No.	Ref. of MoSRT&H	Description	Unit	Quantity	Rate (INR)	Amount (INR)
2			**Mitigation / Enhancement Cost**				
2.1			***Enhancement of Road side ponds***				
	3.22	307	Turfing with Sods (Furnishing and laying of the live sods of perennial turf forming grass on embankment slope, verges or other locations shown on the drawing or as directed by the engineer including preparation of ground, fetching of rods and watering)				
			5 m width turfing on outer side of ponds located at ch 4.450km, ch 9.200km, ch 15.800 km, ch 20.000km, ch 23.000 km, ch 32.200 km, ch 34.200 km, ch 38.900 km, ch 41.750 km	sqm	4500	31	1,39,500
	3.24	309	Surface Drains in Soil (Construction of unlined surface drains of average cross-sectional area 0.40 sqm in soil to specified lines, grades, levels and dimensions to the requirement of clause 301 and 309. Excavated material to be used in embankment within a lead of 50m Average lead 25m)				
			Construction of surface drains on outer side of ponds located at ch 23.000 km, ch 32.200 km, ch 34.200 km, ch 38.900 km, ch 41.750 km	Meter	500	81	40,500
2.2			***Oil Interceptors***				
			Oil interceptors at parking/ servicing of construction vehicles	No.	2	60000	1,20,000
2.3			***Noise Barriers at Sensitive locations***				
			Provision of Noise barrier at sensitive areas like schools and hospitals. The noise barriers of hollow brick wall/ reinforced concrete panels with height of 3.5m. (3 no school, 1 health care centre)	Rm	200	4000	8,00,000
	Total Mitigation / Enhancement Cost during Construction phase						**11,00,000**
	Total Environmental Management Cost						**14,34,400**
	Total Environmental Management Cost (Including GST @ 12%)						**16,06,528**

Table 80: Environment and Social Management Costs (Non-Civil Cost)

Sr. No.	SOR Item No.	Ref. of MoSRT&H	Description	Unit	Quantity	Rate (INR)	Amount (INR)
			Sub Head No-1 Pre-construction Activity (Tree Cutting)				
1			Tree cutting along the project road	m3	5500.03		6,29,17,500.00
			Sub Head No-2 Compensatory Plantation				
3	11.9	307	Planting of Trees and their maintenance for one Year (Planting of trees by the road side (Avenue trees) in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge mannure, planting the saplings, backfilling the trenches, watering, fixing the tree guatrd and maintaining the plants for one year.	No.	83890	831	6,97,12,590
4	11.13		Making Tree Guard 53 cm dia and 1.3 m high as per design from empty bitumen drum (Making tree guard 53 cm dia and 1.3 m high as per design from empty bitumen drum, slit suitably to permit sun and air, (supplied by the department at stock issue rate) including providing and fixing 2 nos MS sheet rings 50mmX0.5mm with rivets, complete in all respects.	No.	83890	359	3,01,16,510
			Sub Head No-3 Administrative Charges including logistics				
5			Data processing, administrative support, stationery etc.	LS			6,99,500
			Digital Camera for the Environment Cell	No.	1	35990	35,990
			Sub Head No-4 Biodiversity Management				
			Budget for Biodiversity Management Plan				4,056,667
			Sub Head No-5 Environmental Awareness and Training				
6			Providing Environmental awareness and training during first 5 years of project implementation	Past Project Experience			4,66,500
Total Cost							**16,80,05,257**
Total Cost @ 12% GST							**18,81,65,888**

10. Conclusions and Recommendations

The proposed project A_20_2 (Nakachari to Balighat Tiniali) falls under Category "A" as per AIIB's Environmental and Social Framework. The project road corridor is neither a new State Highway nor a State Highway expansion project in hilly areas (above 1000 AMSL). However, the Hoollongapar Gibbon Sanctuary and Panidihing Bird Sanctuary lies at a distance of approximately 8km and 20 km the respectively from the project road. Environmental Clearance from MOEF&CC is not required as per EIA Notification 2006 (amended till date) and NOC from the Standing Committee of National Board for Wildlife is also not required. The project is unlikely to cause any major significant environmental impacts, few impacts are identified, all of which are localized, temporary, and easy to mitigate. Most of the impacts are short-term and limited to the construction stage. Key conclusions on the environmental implications of the project are given in the paras below.

Environmental Gains Due to Proposed Work Justifying Implementation

The project entails various impacts on the project setting. There are many positive impacts bearing benefits to the area against the limited number and magnitude of negative impacts. These include (i) The project will substantially improve the transport efficiency on the roads. (ii) The project once implemented will improve the overall environmental conditions with better roads, fuel efficiency, and environmental protection measures (iii) will reduce traffic congestion particularly at junctions hence, air pollution due to the idling of the vehicles.

Potential Impacts and Mitigation

The finding of EIA indicates that the project is unlikely to cause any significant adverse environmental impacts. While some of the minor impacts are negative, there are many bearing benefits to the area. Most of the impacts are likely to occur during the construction stage and are temporary. Anticipated minor impacts will be mitigated through the implementation of mitigation measures summarized in the Environmental and Social Management Plan.

Factors contributing to minimal impacts include the widening of the project road confined within the available RoW with minimum land acquisition at some locations, the impacts would not be severe and will be mitigated as per the Environmental and Social Management Plan (ESMP). However, some of the impacts are unavoidable. These impacts with mitigation measures are indicated below:

- **8389** trees will need to be cut with the prior permission of forest authorities. Compensatory Tree plantation of **83890** trees as per the direction of the forest department will be made to compensate for this loss. Preventive measures shall be taken during the construction phase especially in rainy months, to prevent soil erosion because of tree cutting and alteration of ground flora.
- Air pollution due to construction activities and operation of hot mix plant will be controlled through the adoption of dust suppression measures and provision of the high stack for good dispersion of gaseous emission from hot mix plants.

- Noise levels may increase during the construction phase due to the operation of construction machinery. All the construction equipment and DG set will be well maintained and fitted with silencers.
- Waste materials generated during the construction phase may contaminate soil, surface, and groundwater resources. Waste shall be segregated and reused or disposed of in an environmentally safe manner.
- Along the project stretch, few schools, hospitals, and religious structures are located. Appropriate design options are exercised to minimize the loss of such structures.
- The social issues are addressed through Social Safeguards Due Diligence reports prepared as per AIIB'sEnvironmental and Social Framework.

Application of these measures in parallel with MoRTH environmentally friendly road construction practices will reduce significantly any potential environmental impact. Impacts remaining on the physical environment (air and water pollution) are temporary and often occur away from the presence of people.

Post EIA Surveillance and Monitoring

While an EIA is meant to provide a comprehensive understanding of the environment status of the area under the study, post EIA surveillance is the means to ensure that the significant impacts identified are adequately mitigated as per the proposed mitigation plan. A detailed monitoring plan has been provided as part of the Environmental and Social Management Plan. Air, water quality, noise, soil erosion, and tree survival rate monitoring and reporting along with the follow-up actions in case of deviation from the norms have been detailed out. The frequency has been set in consideration of the likely impacts.

Public Consultations

The project got support and consent from most of the local people. The local people did not perceive any adverse impact due to the proposed project. Environmental awareness and likewise concern were found generally low. People, however, expressed the desire of minimizing the tree cutting.

Recommendations

Adequate mitigations shall be taken up both during the construction and operation stage of the project road to avoid/minimize adverse environmental impacts due to this event and any such event in the future as suggested in EIA.

Effective ESMP implementation is essential for the elimination or minimization of the identified impacts. The PWRD shall ensure that ESMP are included in the Bill of Quantity (BOQ) and forms part of the bid document and civil works contract. The same shall be revised if necessary, during project implementation, or if there is any change in the project design.

PWRD needs capacity building and practical exposure. Adequate training shall be imparted as proposed under the environmental and social management plan to enhance the capability of concerned EA officials.

Annexure 1: Ambient Air Quality Standards

National Ambient Air Quality Standards

Pollutant	Concentration in ambient Air			
	Average	Industrial, Residential and other rural area	Ecologically Sensitive Area (Notified by Central Government)	Methods of Measurement
SO2 ug/m3	Annual* 24 hours**	50 80	20 80	- Improved West andGeake - UltravioletFluorescence
NOx ug/m3	Annual* 24 hours**	40 80	30 80	- Modified Jacob and Hochheiser - Chemiluminescence
PM10 ug/m3	Annual* 24 hours**	60 100	60 100	- Gravimetric - TEOM - Beta Attenuation
PM2.5ug/m3	Annual* 24 hours**	40 60	40 60	- Gravimetric - TEOM - Beta Attenuation
Ozone (O3) ug/m3	8 Hours** 1 Hour**	100 180	100 180	- UV Photometric - Chemiluminescence - ChemicalMethod
Lead ug/m3	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS/ICP Method after sampling on EPM 2000 or equivalent filterpaper - ED-XRF using Teflonfilter
CO ug/m3	8 Hours** 1 Hour**	2000 4000	2000 4000	- Non-Dispersive Infra-Red Spectroscopy
NH3 ug/m3	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method
Benzene (C6H6) ug/m3	Annual*	05	05	- Gas Chromatography based Continuous Analyzer - Adsorption followed by GC Analysis
Benzo Pyrene-Particulate Phase only ug/m3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
Arsenic ng/m3	Annual*	06	06	- AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickelng/m3	Annual*	20	20	- AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

Source: Gazette of India, Part II-Section -3-Subsection (i)

* Annual Arithmetic Mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval.

** 24-hourly/8-hourly values or 0.1 hourly monitored values will be complied with 98% of the time in the year. However, 2% of the time, it may exceed but not on two consecutive days.

WHO Ambient Air Quality Guidelines

Sulphur dioxide (SO2)	24-hour 10 minute	125 (Interim target-1) 50(Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM10	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM2.5	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Annexure 2: Ambient Noise Level Standards

Govt. of India Ambient Noise level standards

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

The maximum permissible sound level (LAeq) according to the receiving zones (WHO)

Category	Noise level, Leq dBA	
	Day Time	Night time
Noise sensitive area, low density residential, institutional (School, Hospital), worship areas	50	40
Suburban residential, Medium density areas, public spaces, parks, recreational areas	55	45
Urban residential, high density areas, designated mixed development areas (commercial)	60	50
Commercial business zones	65	55
Designated industrial zones	70	60

Annexure 3: Indian Standard Drinking Water Specification IS: 10500-2012

Sr. No.	Parameter and Unit	Desirable Limit	Permissible Limit in Absence of Alternate Source
1.	Colour (Hazen units)	5	15
2.	Odour	Agreeable	-
3.	Taste	Agreeable	-
4.	Turbidity (NTU)	1	5
5.	pH	6.5-8.5	No relaxation
6.	Total Coliforms (MPN/100 mL)	nil	-
7.	Pathogenic Organisms or Virus	nil	-
8.	TDS (mg/L)	500	2000
9.	Mineral Oil (mg/L)	0.5	No relaxation
10.	Free Residual Chlorine (mg/L)	0.2	1
11.	Cyanide (mg/L as CN)	0.05	No relaxation
12.	Phenol (mg/L C_6H_5OH)	0.001	0.002
13.	Total Hardness (mg/L as $CaCO_3$)	200	600
14.	Total Alkalinity (mg/L as $CaCO_3$)	200	600
15.	Chloride (mg/L as Cl)	250	1000
16.	Sulphate (mg/L as SO_4)	200	400
17.	Nitrate (mg/L as NO_3)	45	No relaxation
18.	Fluoride (mg/L as F)	1	1.5
19.	Calcium (mg/L as Ca)	75	200
20.	Magnesium (mg/L as Mg)	30	100
21.	Copper (mg/L as Cu)	0.05	1.5
22.	Iron (mg/L as Fe)	0.3	No relaxation
23.	Manganese (mg/L as Mn)	0.1	0.3
24.	Zinc (mg/L as Zn)	5	15
25.	Boron (mg/L as B)	0.5	1
26.	Aluminium (mg/L as AL)	0.03	0.2

Sr. No.	Parameter and Unit	Desirable Limit	Permissible Limit in Absence of Alternate Source
27.	Arsenic (mg/L as As)	0.01	0.05
28.	Mercury (mg/L as Hg)	0.001	No relaxation
29.	Lead (mg/L as Pb)	0.01	No relaxation
30.	Cadmium (mg/L as Cd)	0.003	No relaxation
31.	Chromium (VI) (mg/L as Cr)	0.05	No relaxation
32.	Selenium (mg/L as Se)	0.01	No relaxation
33.	Anionic Detergents (mg/L MBAS)	0.2	1
34.	PAH (mg/L)	0.0001	No relaxation
35.	Pesticides (µg/L)	Absent	0.001
36.	Alpha Emitters (Bq/L)	0.1	No relaxation
37.	Beta Emitters (Bq/L)	1.0	No relaxation

Annexure 4: Record of Public Consultation

Date:- 26/9/2021

ATTENDANCE SHEET

Project Road Name:- NAKACHARI-BJM Chainage 2+100

Name:-	Date:-	Contract No.	Signature:-
MAMON BORAH	26/9/2021	700283431	✓
Farida Borah	26/09/2021	9954537589	Farida Borah
Haresh Borah	26/09/2021	7896756176	Borah
NAREN HANDIQUE	— do —		
Rumi Baruah		9101465749	R. Baruah
Montu Gogoi	—	9365458545	M. Gogoi

Date- 28/9/2021

ATTENDANCE SHEET Village - HEMLAY

Project Road Name:- NAKACHARI – BALIGHAT Chainage:- 7+000 to 7+500

Name:-	Date:-	Contact No.	Signature:-
Nobin Gogoi	28/9/21	9954712849	Gogoi
শ্ৰী ...	২৮/৯/২১		...
শ্ৰী ...			...
শ্ৰী ...			...
শ্ৰী ...			R Chutia
Ghanashyam Borbarh	28/9/21	8011212588	[signature]
S.B. Kanti Chutia			B. Chutia
Moonmoon Gohain			M Gohain
Manju Chutia			M Chutia
Juni Chutia			[signature]
Junu Chutia			J. Chutia
[illegible]			[signature]
Pranjal Ghorsikal			[signature]
Monu Lahalan			
Lokmath Borah			[signature]
Arun Boruah		9954473467	A. Boruah

ATTENDANCE SHEET 00+000

Project Name: NAKACHARI- BALIGHAT Location: NAKACHARI Date: 27-7-2021

Name	Designation	Contact Number	Signature
Narayan Chetia	Retired Teacher	6002038088 / 6003501852	Narayan Chetia
[illegible]			
Bipul Gogoi	[illegible]	9854011924	
Kabindra Nath Dutta	Teacher	9954722774	[illegible]
Sinmoy Paul	[illegible]	9954776231	[illegible]
[illegible]	,,	9101683881	[illegible]
Mamoni Gogoi	,,	9613779249	[illegible]
Rituraj Gogoi	Farmer	9577566128	[illegible]
Sri Panchanan Sharma	Farmer	8011327530	Sharma
Sri Manish Hazarika	[illegible]	9002241992	[illegible]
Sri K.K. Mohan	Medical Stuff	9706977583	[illegible]
T. C. Kalo	Anganwari	9101802271	[illegible]
Amulya Dey	[illegible]	8011609495	[illegible]
Rupam Gogoi	[illegible]	7002633137	[illegible]
Dr S. Ajanta	Govt. Stuff	9435038508	[illegible]
Pankaj Sharma	,,	9435489985	[illegible]

ATTENDANCE SHEET

Project Name ______________ Location AMGURI TOWN-3NO Date 1/10/2021

Name	Designation	Contact Number	Signature
Monoj Phukan			
Dulameswar Saikia		-	
[illegible] Gogoi			
PITAMBAR SAH			
Sanjit Bahadur	Shop	8638095516	[signature]
Robin Borah	AEE	9435335824	[signature]
Mahendra Bora	J.E	9706249237	[signature]
Jintu Sonowal	Shop	9101978480	[signature]
[illegible]	J.E	9435517419	[signature]
Suren Duarah	Amguri Town	9957401590	[signature]
Biraj [illegible]	Amguri Town	8486752909	
[illegible]	[illegible]	6900289639	
[illegible]	Business	8011591840	[signature]
Pallav Kr. Gogoi	Shopkeeper	9854855082	[signature]
[signature]	[illegible]	-	-
[illegible]	- [illegible]	-	-
[illegible]	[illegible]	-	-
Lakhi	-	-	-

Public Consultation at Nakachai Bazar

Consultation at PWD Office, Mariani Tutorial Road

Public Consultation at Hemlay

Public Consultation at Paddmali

Public Consultation at Amguri Town No 3

Public Consultation at Ksanakar Market Area

Annexure 5: GRM Information Sheet

SAMPLE GRIEVANCEREGISTRATION FORM

(To be available in Assamese or any other local languages, if any)

We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date:	**Place of Registration:**	
Contact Information/Personal Details:		
Name:	**Gender:**	**Age:**
Home Address:		
Village/Town:		
District:		
Phone No.:		
Email:		
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:		
If included as attachment/note/letter, please tick here:		
How do you want us to reach you for feedback or update on your comment/grievance?		

For Official Use only

Registered by: (Name of Official Registering Grievance)
If: ❖ Note/Letter ❖ E-mail ❖ Verbal/Telephonic
Reviewed by: (Names/ Positions of Official(s) reviewing grievance)
Action taken:
Whether Action taken disclosed: ❖ Yes ❖ No
Means of Disclosure:

অভিযোগপঞ্জীয়নপ্ৰ-পত্ৰৰনমুনা

প্রকল্পৰুপায়ণসম্পর্কতঅসমচৰকাৰৰগড়কাপ্তানীবিভাগেঅভিযোগ, পৰামর্শ, অনুসন্ধান, মন্তব্যবিচাৰে।স্পষ্টীকৰনআৰুপ্রতিক্রিয়াৰবাবেঅভিযোগকাৰীৰলগতযোগাযোগকৰিবলৈসক্ষম হবলৈআমিঅভিযোগকাৰীসকলকতেওঁলোকৰনামআৰুঠিকনাৰতথ্যদিবলৈআহ্বানজনাওঁ।

আপুনিযদিআপোনাৰব্যক্তিগততথ্যদিববিচাৰেআৰুসেইতথ্যগোপনৰাখিববিচাৰে, তেনেহলেআপোনাৰনামৰওপৰত (গোপনীয়/CONFIDENTIAL)লিখিদিব/টাইপকৰিদিব।

তাৰিখঃ	পঞ্জীয়নৰস্থানঃ	
যোগাযোগৰতথ্য/ব্যক্তিগততথ্যঃ		
নামঃ	লিঙ্গঃ	বয়সঃ
ঠিকনাঃ		
গাওঁ/চহৰঃ		
জিলাঃ		
ফোননং		
ই-মেইলঃ		
অভিযোগ/পৰামর্শ/মন্তব্য/প্রশ্ন - আপোনাৰঅভিযোগৰসবিশেষ (কোন, কি, ক'তআৰুকেনেকৈ) তলতদিবঃ		
যদিসংযোজন/চিঠি/টোকাআদিগাথিদিয়াহৈছে, তেনেহলেইয়াতটিকচিন্হদিবঃ		
প্রতিক্রিয়াঅথবাআপোনাৰঅভিযোগ/মন্তব্যসংক্রান্ততনতুনতথ্যৰবাবেআমাকআপোনাৰলগতকে নেধৰণেযোগাযোগকৰাটোবিচাৰে?		

কার্য্যালয়ৰব্যৱহাৰৰবাবে

পঞ্জীয়নকৰোতাঃ (অভিযোগপঞ্জীয়নকাৰীবিষয়াৰনাম)
যদিঃ • টোকা/চিঠি • ই-মেইল • মৌখিক/টেলিফোনযোগে
পর্যবেক্ষণকাৰীঃ (পর্যবেক্ষণকাৰীবিষয়াৰনামআৰুপদবি)
ইতিমধ্যেলোৱাব্যৱস্থাঃ
ইতিমধ্যেলোৱাব্যৱস্থাপ্রকাশকৰাহৈছেনেনাইঃ ❖ হৈছে ❖ হোৱানাই
প্রকাশকৰাৰধৰণঃ

Annexure 6: Guidelines for Borrow Area Management

A. Selection of Borrow Areas

The location of borrow areas shall be finalized as per IRC: 10-1961 guidelines. The finalization of locations in case of borrows areas identified in private land shall depend upon the formal agreement between landowners and contractors. If the agreement is not reached between the contractor and landowners for the identified borrow areas sites, arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements in respect of excavation and borrow areas as stipulated from time to time by the Ministry of Environment, Forests and Climate Change, Government of India, and local bodies, as applicable shall be the sole responsibility of the contractor. The contractor in addition to the established practices, rules, and regulations will also consider the following criteria before finalizing the locations.

- The borrow area should not be located in the agriculture field unless unavoidable i.e. barren land is not available.
- The borrow pits preferably should not be located along the roads.
- The loss of productive and agricultural soil should be minimum.
- The loss of vegetation is almost nil or minimum.
- The Contractor will ensure that suitable earth is available.

B. Contractor's Responsibility

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing program approved by the Engineer. It shall be ensured that the sub-grade material when compacted to the density requirements shall yield the design CBR value of the sub-grade. Contractor shall begin operations keeping in mind following;

- Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plants are operating at the place of deposition.
- No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. The contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then shall make a consequent deficit of material arising therefrom.
- Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, excavate in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable material shall be stockpiled separately.
- The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, the use of plants is siting of temporary buildings or structures.

C. Borrowing from Different Land-Forms

Areas located in Agricultural Lands

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:1.5 (Vertical: Horizontal).
- Borrowing of the earth will be carried out up to a depth of 1.5m from the existing ground level.
- Borrowing of the earth will not be done continuously throughout the stretch.
- Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- The slope of the edges will be maintained not steeper than 1:1.5 (vertical: Horizontal).
- The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

Borrow Areas located in Elevated Lands

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:1.5 (Vertical: Horizontal).
- At the location where private owners desire their fields to be leveled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields

Borrow Areas near River Side

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:1.5 (Vertical: Horizontal).
- Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is maximum.

Borrow Areas near Settlements

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:1.5 (Vertical: Horizontal).
- Borrow pit location will be located at least 0.75 km from villages and settlements. If un-avoidable, the pit will not be dug for more than 30 cm, and drains will be cut to facilitate drainage.
- Borrow pits located in such locations will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with layers of

stockpiled topsoil in accordance with compliance requirements with respect to MOEF&CC/SPCB guidelines.

Borrow Pits along the Road

Borrow pits along the road shall be discouraged and if deemed necessary and permitted by the Engineer; following precautions are recommended

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:1.5 (Vertical: Horizontal).
- Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- Small drains shall be cut through the ridges of facilitating drainage.
- The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontals projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.
- Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.

Rehabilitation of Borrow Areas

- The objective of the rehabilitation program is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is the fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit floor to approximately the access road level.
- Re-development plan shall be prepared by the Contractor before the start of work in line with the owners will require and to the satisfaction of the owner. The Borrow Areas shall be rehabilitated as per following;
- Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original round surface.
- Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such a borrow area will be photographed after their post-use restoration and Environment Expert of Supervision Consultant will certify the post-use redevelopment.

The Contractor will keep records of photographs of various stages i.e., before using materials from the location (pre-project), for the period borrowing activities (construction Phase) and after rehabilitation (post-development), to ascertain the pre and post borrowing status of the area.

Annexure 7: Guidelines for Emergency Management System

Many emergencies can occur in construction sites and will need to be effectively handled. The environmental and occupational health and safety aspects and related emergency can include incidences such as subsidence of soil / Fire / Explosion / Gas Leak, Collapse of Building / Equipment, and other Occupational Accidents. Onsite and off-site emergency management plans will be developed to effectively handle them. The following guidelines will be used to develop these plans.

Guidelines:

Availability of 'On-Site Emergency Management Plan'

- The contractor will have a written-on site emergency management plan. The contractor should submit a copy of this plan to PWRD, Assam, and the Supervision Consultant before the start of the work.
- The contractor will develop an onsite emergency plan considering the potential environmental, occupational health, and safety emergency at the site.
- The contractor will include a list of potential emergencies in the emergency management plan including potential Environmental and Occupational Health and Safety Emergency Situations during construction, operation, and maintenance stages.

Examples of potential emergencies have been defined below for guidance purposes. The contractors may follow refer to this for developing site-specific on-site emergencypreparedness plans.

Emergency conditions/ situations	Sources
Collapse/subsidence of soil and structures	• Civil structures • Heavy construction machinery
Bulk spillage	• Hazardous substance / inflammable liquid storage • Vehicular movement on Highway
Fire and explosion	• Inflammable Storage Areas • Gas Cylinder Storage Areas • Electrical Circuits • Isolated Gas Cylinders (LPG/DA) Welding / Gas Cutting Activity
Flooding	• Heavy Monsoons • Upstream activities of irrigation and damming • Glacial lake outburst Flood at the source of the river

Emergency conditions/ situations	Sources
Electrical Shocks	• HT line • LT distribution • Electrically operated machines/ equipment's/ Hand tools/ Electric cables
Gaseous leakage	• Gas cylinder storage areas • Gas cylinder used in Gas cutting / Welding purposes
Accidents due to Vehicles	• Heavy earth moving machinery • Cranes • Fork lifts • Trucks • Workman Transport Vehicles (cars/ scooters/ motorcycles/ cycles) • Collapse, toppling or collision of transport equipment
Slips & Falls (Man & Material)	• Work at Height (Roof works, Steek Erection, Scaffold, Repair & Maintenance, Erection of equipment, Excavation etc.) • Slips (Watery surface due to rain) • Lifting tools & Tackles (Electric hoist & Forklifts)
Collision with stationary or moving objects	• Vehicular movement on highway
Other Hazards	• Cuts & Wounds • Confined Space (under & inside machinery etc) • Hot burns • Pressure impacts (Plant contains several pressure vessels & pipefittings containing C02, air, water, product & steams, which can cause accident & injuries to person)

Design of 'On-Site Emergency Plan'

The 'On-site emergency plan' to be prepared by the contractor will include a minimum of the following information:

- Name & Address of Contractor
- Updation sheet
- Project Location
- Name, Designation & Contact Numbers of the organization, nearby hospitals, fire agencies etc. and key personnel including their assigned responsibilities in case of an emergency.
- The roles and responsibilities of executing personnel

- Site Layout Diagram
- Identification of Potential Emergencies Situations/ preventive measures / control & response measures
- Location of Emergency Control Centre (or designated area for emergency control / coordination) with requisite facilities.
- Medical services / first aid
- List of emergency equipment including fire extinguishers, fire suits, etc.

Emergency Control Centre

The emergency control center will be equipped with the following facilities:

- Copy of current on-site emergency plan
- Display of the name of site emergency controller
- Appropriate numbers of artificial respiratory sets
- Appropriate numbers of Stretchers
- Vehicle/ambulances on each construction site for 24 hours
- Adequate and reliable communication facilities (phone, handset, etc.)
- Site layout diagram with entry and exit routes / Assembly points
- Directory of internal/external emergency phone Numbers
- Fire extinguishers (DCP type / Foam Type / CO2) on all construction camps and yards
- List of fire extinguishers installed in the construction sites and yards including maintenance records
- A set of personal protective equipment (PPE) for every member of the construction team
- First-aid boxes with prescribed first-aid medicines in every construction campsite and yard
- List of competent first-aiders
- List of fire trained personnel
- Appropriate numbers of blankets, rescue ropes, and high beam torches
- Drinking water
- Gas leak detectors
- Lifeboats & jackets

Records:

The following records will be maintained:

- Record of emergency preparedness plan with emergency contact numbers
- Mock drill/emergency preparedness exercise records
- Corrective preventive action record after the emergency occurs

Reporting:

The accident and incident records and emergency preparedness drill reports will form part of the quarterly report to PWRD, Assam, and the Supervision Consultant.

Responsibility:

- Prime Responsibility: Contractor will be responsible for implementing the Emergency plan and reporting
- Supervisory Responsibility: The Supervision Consultant will check compliance of the contractor with the above guideline

Annexure 8: Guidelines for Waste Disposal and Management

Waste disposal and management plan will be prepared by the contractor before the start of construction works and submitted to PWRD, Assam, and the Supervision Consultant for their review and approval. The management plan will follow the guidelines as given below:

- The debris disposal site should be identified which are preferably barren or low-lying areas away from settlements.
- Prior concurrence will be taken from concerned Govt. Authorities or landowner
- Due care should be taken during site clearance and disposal of debris so that public/ private properties are not damaged or affected, no traffic is interrupted.
- All efforts should be made to use debris in road construction or any other public utilities.
- The debris should be stored at the site ensuring that existing water bodies and drains within or adjacent to the site are kept safe and free and no blocking of drains occurs.
- All dust prone material should be transported in a covered truck.
- All liquid waste like oils and paint waste should be stored at identified locations and preferably on a cemented floor. The provision of a spill collection pit will be made on the floor to collect the spilled oil or paint. These should be sold off to authorized recyclers.
- All domestic waste generated at construction camp preferably be composted in a portable mechanized composter. The composted material will be used as manure.
- In case composting is not feasible, the material will either be disposed of through a waste disposal system or disposed of through land burial. The dumpsite must be covered up with at least a six-inch thick layer of soil.
- Only appropriately design, engineered and compliant landfills will be used for disposing of waste. Engineered dump sites mean clay or other non-permeable liners to prevent water and soil contamination.
- All efforts should be made that no chemical/ oily waste spill over to ground or water bodies.
- All precautions should be followed for emergency preparedness and occupational health & safety during construction and handling waste.
- Provision of fire extinguishers will be made at the storage area
- Adequate traffic control signals and barriers should be used in case traffic is to be diverted during debris disposal. All efforts should be made to ensure avoidance of traffic jams, which otherwise results in air pollution, noise pollution, and public unrest.
- Hazardous waste and chemicals should be stored in a dedicated storage area that has: 1) weather protection, 2) solid impermeable surface and drainage to the treatment

system, 3) security fence/lock, 4) primary and secondary containment with 110% volume for liquids.

Records: The following records will be maintained

- Generation and disposal quantity with the location of disposal
- Recyclables waste generation and disposal
- Domestic waste disposal locations details

Reporting:

- The waste generation and disposal details will form part of the quarterly report to PWRD Assam.

Responsibility:

- Prime Responsibility: Contractor will be responsible for waste management and reporting
- Supervisory Responsibility: Supervision Consultant will check the contractor's adherence to the above guidelines

Annexure 9: Outline of an Environmental Monitoring Report

1. **Introduction**

   (Report Purpose, Brief project background including organizational setup, list of roads, planned project schedule, etc., Details on Project Implementation Progress with details on current site works, location, earthworks, vegetation clearing, spoils disposal, the establishment of construction camp and other construction-related facilities (e.g., concrete mixing plant, asphalt batching plant, crushing plant, etc.), establishment and operation of quarry/borrow areas, etc., including locations, schedules, dates, etc., Schedule of construction activities for the subsequent months).

2. **Compliance on Environment Safeguards Requirements**

   (Status of compliance with AIIB loan covenants: provide a list of environmental loan covenants and specify the level of compliance).

   Status of compliance with government environmental requirements: provide a list of government environmental requirements (permits, etc.) for the project as well as construction-related facilities/ activities and specify the level of compliance, indicate any required environmental permit/license/consent obtained to date and to be obtained (including the schedule) for the project and construction-related facilities/activities).

3. **Changes in project scope**

   (Such as a change in alignment or footprint in case of horizontal infrastructure, implementation of additional Project component/s, etc. (with reference to the Project scope identified in the AIIB cleared environmental assessment report, i.e., EIA) and corresponding safeguard measures are undertaken, if applicable).

4. **Implementation of Environmental and Social Management Plan**

   Indicate how ESMP requirements are incorporated into contractual arrangements, such as with contractors or other parties.

   Summary of Environmental Mitigations and Compensation Measures Implemented.

   Based on EMP; it may include measures related to air quality, water quality, noise quality, pollution prevention, biodiversity, and natural resources, health and safety, physical cultural resources, capacity building, and others. Provide a table/matrix showing a summary of each environmental mitigation measure specified in the EMP.

EMP Requirement (list all mitigation measures specified in the EMP)	Compliance Attained (Yes, No, Partial)	Comment on Reasons for Partial or Non-Compliance	Issues for Further Action and Target Dates
1			
2			
3			
4			
5			
etc.			

5. Environmental Monitoring Activities

(Compliance Inspections, Summary of Inspection Activities, Mitigation Compliance Mitigation Effectiveness. Findings of Environmental Monitoring Plan (EMOP) on quality of air, noise, water, etc. and Results Assessment)

6. Key Environmental Issues

(Key Issues Identified (e.g., non-compliance to loan covenants, ESMP and/or government environmental requirements, insufficient mitigation measures to address Project impacts, incidents, accidents, etc.) Actions Taken and Corrective Action Plan (specify actions taken and corrective action plans to be implemented to address non-compliance and other identified issues. Such an action plan should provide details of specific actions to be undertaken to resolve identified issues, responsible persons who will carry out such actions and timeframe/target date to carry out and complete required actions. The action plan could be presented in a tabular/matrix form (see below). Timeframe and responsibilities for reporting to AIIB on the progress of implementation of the corrective action plan should also be specified under this section.)

Issue	Cause	Required Action	Responsibility	Timing (Target Dates)	Description of Resolution and Timing (Actual)
Old Issues from Previous Reports					
1					
2					
New Issues from this Report					
1					
2					

Complaints: Details of Complaint/s (Provide details of any complaints that have been raised by the local population and other stakeholders regarding environmental performance and Overall compliance with mitigation implementation requirements could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

- Very Good (all required mitigations implemented)
- Good (the majority of required mitigations implemented)
- Fair (some mitigations implemented)
- Poor (few mitigations implemented)
- Very Poor (very few or no mitigations implemented)

Additional explanatory comments should be provided as necessary.

Effectiveness of mitigation implementation could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

- Very Good (mitigations are fully effective)
- Good (mitigations are generally effective)
- Fair (mitigations are partially effective)
- Poor (mitigations are generally ineffective)
- Very Poor (mitigations are completely ineffective)

Additional explanatory comments should be provided as necessary.

Discharge levels should be compared to the relevant discharge standards and/or performance indicators noted in the EMP. Any accidents should be highlighted for attention and follow-up. Besides, discharge levels could be compared to baseline conditions (if baseline data is available) and described in qualitative terms or be evaluated based on a ranking system, such as the following:

- Very Good (overall conditions are generally improved)
- Good (conditions are maintained or slightly improved)
- Fair (conditions are unchanged)
- Poor (conditions are moderately degraded)
- Very Poor (conditions are significantly degraded)

Additional explanatory comments should be provided as necessary.

Environmental impacts (complainant, nature of the complaint, date complaint was filed, which office received the complaint, etc.)

Action Taken (Document how the complaints were addressed or will be addressed by indicating the following:

- Names and designation of specific staff or officials within the Grievance Redress Committee, executing agency, project management unit, local government, contractor, and/or supervision consultant involved in receiving, documenting, and resolving the complaint (s).
- Specific actions are taken to be taken to resolve the complaint and corresponding timeframe

7. Conclusion and Recommendation

- Overall Progress of Implementation of Environmental and Social Management Measures
- Problems Identified and Actions Recommended
- Monitoring adjustment (recommended monitoring modifications based on monitoring experience/trends and stakeholder's response)

8. Appendices

- Site Inspection / Monitoring Reports
- Source and Ambient Monitoring Results (Laboratory Analysis)
- Photographs
- Location Map of Sampling Stations
- Copies of Environmental Permits/Approvals
- Other relevant information/documents

Overall sector environmental and Social management progress could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

- Very Good
- Good
- Fair
- Poor
- Very Poor

Additional explanatory comments should be provided as necessary.

Annexure 10: Impacts of Climate Change on Road Transport in the state of Assam

1. Introduction

The PWRD road project is mainly linked to road transport engineering aspects of augmentation, rehabilitation, and widening initiatives with the primary objective of supporting the State's accelerated economic development. This climate risk and vulnerability Adaptation (CRVA) is an essential component, the study needs to demonstrate that climate considerations have been integrated into the DPR of the project road.

Projected change in the global climate is almost certain to have a significant impact on the appraisal, planning, design, construction, operation, and maintenance of road infrastructure. The environmental impact reports of the project roads state that climate change and its associated impacts will be experienced through changing temperatures and precipitation, changes in the frequency and severity of climate extremes, and the dynamics of hazardous conditions. Existing roads designed and constructed decades ago were meant totypically with stand local weather and climate but now under exposures and sensitivities to climate-related extremes, the need for the adaptation to climate change has been recognized by the State Government.

As per the Assam State Action Plan on Climate Change, Rapid increase in numbers of motor vehicles on road in Assam has been observed over the past decade. The on-road vehicle population in the State reached 1.98 million in 2013-14 from 0.53 million in 2001-01. The growth has been at a compounded annual growth rate of 12.7%. The number of Motor vehicles registered in the State is 6360 per lakh of population.

Due to the lack of adequate public transport systems where buses comprise only 1% of the total population of vehicles on road, and due to the availability of easy loans, most of the people are aspiring to buy their vehicles. As a result, two-wheelers are 57% of the total vehicle mix in the State, and cars follow suit with a 21% share in 2013-14.

The road transport sector is a direct consumer of fossil fuel, emits GHG into the atmosphere. With an increase in population and per capita rise in the number of personal vehicles, GHG emissions are likely to rise. The use of the public transport system needs to control future emissions in the future and also to ease off the pressure of vehicles on the roads, hence. This would require policy changes in the way lending is done by banks, enabling fuel mix with biofuels, and also behavioral changes of the population whereby they use more and more non-motorized transport at short distances and public transport for long distances. The Guwahati city is already in the process of developing the Bus Rapid Transit system, but further development of the public transport system is required. Other major cities also need to embrace the same for an orderly functioning road transportation system in the cities of Assam.

The roads and bridges built for the transport sector are also susceptible to floods and landslides in the State, the intensity of which is likely to increase in the future. In this context therefore roads, bridges need to be built keeping in view the maximum projected intensity of extreme events.

Suggested Strategies for the transport sector

Sr. No.	Action	Cost (INR Cr)	Sources of Fund	Priority	Department Responsible
1	Installation of CNG pump stations across major cities of Assam; 100 depots	25	Funded	VH	Department
2	Procurement of CNG enable buses, 1000 buses	250	JNNURM	VH	Department of Transport
3	Assess req of non-motorized transport numbers and Introduce tracks for non-motorized transport along existing roads, 10 major cities	2	State Govt./Central Govt.	H	Department of Transport
4	Retrofitting all Public Vehicles with CNG Kit – Policy regulations to be formulated	100		VH	Department of Transport
5	Introducing intelligent traffic management systems, 10 major cities	10		H	Department of Transport
6	Construct parking slots in Guwahati, Tinsukia, Dibrugarh, Nagaon, Tezpur, Jorhat, and Silchar. Partial cost of construction, 7 major cities	35		H	Department of Transport
7	Promote better driving practices and maintenance of vehicles among truck, bus and car drivers to enhance fuel efficiency	1		H	Department of Transport

Source: Assam State Action Plan on Climate Change

2. Review of Climate Change Literatures Specific to Assam

With the "Tropical Monsoon Rainforest Climate", Assam is temperate (summer max. at 35–39 °C and winter min. at 5–8 °C) and experiences heavy rainfall and high humidity. The climate is characterized by heavy monsoon downpours, which reduce summer temperatures, enable the formation of foggy nights and mornings in winters. Spring (Mar-Apr) and autumn (Sept-Oct) are usually pleasant with moderate rainfall and temperature.

For ascertaining long term climate trends, State level climate data for the period 1951 to 2010 has been analyzed by the India Meteorological Department. This analysis is based on 282

stations for temperature and 1721 stations for rainfall across the country. In Assam, the analysis is based on data collected from 6 Stations for temperature and 12 Stations for rainfall. The analysis indicates that the mean temperature in the State has increased by +0.01°C/year. There is also an increase in seasonal temperatures across seasons with pronounced warming in post-monsoon and winter temperatures. The annual rainfall has also decreased by -2.96 mm/year during the same period.

Climate trends in Assam between 1951 and 2010

Annual	Winter	Summer	Monsoon	Post Monsoon
Mean Max Temp +0.02 (°C/yr)	0.01	No trend	0.01	0.02
Mean Min Temp +0.01 (°C/yr)	0.02	0.01	0.01	0.02
Mean Temp (°C/yr) +0.01	0.01	No trend	0.01	0.02
Rainfall (mm/yr) -2.96	0.08	-0.56	-2.19	-0.75

Source: Assam State Action Plan on Climate Change

Projected Changes in Climate

	2021-2050 wrt BL	Remarks
Mean Temperature	1.7-2.0°C	All across Assam
Annual Rainfall	-5 to 5%	North-western districts
	5-10%	North-Eastern districts
	10-25%	Central, South Eastern districts
Extreme rainfall days	5-38%	Rainfall >25 to 150 mm
Drought weeks	-25% to >75%	Southern districts show a marginal reduction in drought weeks but rest of the district show an increase by more than 75% wrt BL

Source: Assam State Action Plan on Climate Change

Annexure 11: Tree numeration/ inventory

Left Side				**Right Side**			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
0.00 km to 1.00 km	0.060	L1	TR1	0.00 km to 1.00 km	0.012	R1	TR3
	0.208	L2	TR2		0.024	R2	TR2
	0.240	L3	TR1		0.036	R3	TR3
	0.322	L4	TR1		0.066	R4	TR2
	0.354	L5	TR2		0.084	R5	TR2
	0.412	L6	TR1		0.086	R6	TR3
	0.412	L7	TR1		0.096	R7	TR3
	0.412	L8	TR1		0.098	R8	TR2
	0.414	L9	TR1		0.106	R9	TR2
	0.430	L10	TR1		0.116	R10	TR4
	0.430	L11	TR1		0.146	R11	TR2
	0.652	L12	TR3		0.154	R12	TR1
	0.664	L13	TR1		0.156	R13	TR2
	0.688	L14	TR2		0.166	R14	TR4
	0.690	L15	TR1		0.166	R15	TR1
	0.696	L16	TR1		0.170	R16	TR1
	0.698	L17	TR1		0.186	R17	TR3
	0.742	L18	TR2		0.196	R18	TR2
	0.750	L19	TR3		0.206	R19	TR2
	0.750	L20	TR2		0.216	R20	TR2
	0.864	L21	TR1		0.224	R21	TR2
	0.878	L22	TR3		0.234	R22	TR2
	0.892	L23	TR4		0.244	R23	TR2
	0.908	L24	TR1		0.250	R24	TR2
	0.908	L25	TR1		0.260	R25	TR2
	0.908	L26	TR1		0.270	R26	TR3
	0.908	L27	TR1		0.308	R27	TR2
	0.908	L28	TR2		0.316	R28	TR1
	0.910	L29	TR1		0.318	R29	TR2
	0.910	L30	TR1		0.322	R30	TR4
	0.910	L31	TR1		0.330	R31	TR1
	0.912	L32	TR1		0.336	R32	TR3
	0.912	L33	TR1		0.340	R33	TR1
	0.914	L34	TR1		0.340	R34	TR1
	0.914	L35	TR1		0.346	R35	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	0.916	L36	TR1		0.356	R36	TR3
	0.916	L37	TR1		0.386	R37	TR1
	0.916	L38	TR1		0.386	R38	TR3
	0.918	L39	TR1		0.390	R39	TR3
	0.918	L40	TR1		0.402	R40	TR1
	0.918	L41	TR1		0.404	R41	TR1
	0.920	L42	TR1		0.420	R42	TR1
	0.922	L43	TR1		0.442	R43	TR3
	0.922	L44	TR1		0.458	R44	TR2
	0.922	L45	TR1		0.460	R45	TR1
	0.922	L46	TR1		0.466	R46	TR3
	0.922	L47	TR2		0.476	R47	TR1
	0.924	L48	TR1		0.520	R48	TR1
	0.924	L49	TR1		0.528	R49	TR2
	0.926	L50	TR1		0.536	R50	TR1
	0.926	L51	TR1		0.538	R51	TR1
	0.926	L52	TR1		0.544	R52	TR1
	0.928	L53	TR1		0.544	R53	TR1
	0.928	L54	TR1		0.548	R54	TR1
	0.930	L55	TR1		0.574	R55	TR3
	0.932	L56	TR1		0.598	R56	TR2
	0.938	L57	TR1		0.612	R57	TR1
	0.940	L58	TR1		0.616	R58	TR1
	0.946	L59	TR1		0.650	R59	TR2
	0.966	L60	TR1		0.658	R60	TR1
	0.972	L61	TR1		0.658	R61	TR2
	0.976	L62	TR1		0.660	R62	TR1
	0.976	L63	TR1		0.662	R63	TR2
	0.980	L64	TR1		0.672	R64	TR2
	0.980	L65	TR1		0.678	R65	TR1
	0.982	L66	TR1		0.684	R66	TR1
	0.982	L67	TR1		0.688	R67	TR3
	0.982	L68	TR3		0.708	R68	TR1
	0.984	L69	TR1		0.708	R69	TR1
	0.986	L70	TR1		0.708	R70	TR1
	0.986	L71	TR1		0.708	R71	TR2
	0.986	L72	TR1		0.710	R72	TR1
	0.986	L73	TR1		0.712	R73	TR1
	0.988	L74	TR1		0.712	R74	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	0.988	L75	TR1		0.714	R75	TR1
	0.990	L76	TR1		0.714	R76	TR1
	0.990	L77	TR1		0.714	R77	TR1
	0.990	L78	TR1		0.718	R78	TR1
	0.992	L79	TR1		0.718	R79	TR1
	0.992	L80	TR1		0.724	R80	TR2
	0.992	L81	TR2		0.728	R81	TR1
	0.996	L82	TR3		0.734	R82	TR1
	0.998	L83	TR1		0.736	R83	TR1
	0.998	L84	TR1		0.754	R84	TR2
	0.998	L85	TR1		0.758	R85	TR2
	0.998	L86	TR1		0.788	R86	TR1
	0.998	L87	TR1		0.800	R87	TR2
	0.998	L88	TR3		0.812	R88	TR1
1.00 km to 2.00 km	1.000	L89	TR1		0.832	R89	TR1
	1.000	L90	TR1		0.832	R90	TR1
	1.002	L91	TR1		0.832	R91	TR1
	1.002	L92	TR1		0.834	R92	TR1
	1.002	L93	TR3		0.836	R93	TR3
	1.004	L94	TR1		0.838	R94	TR1
	1.006	L95	TR1		0.838	R95	TR3
	1.008	L96	TR1		0.842	R96	TR1
	1.008	L97	TR1		0.848	R97	TR3
	1.008	L98	TR1		0.850	R98	TR1
	1.008	L99	TR1		0.854	R99	TR3
	1.010	L100	TR1		0.862	R100	TR1
	1.010	L101	TR2		0.866	R101	TR1
	1.012	L102	TR1		0.868	R102	TR2
	1.014	L103	TR1		0.868	R103	TR2
	1.016	L104	TR1		0.870	R104	TR1
	1.018	L105	TR1		0.870	R105	TR1
	1.018	L106	TR1		0.872	R106	TR2
	1.018	L107	TR1		0.872	R107	TR1
	1.022	L108	TR1		0.872	R108	TR3
	1.022	L109	TR1		0.874	R109	TR1
	1.024	L110	TR1		0.882	R110	TR1
	1.024	L111	TR1		0.886	R111	TR1
	1.024	L112	TR1		0.888	R112	TR1
	1.032	L113	TR1		0.888	R113	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	1.032	L114	TR2		0.888	R114	TR2
	1.058	L115	TR1		0.890	R115	TR1
	1.092	L116	TR1		0.892	R116	TR1
	1.096	L117	TR1		0.892	R117	TR1
	1.096	L118	TR3		0.894	R118	TR1
	1.098	L119	TR3		0.896	R119	TR1
	1.104	L120	TR1		0.940	R120	TR1
	1.104	L121	TR1		0.952	R121	TR1
	1.120	L122	TR1		0.954	R122	TR3
	1.130	L123	TR1		0.964	R123	TR1
	1.132	L124	TR1		0.964	R124	TR2
	1.132	L125	TR1		0.966	R125	TR1
	1.132	L126	TR1		0.966	R126	TR3
	1.132	L127	TR1		0.968	R127	TR2
	1.134	L128	TR1		0.974	R128	TR1
	1.134	L129	TR1		0.974	R129	TR3
	1.136	L130	TR1		0.976	R130	TR2
	1.140	L131	TR3		0.980	R131	TR1
	1.144	L132	TR2		0.980	R132	TR3
	1.146	L133	TR1		1.036	R133	TR1
	1.146	L134	TR1		1.056	R134	TR3
	1.342	L135	TR2		1.146	R135	TR1
	1.352	L136	TR2		1.146	R136	TR1
	1.382	L137	TR1		1.146	R137	TR1
	1.382	L138	TR1		1.148	R138	TR1
	1.384	L139	TR1		1.148	R139	TR2
	1.384	L140	TR1		1.162	R140	TR1
	1.386	L141	TR1		1.164	R141	TR1
	1.386	L142	TR1	1.00 km to 2.00 km	1.178	R142	TR1
	1.386	L143	TR1		1.260	R143	TR1
	1.388	L144	TR1		1.396	R144	TR1
	1.388	L145	TR1		1.422	R145	TR1
	1.390	L146	TR1		1.434	R146	TR2
	1.390	L147	TR1		1.440	R147	TR3
	1.392	L148	TR1		1.444	R148	TR2
	1.392	L149	TR1		1.448	R149	TR2
	1.392	L150	TR1		1.462	R150	TR1
	1.392	L151	TR1		1.464	R151	TR2
	1.392	L152	TR1		1.466	R152	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	1.394	L153	TR2		1.476	R153	TR2
	1.396	L154	TR1		1.492	R154	TR1
	1.400	L155	TR1		1.504	R155	TR4
	1.402	L156	TR1		1.556	R156	TR2
	1.404	L157	TR1		1.572	R157	TR2
	1.406	L158	TR1		1.582	R158	TR2
	1.422	L159	TR1		1.616	R159	TR1
	1.422	L160	TR1		1.662	R160	TR4
	1.424	L161	TR1		1.666	R161	TR2
	1.424	L162	TR1		1.680	R162	TR2
	1.424	L163	TR1		1.692	R163	TR1
	1.424	L164	TR1		1.804	R164	TR2
	1.426	L165	TR1		1.804	R165	TR2
	1.428	L166	TR1		1.816	R166	TR1
	1.428	L167	TR2		1.822	R167	TR1
	1.430	L168	TR1		1.862	R168	TR4
	1.430	L169	TR2		1.878	R169	TR3
	1.430	L170	TR2		1.892	R170	TR2
	1.430	L171	TR2		1.912	R171	TR3
	1.436	L172	TR2		1.942	R172	TR3
	1.438	L173	TR1		1.952	R173	TR1
	1.438	L174	TR2		2.030	R174	TR2
	1.440	L175	TR1		2.068	R175	TR4
	1.440	L176	TR3		2.128	R176	TR4
	1.444	L177	TR1		2.152	R177	TR3
	1.452	L178	TR2		2.160	R178	TR4
	1.462	L179	TR1		2.166	R179	TR3
	1.464	L180	TR1		2.174	R180	TR3
	1.466	L181	TR1		2.282	R181	TR2
	1.466	L182	TR1	2.00 km to 3.00 km	2.482	R182	TR1
	1.466	L183	TR1		2.482	R183	TR1
	1.466	L184	TR1		2.484	R184	TR1
	1.470	L185	TR2		2.484	R185	TR1
	1.472	L186	TR1		2.486	R186	TR1
	1.476	L187	TR1		2.488	R187	TR1
	1.482	L188	TR1		2.488	R188	TR1
	1.482	L189	TR2		2.488	R189	TR1
	1.528	L190	TR4		2.488	R190	TR2
	1.542	L191	TR4		2.490	R191	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	1.614	L192	TR1		2.490	R192	TR1
	1.634	L193	TR2		2.492	R193	TR1
	1.642	L194	TR1		2.492	R194	TR2
	1.644	L195	TR2		2.498	R195	TR1
	1.646	L196	TR1		2.498	R196	TR1
	1.650	L197	TR2		2.498	R197	TR2
	1.652	L198	TR1		2.500	R198	TR2
	1.652	L199	TR2		2.500	R199	TR2
	1.654	L200	TR1		2.502	R200	TR1
	1.658	L201	TR2		2.502	R201	TR1
	1.664	L202	TR2		2.506	R202	TR1
	1.668	L203	TR1		2.508	R203	TR1
	1.678	L204	TR1		2.510	R204	TR1
	1.680	L205	TR1		2.510	R205	TR1
	1.680	L206	TR1		2.512	R206	TR1
	1.708	L207	TR2		2.512	R207	TR1
	1.712	L208	TR2		2.512	R208	TR1
	1.732	L209	TR2		2.512	R209	TR1
	1.738	L210	TR3		2.514	R210	TR1
	1.792	L211	TR2		2.518	R211	TR1
	1.794	L212	TR2		2.518	R212	TR1
	1.808	L213	TR2		2.520	R213	TR1
	1.818	L214	TR2		2.522	R214	TR1
	1.836	L215	TR2		2.522	R215	TR1
	1.838	L216	TR2		2.524	R216	TR1
	1.872	L217	TR2		2.528	R217	TR1
	1.886	L218	TR1		2.528	R218	TR1
	1.900	L219	TR4		2.528	R219	TR1
	1.956	L220	TR2		2.528	R220	TR1
	1.994	L221	TR1		2.530	R221	TR1
2.00 km to 3.00 km	2.188	L222	TR4		2.530	R222	TR1
	2.214	L223	TR1		2.532	R223	TR1
	2.222	L224	TR4		2.532	R224	TR1
	2.226	L225	TR2		2.534	R225	TR1
	2.232	L226	TR1		2.534	R226	TR1
	2.240	L227	TR1		2.534	R227	TR2
	2.240	L228	TR2		2.536	R228	TR1
	2.246	L229	TR1		2.536	R229	TR1
	2.252	L230	TR1		2.538	R230	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	2.276	L231	TR1		2.540	R231	TR1
	2.278	L232	TR1		2.542	R232	TR1
	2.278	L233	TR1		2.546	R233	TR1
	2.282	L234	TR1		2.548	R234	TR1
	2.284	L235	TR1		2.550	R235	TR1
	2.284	L236	TR2		2.552	R236	TR1
	2.294	L237	TR2		2.556	R237	TR1
	2.318	L238	TR1		2.556	R238	TR2
	2.318	L239	TR1		2.558	R239	TR1
	2.366	L240	TR2		2.560	R240	TR2
	2.382	L241	TR2		2.562	R241	TR2
	2.430	L242	TR3		2.566	R242	TR2
	2.462	L243	TR1		2.568	R243	TR2
	2.486	L244	TR3		2.570	R244	TR1
	2.492	L245	TR2		2.572	R245	TR1
	2.494	L246	TR1		2.574	R246	TR2
	2.514	L247	TR2		2.576	R247	TR2
	2.514	L248	TR2		2.580	R248	TR2
	2.516	L249	TR2		2.582	R249	TR1
	2.518	L250	TR2		2.584	R250	TR1
	2.518	L251	TR2		2.584	R251	TR3
	2.520	L252	TR2		2.600	R252	TR4
	2.528	L253	TR1		2.726	R253	TR4
	2.534	L254	TR1		2.738	R254	TR2
	2.544	L255	TR2		2.752	R255	TR2
	2.548	L256	TR1		2.764	R256	TR1
	2.562	L257	TR1		2.970	R257	TR3
	2.574	L258	TR1		3.026	R258	BAMBOO
	2.580	L259	TR1		3.026	R259	BAMBOO
	2.580	L260	TR1		3.034	R260	TR1
	2.604	L261	TR1	3.00 km to 4.00 km	3.034	R261	TR1
	2.662	L262	TR2		3.034	R262	TR1
	2.670	L263	TR1		3.036	R263	TR1
	2.670	L264	TR2		3.058	R264	TR1
	2.688	L265	TR1		3.058	R265	TR2
	2.688	L266	TR2		3.066	R266	TR2
	2.766	L267	TR2		3.074	R267	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	2.870	L268	TR2		3.088	R268	TR2
	2.874	L269	TR2		3.090	R269	TR1
	2.916	L270	BAMBOO		3.090	R270	TR3
	2.934	L271	TR4		3.090	R271	TR2
	2.962	L272	TR4		3.094	R272	TR1
3.00 km to 4.00 km	3.004	L273	TR3		3.094	R273	TR2
	3.032	L274	TR3		3.096	R274	TR1
	3.038	L275	TR2		3.098	R275	TR1
	3.044	L276	TR2		3.106	R276	BAMBOO
	3.054	L277	TR3		3.106	R277	TR3
	3.058	L278	TR2		3.112	R278	TR1
	3.060	L279	TR1		3.116	R279	TR2
	3.070	L280	TR4		3.118	R280	TR1
	3.078	L281	TR2		3.118	R281	TR1
	3.088	L282	TR2		3.130	R282	TR1
	3.110	L283	TR4		3.160	R283	TR3
	3.170	L284	TR1		3.164	R284	TR1
	3.170	L285	TR1		3.172	R285	TR3
	3.172	L286	TR1		3.172	R286	TR2
	3.174	L287	BAMBOO		3.184	R287	BAMBOO
	3.176	L288	BAMBOO		3.186	R288	BAMBOO
	3.178	L289	BAMBOO		3.186	R289	BAMBOO
	3.184	L290	BAMBOO		3.196	R290	BAMBOO
	3.186	L291	BAMBOO		3.202	R291	BAMBOO
	3.188	L292	BAMBOO		3.202	R292	BAMBOO
	3.190	L293	BAMBOO		3.202	R293	BAMBOO
	3.192	L294	BAMBOO		3.202	R294	BAMBOO
	3.194	L295	BAMBOO		3.204	R295	BAMBOO
	3.194	L296	BAMBOO		3.204	R296	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	3.194	L297	BAMBOO		3.254	R297	TR3
	3.222	L298	TR2		3.254	R298	TR2
	3.222	L299	TR2		3.3	R299	TR2
	3.336	L300	TR2		3.402	R300	TR1
	3.352	L301	TR3		3.404	R301	TR1
	3.376	L302	TR1		3.42	R302	TR2
	3.400	L303	TR3		3.502	R303	TR2
	3.472	L304	TR1		3.514	R304	TR2
	3.474	L305	TR1		3.56	R305	TR2
	3.498	L306	TR1		3.56	R306	TR2
	3.508	L307	TR1		3.582	R307	TR2
	3.522	L308	TR2		3.596	R308	BAMBOO
	3.564	L309	TR3		3.598	R309	TR1
	3.590	L310	TR2		3.598	R310	TR2
	3.594	L311	TR2		3.602	R311	TR2
	3.616	L312	TR3		3.608	R312	BAMBOO
	3.618	L313	TR4		3.622	R313	TR4
	3.626	L314	TR2		3.624	R314	TR1
	3.626	L315	TR2		3.628	R315	TR3
	3.628	L316	TR3		3.632	R316	TR2
	3.632	L317	TR3		3.638	R317	TR2
	3.632	L318	TR3		3.642	R318	TR1
	3.634	L319	TR3		3.646	R319	TR1
	3.634	L320	TR2		3.654	R320	TR2
	3.636	L321	BAMBOO		3.672	R321	TR2
	3.666	L322	TR3		3.674	R322	TR3
	3.754	L323	TR3		3.682	R323	TR2
	3.780	L324	TR3		3.686	R324	TR2
	3.794	L325	TR4		3.688	R325	TR2
	3.818	L326	TR4		3.696	R326	TR4
	3.826	L327	TR2		3.7	R327	TR1
	3.836	L328	TR3		3.716	R328	TR4
	3.842	L329	BAMBOO		3.75	R329	BAMBOO
	3.848	L330	TR2		3.766	R330	TR1
	3.852	L331	TR1		3.768	R331	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	3.860	L332	TR2		3.776	R332	BAMBOO
	3.862	L333	TR2		3.828	R333	TR2
	3.868	L334	TR2		3.83	R334	TR3
	3.874	L335	TR3		3.83	R335	TR2
	3.888	L336	TR2		3.84	R336	TR1
	3.890	L337	TR2		3.844	R337	TR1
	3.900	L338	TR1		3.846	R338	TR2
	3.940	L339	TR2		3.85	R339	TR1
	3.954	L340	TR3		3.856	R340	TR1
	3.960	L341	TR3		3.856	R341	TR1
	3.960	L342	TR3		3.86	R342	TR2
	3.988	L343	TR1		3.862	R343	TR1
	3.990	L344	TR1		3.864	R344	TR2
	3.990	L345	TR1		3.894	R345	BAMBOO
4.00 km to 5.00 km	4.078	L346	BAMBOO		3.906	R346	BAMBOO
	4.078	L347	BAMBOO		3.91	R347	TR1
	4.082	L348	BAMBOO		3.92	R348	TR4
	4.082	L349	BAMBOO		3.922	R349	TR1
	4.082	L350	TR1		3.924	R350	TR1
	4.084	L351	BAMBOO		3.926	R351	TR1
	4.084	L352	BAMBOO		3.934	R352	TR3
	4.084	L353	BAMBOO		3.938	R353	TR1
	4.090	L354	TR1		3.94	R354	TR4
	4.090	L355	TR1		3.942	R355	TR1
	4.092	L356	TR1		3.942	R356	TR1
	4.092	L357	TR1		3.942	R357	TR1
	4.094	L358	TR3		3.944	R358	TR2
	4.100	L359	TR3		3.962	R359	TR1
	4.102	L360	TR1		3.972	R360	TR2
	4.104	L361	TR1		3.974	R361	TR1
	4.104	L362	TR3		3.974	R362	TR1
	4.106	L363	TR3		3.982	R363	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	4.108	L364	TR1		4.042	R364	TR3
	4.110	L365	TR4		4.044	R365	TR3
	4.114	L366	TR1		4.06	R366	TR1
	4.116	L367	TR1		4.06	R367	TR3
	4.116	L368	TR1		4.06	R368	TR3
	4.118	L369	TR1		4.068	R369	TR3
	4.118	L370	TR1		4.072	R370	TR2
	4.120	L371	TR1		4.078	R371	TR3
	4.120	L372	TR1		4.078	R372	TR2
	4.124	L373	TR3		4.082	R373	TR4
	4.126	L374	TR2		4.082	R374	TR1
	4.128	L375	TR2		4.084	R375	TR3
	4.130	L376	TR2		4.086	R376	TR2
	4.132	L377	TR4		4.09	R377	TR2
	4.132	L378	TR2		4.094	R378	TR2
	4.136	L379	TR2		4.102	R379	TR3
	4.136	L380	TR2		4.104	R380	TR2
	4.138	L381	TR1		4.114	R381	TR1
	4.140	L382	TR1		4.126	R382	TR2
	4.140	L383	TR1	4.00 km to 5.00 km	4.128	R383	TR2
	4.142	L384	TR1		4.13	R384	TR2
	4.142	L385	TR1		4.136	R385	TR1
	4.168	L386	TR1		4.14	R386	TR3
	4.192	L387	TR1		4.144	R387	TR3
	4.196	L388	TR1		4.17	R388	TR1
	4.210	L389	TR2		4.17	R389	TR2
	4.218	L390	TR1		4.188	R390	TR2
	4.228	L391	TR1		4.2	R391	TR2
	4.228	L392	TR1		4.202	R392	TR1
	4.238	L393	TR1		4.24	R393	TR1
	4.248	L394	TR2		4.244	R394	TR1
	4.252	L395	TR1		4.268	R395	TR3
	4.290	L396	TR3		4.282	R396	TR1
	4.310	L397	TR3		4.29	R397	TR1
	4.346	L398	TR1		4.296	R398	TR2
	4.348	L399	TR1		4.304	R399	TR1
	4.374	L400	TR1		4.31	R400	TR2
	4.378	L401	TR1		4.316	R401	TR2
	4.380	L402	TR1		4.322	R402	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	4.402	L403	TR1		4.388	R403	TR2
	4.404	L404	TR1		4.394	R404	TR2
	4.420	L405	TR3		4.43	R405	TR1
	4.456	L406	TR1		4.498	R406	BAMBOO
	4.466	L407	TR1		4.5	R407	TR1
	4.468	L408	TR1		4.514	R408	TR1
	4.474	L409	TR1		4.518	R409	TR1
	4.476	L410	TR1		4.52	R410	TR2
	4.478	L411	TR1		4.524	R411	TR2
	4.480	L412	TR1		4.532	R412	TR2
	4.480	L413	TR1		4.546	R413	TR1
	4.480	L414	TR1		4.552	R414	TR1
	4.482	L415	TR1		4.556	R415	TR1
	4.484	L416	TR1		4.562	R416	TR3
	4.486	L417	TR1		4.564	R417	TR3
	4.492	L418	TR2		4.568	R418	TR1
	4.494	L419	TR1		4.568	R419	TR1
	4.496	L420	TR1		4.568	R420	TR1
	4.496	L421	TR1		4.568	R421	TR1
	4.498	L422	TR1		4.57	R422	TR1
	4.498	L423	TR1		4.57	R423	TR1
	4.518	L424	BAMBOO		4.572	R424	TR1
	4.526	L425	TR2		4.572	R425	TR1
	4.538	L426	TR1		4.574	R426	TR1
	4.544	L427	TR1		4.574	R427	TR1
	4.550	L428	TR1		4.574	R428	TR3
	4.556	L429	TR1		4.576	R429	TR1
	4.572	L430	TR2		4.576	R430	TR1
	4.582	L431	TR1		4.578	R431	TR1
	4.584	L432	TR1		4.58	R432	TR1
	4.584	L433	TR1		4.58	R433	TR1
	4.586	L434	TR2		4.58	R434	TR1
	4.588	L435	TR2		4.58	R435	TR1
	4.590	L436	TR1		4.582	R436	TR1
	4.590	L437	TR1		4.582	R437	TR1
	4.590	L438	TR1		4.586	R438	TR1
	4.596	L439	TR1		4.586	R439	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	4.598	L440	TR1		4.586	R440	TR1
	4.598	L441	TR1		4.588	R441	TR1
	4.600	L442	TR4		4.588	R442	TR1
	4.600	L443	TR1		4.588	R443	TR1
	4.602	L444	TR1		4.588	R444	TR1
	4.610	L445	TR2		4.594	R445	TR3
	4.610	L446	TR2		4.596	R446	TR2
	4.612	L447	TR2		4.598	R447	TR3
	4.620	L448	TR1		4.6	R448	TR1
	4.620	L449	TR1		4.6	R449	TR1
	4.622	L450	TR1		4.6	R450	TR2
	4.624	L451	TR1		4.608	R451	TR1
	4.624	L452	TR1		4.608	R452	TR1
	4.642	L453	TR1		4.614	R453	TR1
	4.662	L454	TR1		4.618	R454	TR2
	4.674	L455	TR1		4.636	R455	TR4
	4.700	L456	TR3		4.666	R456	TR2
	4.742	L457	TR1		4.682	R457	TR3
	4.760	L458	TR1		4.728	R458	TR2
	4.772	L459	TR1		4.734	R459	BAMBOO
	4.776	L460	TR1		4.746	R460	TR1
	4.786	L461	TR4		4.756	R461	BAMBOO
	4.808	L462	TR1		4.776	R462	TR1
	4.836	L463	TR4		4.778	R463	TR1
	4.838	L464	TR1	5.00 km to 6.00 km	5.192	R464	TR1
	4.842	L465	TR1		5.248	R465	TR3
	4.868	L466	BAMBOO		5.288	R466	TR1
5.00 km to 6.00 km	5.154	L467	TR3		5.394	R467	TR1
	5.190	L468	TR2		5.514	R468	TR1
	5.228	L469	TR2		5.594	R469	TR1
	5.250	L470	TR1		5.596	R470	TR1
	5.252	L471	TR2		5.598	R471	TR1
	5.262	L472	TR1		5.598	R472	TR1
	5.324	L473	TR1		5.61	R473	TR1
	5.342	L474	TR3		5.612	R474	TR1
	5.348	L475	TR2		5.616	R475	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	5.442	L476	TR1		5.626	R476	TR4
	5.452	L477	TR3		5.634	R477	TR1
	5.458	L478	TR2		5.66	R478	TR1
	5.466	L479	TR3		5.666	R479	TR1
	5.478	L480	TR1		5.672	R480	TR1
	5.482	L481	TR1		5.674	R481	TR1
	5.484	L482	TR2		5.676	R482	TR1
	5.492	L483	BAMBOO		5.678	R483	TR1
	5.494	L484	BAMBOO		5.682	R484	TR1
	5.498	L485	BAMBOO		5.684	R485	TR1
	5.500	L486	BAMBOO		5.688	R486	TR1
	5.502	L487	BAMBOO		5.688	R487	TR1
	5.502	L488	BAMBOO		5.688	R488	TR1
	5.506	L489	TR1		5.702	R489	TR4
	5.510	L490	TR1		5.794	R490	TR2
	5.510	L491	TR1		5.808	R491	TR2
	5.512	L492	TR2		5.816	R492	TR3
	5.520	L493	TR1		5.828	R493	TR1
	5.522	L494	TR1		5.836	R494	TR2
	5.524	L495	TR2		5.84	R495	TR2
	5.524	L496	TR2		5.846	R496	TR2
	5.526	L497	TR1		5.858	R497	TR2
	5.528	L498	BAMBOO		5.866	R498	TR1
	5.528	L499	BAMBOO		5.87	R499	TR1
	5.530	L500	BAMBOO		5.874	R500	TR1
	5.548	L501	TR2		5.876	R501	TR1
	5.578	L502	TR2		5.878	R502	TR1
	5.628	L503	TR2		5.89	R503	TR2
	5.632	L504	TR4		5.898	R504	TR2
	5.642	L505	TR3		5.9	R505	TR3
	5.644	L506	TR2		5.926	R506	TR2
	5.654	L507	TR3		5.93	R507	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	5.668	L508	TR3		5.932	R508	TR2
	5.680	L509	TR2		5.936	R509	TR2
	5.770	L510	TR3		5.96	R510	TR3
	5.780	L511	TR3		5.966	R511	TR3
	5.798	L512	TR3		6.02	R512	TR2
	5.806	L513	TR3		6.024	R513	TR2
	5.822	L514	BAMBOO		6.154	R514	BAMBOO
	5.824	L515	TR1		6.156	R515	BAMBOO
	5.828	L516	TR1		6.156	R516	BAMBOO
	5.830	L517	TR1		6.158	R517	BAMBOO
	5.832	L518	TR1		6.162	R518	BAMBOO
	5.834	L519	TR1		6.162	R519	BAMBOO
	5.834	L520	TR2		6.164	R520	BAMBOO
	5.836	L521	TR2		6.17	R521	BAMBOO
	5.840	L522	TR2	6.00 km to 7.00 km	6.172	R522	BAMBOO
	5.842	L523	TR2		6.174	R523	BAMBOO
	5.842	L524	TR2		6.178	R524	BAMBOO
	5.844	L525	TR2		6.18	R525	BAMBOO
	5.850	L526	TR2		6.18	R526	BAMBOO
	5.850	L527	TR2		6.182	R527	BAMBOO
	5.854	L528	TR2		6.184	R528	TR2
	5.858	L529	TR1		6.188	R529	BAMBOO
	5.858	L530	TR1		6.19	R530	BAMBOO
	5.858	L531	TR1		6.19	R531	BAMBOO
	5.858	L532	TR1		6.21	R532	TR3
	5.858	L533	TR2		6.21	R533	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	5.858	L534	TR2		6.216	R534	TR4
	5.860	L535	TR1		6.222	R535	TR1
	5.860	L536	TR1		6.23	R536	TR1
	5.862	L537	TR1		6.238	R537	BAMBOO
	5.864	L538	TR1		6.25	R538	BAMBOO
	5.866	L539	TR1		6.25	R539	TR1
	5.866	L540	TR1		6.252	R540	BAMBOO
	5.870	L541	TR1		6.252	R541	TR1
	5.870	L542	TR1		6.272	R542	TR3
	5.870	L543	TR1		6.282	R543	TR4
	5.870	L544	TR1		6.302	R544	TR2
	5.872	L545	TR1		6.306	R545	TR2
	5.872	L546	TR1		6.308	R546	TR3
	5.874	L547	TR2		6.33	R547	TR4
	5.876	L548	TR1		6.332	R548	TR1
	5.876	L549	TR1		6.338	R549	TR1
	5.884	L550	TR2		6.34	R550	TR1
	5.894	L551	TR2		6.344	R551	TR1
	5.908	L552	TR1		6.346	R552	TR3
	5.914	L553	TR2		6.35	R553	TR1
	5.928	L554	TR1		6.364	R554	TR3
	5.934	L555	TR1		6.374	R555	TR3
	5.942	L556	TR2		6.378	R556	TR3
	5.946	L557	TR2		6.382	R557	TR3
	5.958	L558	TR2		6.394	R558	TR1
	5.988	L559	TR3		6.418	R559	TR2
	5.996	L560	TR4		6.432	R560	TR2
6.00 km to 7.00 km	6.008	L561	TR1		6.442	R561	TR2
	6.014	L562	TR3		6.446	R562	TR2
	6.046	L563	TR2		6.452	R563	TR2
	6.086	L564	TR2		6.454	R564	TR2
	6.092	L565	TR2		6.46	R565	TR3
	6.092	L566	TR2		6.472	R566	TR3
	6.094	L567	TR1		6.476	R567	TR2
	6.094	L568	TR1		6.48	R568	TR2
	6.114	L569	TR2		6.482	R569	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	6.120	L570	TR1		6.484	R570	TR3
	6.122	L571	TR1		6.5	R571	TR3
	6.124	L572	TR1		6.514	R572	TR2
	6.126	L573	TR1		6.52	R573	TR1
	6.126	L574	TR1		6.53	R574	TR3
	6.126	L575	TR2		6.534	R575	TR1
	6.128	L576	TR1		6.54	R576	TR2
	6.130	L577	TR2		6.542	R577	TR2
	6.132	L578	TR2		6.684	R578	TR2
	6.134	L579	TR2		6.688	R579	TR3
	6.140	L580	TR2		6.702	R580	TR2
	6.146	L581	TR3		6.704	R581	TR3
	6.160	L582	TR2		6.714	R582	TR4
	6.166	L583	TR3		6.72	R583	TR2
	6.178	L584	TR1		6.724	R584	TR2
	6.200	L585	TR4		6.728	R585	TR3
	6.212	L586	TR2		6.732	R586	TR3
	6.218	L587	TR1		6.732	R587	TR3
	6.218	L588	TR1		6.75	R588	TR3
	6.218	L589	TR1		6.76	R589	TR2
	6.220	L590	TR1		6.77	R590	TR2
	6.222	L591	TR1		6.78	R591	TR4
	6.222	L592	TR1		6.788	R592	TR1
	6.226	L593	TR1		6.798	R593	TR3
	6.230	L594	TR1		6.8	R594	TR2
	6.234	L595	TR4		6.806	R595	TR2
	6.250	L596	TR2		6.81	R596	TR2
	6.278	L597	TR4		6.816	R597	BAMBOO
	6.322	L598	TR2		6.82	R598	TR3
	6.324	L599	TR2		6.826	R599	TR2
	6.336	L600	TR2		6.828	R600	TR2
	6.358	L601	TR2		6.832	R601	TR3
	6.362	L602	TR2		6.85	R602	TR3
	6.394	L603	TR2		6.86	R603	TR2
	6.400	L604	TR4		6.866	R604	TR2
	6.402	L605	TR4		6.868	R605	TR3
	6.408	L606	TR2	7.00 km to 8.00 km	7.092	R606	TR3
	6.420	L607	TR4		7.094	R607	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	6.420	L608	TR3		7.376	R608	TR1
	6.422	L609	TR2		7.382	R609	TR4
	6.426	L610	TR2		7.45	R610	TR2
	6.430	L611	TR3		7.462	R611	TR1
	6.434	L612	TR2		7.49	R612	TR4
	6.436	L613	TR3		7.53	R613	TR1
	6.444	L614	TR3		7.554	R614	TR1
	6.458	L615	TR3		7.556	R615	TR1
	6.464	L616	TR2		7.564	R616	TR1
	6.470	L617	TR3		7.568	R617	TR1
	6.478	L618	TR4		7.578	R618	TR2
	6.514	L619	TR3		7.582	R619	TR2
	6.520	L620	TR2		7.584	R620	TR1
	6.524	L621	TR3		7.584	R621	TR2
	6.566	L622	TR2		7.6	R622	TR2
	6.612	L623	TR3		7.608	R623	TR2
	6.622	L624	TR1		7.608	R624	TR2
	6.632	L625	TR1		7.612	R625	TR2
	6.636	L626	TR1		7.614	R626	TR3
	6.678	L627	TR2		7.618	R627	TR2
	6.688	L628	TR2		7.63	R628	TR1
	6.714	L629	TR2		7.638	R629	TR1
	6.716	L630	TR2		7.642	R630	TR2
	6.732	L631	TR2		7.644	R631	TR2
	6.752	L632	TR4		7.652	R632	TR2
	6.762	L633	TR3		7.666	R633	TR2
	6.764	L634	TR2		7.672	R634	TR2
	6.766	L635	TR3		7.674	R635	TR3
	6.766	L636	TR2		7.68	R636	TR1
	6.772	L637	TR2		7.686	R637	TR2
	6.774	L638	TR2		7.69	R638	TR2
	6.784	L639	TR4		7.698	R639	TR2
	6.796	L640	TR3		7.702	R640	TR2
	6.798	L641	BAMBOO		7.712	R641	TR2
	6.800	L642	BAMBOO		7.726	R642	TR2
	6.806	L643	BAMBOO		7.73	R643	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	6.806	L644	BAMBOO		7.74	R644	TR2
	6.808	L645	BAMBOO		7.744	R645	TR2
	6.808	L646	BAMBOO		7.752	R646	TR1
	6.824	L647	TR3		7.758	R647	TR1
	6.838	L648	TR3		7.76	R648	TR2
	6.848	L649	TR3		7.774	R649	TR1
	6.864	L650	TR4		7.774	R650	TR1
	6.880	L651	TR2		7.778	R651	TR1
	6.894	L652	TR2		7.788	R652	TR2
	6.902	L653	TR4		7.796	R653	TR2
	6.904	L654	TR4		7.798	R654	TR1
	6.906	L655	TR4		7.802	R655	TR2
	6.910	L656	TR4		7.81	R656	TR2
	6.920	L657	TR4		7.824	R657	TR1
	6.928	L658	TR4		7.824	R658	TR2
	6.928	L659	TR3		7.844	R659	TR2
	6.936	L660	TR3		7.852	R660	TR2
	6.940	L661	TR3		7.862	R661	TR3
	6.944	L662	TR1		7.87	R662	TR3
	6.944	L663	TR1		7.882	R663	TR3
	6.944	L664	TR1		7.884	R664	TR1
	6.946	L665	TR1		7.886	R665	TR4
	6.946	L666	TR1		7.888	R666	TR3
	6.948	L667	TR1		7.898	R667	TR2
	6.948	L668	TR1		7.926	R668	TR2
	6.948	L669	TR1		7.968	R669	TR2
	6.948	L670	TR1		8.208	R670	TR4
	6.948	L671	TR1		8.28	R671	TR4
	6.950	L672	TR1		8.37	R672	TR3
	6.950	L673	TR1		8.378	R673	TR3
	6.950	L674	TR1	8.00 km to 9.00 km	8.398	R674	TR4
	6.950	L675	TR1		8.464	R675	TR4
	6.950	L676	TR1		8.494	R676	TR4
	6.950	L677	TR1		8.508	R677	TR3
	6.950	L678	TR2		8.598	R678	TR2
	6.952	L679	TR1		8.61	R679	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	6.952	L680	TR1		8.618	R680	TR3
	6.954	L681	TR1		8.628	R681	TR2
	6.954	L682	TR1		8.638	R682	TR2
	6.954	L683	TR1		8.644	R683	TR3
	6.954	L684	TR1		8.648	R684	TR1
	6.954	L685	TR1		8.668	R685	TR2
	6.954	L686	TR1		8.674	R686	TR3
	6.956	L687	TR2		8.69	R687	TR3
	6.958	L688	TR1		8.72	R688	TR1
	6.960	L689	TR1		8.762	R689	TR3
	6.960	L690	TR1		8.768	R690	TR3
	6.960	L691	TR1		8.786	R691	TR3
	6.960	L692	TR1		8.798	R692	TR1
	6.962	L693	BAMBOO		8.806	R693	TR3
	6.964	L694	TR1		8.814	R694	TR3
	6.964	L695	TR1		8.822	R695	TR2
	6.966	L696	TR1		8.826	R696	TR3
	6.966	L697	TR1		8.85	R697	TR3
	6.966	L698	TR1		8.864	R698	TR3
	6.966	L699	TR1		8.874	R699	TR2
	6.966	L700	TR1		8.882	R700	TR3
	6.966	L701	TR1		8.914	R701	TR2
	6.968	L702	TR1		8.928	R702	TR3
	6.970	L703	BAMBOO		8.934	R703	TR4
	6.972	L704	TR1		8.938	R704	TR2
	6.974	L705	TR4		8.964	R705	TR4
	6.974	L706	TR1		8.968	R706	TR1
	6.974	L707	TR1		8.968	R707	TR1
	6.974	L708	TR1		8.97	R708	TR1
	6.974	L709	TR1		8.972	R709	TR1
	6.976	L710	TR1		8.972	R710	TR1
	6.976	L711	TR1		8.976	R711	TR1
	6.976	L712	TR1		8.978	R712	TR1
	6.976	L713	TR1		8.99	R713	TR2
	6.976	L714	TR1		8.992	R714	TR1
	6.976	L715	TR1		8.994	R715	TR1
	6.982	L716	TR1		8.998	R716	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	6.982	L717	TR1	9.00 km to 10.00 km	9	R717	TR4
	6.982	L718	TR1		9	R718	TR1
	6.982	L719	TR1		9.002	R719	TR1
	6.982	L720	TR1		9.002	R720	TR1
	6.982	L721	TR1		9.002	R721	TR1
	6.984	L722	TR1		9.006	R722	TR1
	6.984	L723	TR1		9.016	R723	BAMBOO
	6.984	L724	TR1		9.18	R724	TR1
	6.986	L725	TR1		9.186	R725	TR3
	6.986	L726	TR1		9.272	R726	TR1
	6.986	L727	TR1		9.286	R727	TR2
	6.988	L728	TR1		9.38	R728	TR2
	6.988	L729	TR1		9.394	R729	TR2
	6.988	L730	TR1		9.402	R730	TR2
	6.988	L731	TR1		9.5	R731	TR2
	6.988	L732	TR1		9.514	R732	TR2
	6.990	L733	TR1		9.538	R733	TR1
	6.990	L734	TR1		9.558	R734	TR1
	6.990	L735	TR1		9.564	R735	TR1
	6.990	L736	TR1		9.566	R736	TR1
	6.990	L737	TR1		9.57	R737	TR1
	6.990	L738	TR1		9.57	R738	TR1
	6.990	L739	TR1		9.572	R739	TR2
	6.990	L740	TR1		9.576	R740	TR2
	6.992	L741	TR1		9.578	R741	TR1
	6.992	L742	TR1		9.578	R742	TR1
	6.992	L743	TR1		9.586	R743	TR2
	6.992	L744	TR1		9.59	R744	TR2
	6.992	L745	TR1		9.594	R745	TR2
	6.992	L746	TR2		9.596	R746	TR1
	6.994	L747	TR1		9.598	R747	TR1
	6.994	L748	TR1		9.6	R748	TR1
	6.994	L749	TR1		9.604	R749	TR2
	6.994	L750	TR1		9.61	R750	TR2
	6.994	L751	TR1		9.612	R751	TR1
	6.994	L752	TR1		9.618	R752	TR2
	6.994	L753	TR1		9.624	R753	TR1
	6.996	L754	TR1		9.632	R754	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	6.996	L755	TR1		9.666	R755	TR2
	6.996	L756	TR1		9.692	R756	TR2
	6.996	L757	TR1		9.698	R757	TR2
	6.996	L758	TR1		9.724	R758	TR2
	6.996	L759	TR1		9.728	R759	TR2
	6.996	L760	TR1		9.762	R760	TR1
	6.996	L761	TR3		9.766	R761	TR2
	6.998	L762	TR1		9.896	R762	TR1
	6.998	L763	TR1		9.944	R763	TR3
	6.998	L764	TR2		10.014	R764	TR3
	7.000	L765	TR1		10.036	R765	TR1
	7.004	L766	TR2		10.048	R766	TR1
	7.014	L767	TR1		10.096	R767	TR2
	7.022	L768	BAMBOO		10.11	R768	TR2
	7.040	L769	TR1		10.12	R769	TR1
	7.132	L770	TR2		10.128	R770	TR1
	7.132	L771	TR2		10.132	R771	TR2
	7.138	L772	TR2		10.142	R772	TR3
	7.142	L773	TR2		10.156	R773	TR4
	7.152	L774	TR3		10.174	R774	TR3
	7.154	L775	TR2		10.188	R775	TR1
	7.156	L776	TR4		10.194	R776	TR1
	7.164	L777	TR3		10.218	R777	TR1
7.00 km to 8.00 km	7.172	L778	TR2	10.00 km to 11.00 km	10.238	R778	TR2
	7.172	L779	TR2		10.242	R779	TR1
	7.178	L780	TR3		10.244	R780	TR2
	7.214	L781	TR2		10.246	R781	TR1
	7.246	L782	TR3		10.248	R782	TR1
	7.254	L783	TR2		10.248	R783	TR1
	7.262	L784	TR2		10.252	R784	TR1
	7.268	L785	TR2		10.254	R785	TR1
	7.280	L786	TR2		10.27	R786	TR2
	7.290	L787	TR2		10.318	R787	TR1
	7.298	L788	TR2		10.328	R788	TR1
	7.306	L789	TR2		10.328	R789	TR1
	7.320	L790	TR3		10.33	R790	TR1
	7.322	L791	TR3		10.33	R791	TR2
	7.324	L792	TR1		10.33	R792	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	7.336	L793	TR1		10.334	R793	TR1
	7.338	L794	TR2		10.338	R794	TR1
	7.342	L795	TR2		10.344	R795	TR1
	7.346	L796	TR3		10.346	R796	TR1
	7.354	L797	TR1		10.356	R797	TR3
	7.358	L798	TR2		10.38	R798	TR1
	7.362	L799	TR2		10.38	R799	TR1
	7.366	L800	TR1		10.394	R800	TR1
	7.396	L801	TR1		10.4	R801	TR2
	7.440	L802	TR1		10.402	R802	TR2
	7.460	L803	TR1		10.404	R803	TR1
	7.496	L804	TR1		10.406	R804	TR1
	7.512	L805	TR1		10.408	R805	TR2
	7.524	L806	TR1		10.412	R806	TR1
	7.538	L807	TR1		10.414	R807	TR1
	7.586	L808	TR1		10.416	R808	TR2
	7.608	L809	TR1		10.42	R809	TR1
	7.648	L810	TR1		10.422	R810	TR1
	7.702	L811	TR1		10.424	R811	TR1
	7.720	L812	TR1		10.426	R812	TR1
	7.734	L813	TR4		10.426	R813	TR1
	7.752	L814	TR4		10.428	R814	TR1
	7.764	L815	TR1		10.432	R815	TR1
	7.774	L816	TR2		10.434	R816	TR1
	7.778	L817	TR2		10.436	R817	TR1
	7.782	L818	TR1		10.436	R818	TR1
	7.790	L819	TR1		10.456	R819	TR1
	7.808	L820	TR4		10.464	R820	TR2
	7.820	L821	TR2		10.486	R821	TR2
	7.824	L822	TR1		10.488	R822	TR1
	7.856	L823	TR1		10.49	R823	TR1
	7.872	L824	TR1		10.492	R824	TR1
	7.880	L825	TR4		10.502	R825	TR1
	7.898	L826	TR1		10.51	R826	TR1
	7.898	L827	TR2		10.524	R827	TR2
	7.914	L828	TR1		10.528	R828	TR2
	7.918	L829	TR1		10.54	R829	TR1
	7.918	L830	TR2		10.596	R830	TR2
	7.918	L831	TR2		10.608	R831	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	7.920	L832	TR1		10.612	R832	TR2
	7.920	L833	TR1		10.694	R833	TR1
	7.920	L834	TR1		10.746	R834	TR1
	7.922	L835	TR1		10.84	R835	TR2
	7.922	L836	TR2		10.85	R836	TR1
	7.924	L837	TR1		10.86	R837	TR1
	7.924	L838	TR1		10.878	R838	TR1
	7.924	L839	TR1		10.894	R839	TR1
	7.924	L840	TR1		10.916	R840	TR1
	7.924	L841	TR1		10.93	R841	TR2
	7.926	L842	TR1		10.95	R842	TR1
	7.926	L843	TR1		11.028	R843	TR1
	7.926	L844	TR1		11.082	R844	TR1
	7.932	L845	TR1		11.138	R845	TR1
	7.932	L846	TR1		11.164	R846	TR1
	7.936	L847	TR1		11.166	R847	TR1
	7.942	L848	TR1		11.178	R848	TR1
	7.944	L849	TR2		11.188	R849	TR1
	7.948	L850	TR2		11.262	R850	TR1
	7.962	L851	TR1		11.372	R851	TR1
	7.974	L852	BAMBOO		11.386	R852	TR1
	7.980	L853	TR1		11.396	R853	TR1
	7.982	L854	TR1		11.414	R854	TR1
	7.982	L855	TR1	11.00 km to 12.00 km	11.428	R855	TR1
	7.982	L856	TR1		11.458	R856	TR1
	7.982	L857	TR1		11.504	R857	TR4
	7.984	L858	TR1		11.608	R858	TR1
8.00 km to 9.00 km	8.012	L859	TR2		11.648	R859	TR1
	8.012	L860	TR2		11.66	R860	TR1
	8.026	L861	TR3		11.666	R861	TR1
	8.036	L862	TR2		11.678	R862	TR1
	8.052	L863	TR4		11.68	R863	TR1
	8.064	L864	TR2		11.69	R864	TR2
	8.076	L865	TR2		11.726	R865	TR2
	8.080	L866	TR2		11.74	R866	TR1
	8.090	L867	TR3		11.744	R867	TR3
	8.104	L868	TR3		11.746	R868	TR1
	8.108	L869	TR2		11.766	R869	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	8.110	L870	TR3		11.768	R870	TR3
	8.118	L871	TR2		11.772	R871	TR1
	8.130	L872	TR2		11.772	R872	TR1
	8.136	L873	TR3		11.786	R873	TR2
	8.148	L874	TR2		11.792	R874	TR3
	8.154	L875	BAMBOO		11.798	R875	TR1
	8.158	L876	TR4		11.8	R876	TR1
	8.230	L877	TR3		11.8	R877	TR1
	8.278	L878	TR3		11.812	R878	TR1
	8.282	L879	TR4		11.814	R879	TR3
	8.312	L880	TR2		11.822	R880	TR1
	8.364	L881	TR1		11.838	R881	TR3
	8.406	L882	TR3		11.84	R882	TR1
	8.444	L883	TR4		11.85	R883	TR1
	8.460	L884	TR2		11.854	R884	TR1
	8.492	L885	TR4		11.854	R885	TR1
	8.500	L886	BAMBOO		11.876	R886	TR1
	8.502	L887	BAMBOO		11.878	R887	TR3
	8.508	L888	TR4		11.886	R888	TR1
	8.518	L889	TR3		11.894	R889	TR1
	8.532	L890	TR3		11.92	R890	TR2
	8.608	L891	BAMBOO		11.922	R891	TR1
	8.624	L892	TR1		11.946	R892	TR1
	8.656	L893	TR3		11.968	R893	TR1
	8.662	L894	TR4		11.994	R894	TR1
	8.672	L895	TR3		11.996	R895	TR1
	8.680	L896	TR3		12.012	R896	TR1
	8.686	L897	TR1		12.016	R897	TR1
	8.704	L898	TR3		12.024	R898	TR1
	8.706	L899	TR2		12.044	R899	TR1
	8.718	L900	TR2	12.00 km to 13.00 km	12.06	R900	TR1
	8.732	L901	TR2		12.078	R901	TR1
	8.750	L902	TR3		12.144	R902	TR1
	8.754	L903	TR1		12.144	R903	TR1
	8.774	L904	TR3		12.148	R904	TR1
	8.776	L905	TR1		12.152	R905	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	8.796	L906	TR2		12.154	R906	TR2
	8.812	L907	TR4		12.166	R907	TR1
	8.834	L908	TR3		12.168	R908	TR1
	8.856	L909	TR1		12.168	R909	TR1
	8.862	L910	TR1		12.17	R910	TR1
	8.884	L911	TR3		12.172	R911	TR1
	8.904	L912	TR2		12.176	R912	TR4
	8.914	L913	TR1		12.176	R913	TR1
	8.918	L914	TR2		12.18	R914	TR1
	8.926	L915	TR2		12.184	R915	TR1
	8.930	L916	TR2		12.184	R916	TR1
	8.944	L917	TR3		12.184	R917	TR2
	8.946	L918	TR2		12.19	R918	TR1
	8.950	L919	TR2		12.192	R919	TR1
	8.986	L920	TR2		12.216	R920	TR1
9.00 km to 10.00 km	9.004	L921	TR2		12.222	R921	TR1
	9.016	L922	TR3		12.222	R922	TR1
	9.016	L923	TR3		12.222	R923	TR1
	9.020	L924	TR3		12.222	R924	TR1
	9.024	L925	TR2		12.228	R925	TR2
	9.046	L926	TR2		12.24	R926	TR2
	9.054	L927	TR2		12.246	R927	TR1
	9.058	L928	TR2		12.254	R928	TR4
	9.072	L929	TR1		12.27	R929	TR2
	9.076	L930	TR1		12.278	R930	TR1
	9.084	L931	TR2		12.304	R931	TR3
	9.096	L932	TR2		12.316	R932	TR2
	9.104	L933	TR3		12.326	R933	TR4
	9.110	L934	BAMBOO		12.338	R934	TR2
	9.114	L935	TR2		12.356	R935	TR1
	9.128	L936	TR2		12.36	R936	TR1
	9.136	L937	TR2		12.362	R937	TR1
	9.142	L938	TR1		12.376	R938	TR1
	9.154	L939	TR3		12.376	R939	TR1
	9.164	L940	BAMBOO		12.376	R940	TR1
	9.168	L941	TR2		12.382	R941	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	9.170	L942	BAMBOO		12.39	R942	TR1
	9.204	L943	TR3		12.39	R943	TR1
	9.220	L944	TR2		12.396	R944	TR1
	9.224	L945	TR2		12.41	R945	TR1
	9.250	L946	TR2		12.41	R946	TR2
	9.250	L947	TR2		12.416	R947	TR3
	9.256	L948	TR1		12.418	R948	TR2
	9.256	L949	TR2		12.446	R949	TR2
	9.260	L950	TR1		12.448	R950	TR2
	9.272	L951	TR2		12.454	R951	TR3
	9.274	L952	TR2		12.528	R952	TR1
	9.294	L953	TR2		12.536	R953	TR1
	9.300	L954	TR2		12.548	R954	TR4
	9.302	L955	TR2		12.594	R955	TR1
	9.334	L956	TR1		12.608	R956	TR1
	9.366	L957	TR1		12.618	R957	TR1
	9.376	L958	TR4		12.626	R958	TR4
	9.468	L959	TR3		12.636	R959	TR1
	9.490	L960	TR3		12.642	R960	TR1
	9.518	L961	TR2		12.662	R961	TR1
	9.522	L962	TR2		12.672	R962	TR4
	9.524	L963	TR2		12.676	R963	TR4
	9.526	L964	TR1		12.682	R964	TR4
	9.526	L965	TR1		12.688	R965	TR1
	9.528	L966	TR1		12.708	R966	TR3
	9.528	L967	TR1		12.712	R967	TR1
	9.530	L968	TR1		12.738	R968	TR4
	9.530	L969	TR1		12.754	R969	TR4
	9.532	L970	TR1		12.756	R970	TR4
	9.534	L971	TR1		12.756	R971	TR4
	9.534	L972	TR1		12.762	R972	TR3
	9.536	L973	TR1		12.772	R973	TR3
	9.536	L974	TR1		12.782	R974	TR4
	9.540	L975	TR1		12.786	R975	TR4
	9.540	L976	TR1		12.792	R976	TR2
	9.548	L977	TR1		12.806	R977	TR3
	9.568	L978	TR2		12.812	R978	TR3
	9.602	L979	TR1		12.824	R979	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	9.604	L980	TR1		12.836	R980	TR1
	9.638	L981	TR3		12.84	R981	TR3
	9.764	L982	TR1		12.842	R982	TR1
	9.766	L983	TR2		12.85	R983	TR1
	9.820	L984	TR1		12.854	R984	TR2
	9.822	L985	TR1		12.856	R985	TR2
	9.854	L986	TR1		12.868	R986	TR1
	9.854	L987	TR3		12.87	R987	TR1
	9.854	L988	TR2		12.878	R988	TR1
	9.860	L989	TR3		12.888	R989	TR1
	9.884	L990	TR1		12.894	R990	TR2
	9.894	L991	TR1		12.902	R991	TR4
	9.894	L992	TR1		12.912	R992	TR2
	9.898	L993	TR1		12.914	R993	TR2
	9.948	L994	TR1		12.922	R994	TR1
	9.952	L995	TR1		12.944	R995	TR4
	9.958	L996	TR1		12.952	R996	TR1
	9.960	L997	TR1		12.96	R997	TR2
	9.962	L998	TR1		12.968	R998	TR1
	9.964	L999	TR1		12.974	R999	TR4
	9.970	L1000	TR1		12.978	R1000	TR1
	9.972	L1001	TR2		12.982	R1001	TR1
	9.988	L1002	TR1		12.984	R1002	TR4
	9.988	L1003	TR1		12.99	R1003	TR2
	9.992	L1004	TR1		13.004	R1004	TR2
	9.992	L1005	TR1		13.004	R1005	TR2
	9.998	L1006	TR1		13.008	R1006	TR3
	10.004	L1007	TR1		13.012	R1007	TR3
	10.004	L1008	TR1		13.014	R1008	TR4
	10.008	L1009	TR1		13.034	R1009	TR1
	10.010	L1010	TR1		13.064	R1010	TR4
	10.010	L1011	TR2		13.064	R1011	TR2
10.00 km to 11.00 km	10.012	L1012	TR1	13.00 km to 14.00 km	13.074	R1012	TR2
	10.014	L1013	TR1		13.076	R1013	TR2
	10.014	L1014	TR1		13.092	R1014	TR4
	10.014	L1015	TR1		13.096	R1015	TR4
	10.024	L1016	TR1		13.098	R1016	TR4
	10.042	L1017	TR2		13.12	R1017	TR3
	10.044	L1018	TR2		13.132	R1018	TR4

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	10.046	L1019	TR2		13.138	R1019	TR2
	10.082	L1020	TR2		13.144	R1020	TR3
	10.112	L1021	TR1		13.154	R1021	TR4
	10.120	L1022	TR1		13.162	R1022	TR4
	10.120	L1023	TR1		13.164	R1023	TR1
	10.124	L1024	TR1		13.164	R1024	TR4
	10.124	L1025	TR1		13.166	R1025	TR3
	10.126	L1026	TR1		13.176	R1026	TR4
	10.126	L1027	TR1		13.198	R1027	TR1
	10.130	L1028	TR1		13.198	R1028	TR4
	10.142	L1029	TR4		13.2	R1029	TR2
	10.178	L1030	TR2		13.206	R1030	TR2
	10.196	L1031	TR2		13.21	R1031	TR4
	10.198	L1032	TR2		13.216	R1032	TR1
	10.206	L1033	TR2		13.218	R1033	TR1
	10.218	L1034	TR3		13.222	R1034	TR1
	10.220	L1035	TR3		13.226	R1035	TR1
	10.224	L1036	TR4		13.232	R1036	TR1
	10.226	L1037	TR1		13.232	R1037	TR1
	10.226	L1038	TR2		13.236	R1038	TR2
	10.228	L1039	TR1		13.252	R1039	TR3
	10.230	L1040	TR1		13.254	R1040	TR1
	10.234	L1041	TR1		13.262	R1041	TR3
	10.234	L1042	TR3		13.276	R1042	TR1
	10.236	L1043	TR1		13.278	R1043	TR1
	10.238	L1044	TR2		13.282	R1044	TR1
	10.242	L1045	TR1		13.29	R1045	TR1
	10.258	L1046	TR1		13.294	R1046	TR1
	10.262	L1047	TR1		13.296	R1047	TR1
	10.278	L1048	TR1		13.298	R1048	TR1
	10.340	L1049	TR1		13.3	R1049	TR1
	10.340	L1050	TR1		13.302	R1050	TR1
	10.342	L1051	TR1		13.308	R1051	TR2
	10.342	L1052	TR1		13.318	R1052	TR3
	10.344	L1053	TR1		13.362	R1053	TR1
	10.344	L1054	TR1		13.368	R1054	TR1
	10.344	L1055	TR1		13.374	R1055	TR2
	10.344	L1056	TR1		13.388	R1056	TR1
	10.344	L1057	TR1		13.392	R1057	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	10.346	L1058	TR1		13.4	R1058	TR1
	10.346	L1059	TR1		13.408	R1059	TR1
	10.346	L1060	TR1		13.414	R1060	TR1
	10.346	L1061	TR1		13.422	R1061	TR1
	10.348	L1062	TR1		13.426	R1062	TR1
	10.348	L1063	TR1		13.43	R1063	TR1
	10.348	L1064	TR1		13.434	R1064	TR1
	10.350	L1065	TR1		13.438	R1065	TR1
	10.350	L1066	TR1		13.446	R1066	TR1
	10.350	L1067	TR1		13.452	R1067	TR1
	10.352	L1068	TR1		13.46	R1068	TR1
	10.354	L1069	TR2		13.49	R1069	TR1
	10.356	L1070	TR2		13.5	R1070	TR1
	10.358	L1071	TR1		13.502	R1071	TR1
	10.360	L1072	TR1		13.506	R1072	TR1
	10.360	L1073	TR1		13.518	R1073	TR1
	10.360	L1074	TR2		13.554	R1074	TR4
	10.362	L1075	TR1		13.752	R1075	TR1
	10.362	L1076	TR1		13.756	R1076	TR1
	10.362	L1077	TR1		13.758	R1077	TR1
	10.372	L1078	TR1		13.762	R1078	TR1
	10.372	L1079	TR1		13.766	R1079	TR1
	10.380	L1080	TR1		13.77	R1080	TR1
	10.384	L1081	TR1		13.782	R1081	TR1
	10.384	L1082	TR1		13.79	R1082	TR1
	10.384	L1083	TR1		13.796	R1083	TR1
	10.390	L1084	TR1		13.804	R1084	TR1
	10.396	L1085	TR1		13.808	R1085	TR1
	10.396	L1086	TR1		13.81	R1086	TR1
	10.398	L1087	TR1		13.814	R1087	TR1
	10.400	L1088	TR1		13.818	R1088	TR1
	10.400	L1089	TR2		13.822	R1089	TR1
	10.402	L1090	TR1		13.826	R1090	TR1
	10.408	L1091	TR1		13.83	R1091	TR1
	10.412	L1092	TR1		13.836	R1092	TR1
	10.416	L1093	TR1		13.876	R1093	TR2
	10.420	L1094	TR1		13.882	R1094	TR1
	10.422	L1095	BAMBOO		13.886	R1095	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	10.422	L1096	BAMBOO		13.89	R1096	TR1
	10.422	L1097	BAMBOO		13.896	R1097	TR1
	10.426	L1098	BAMBOO		13.9	R1098	TR1
	10.430	L1099	BAMBOO		13.904	R1099	TR1
	10.430	L1100	BAMBOO		13.908	R1100	TR1
	10.430	L1101	TR1		13.916	R1101	TR1
	10.432	L1102	TR2		13.924	R1102	TR1
	10.436	L1103	TR1		13.928	R1103	TR1
	10.448	L1104	TR1		13.944	R1104	TR2
	10.448	L1105	TR1		13.962	R1105	TR1
	10.450	L1106	TR1		14.012	R1106	TR1
	10.452	L1107	TR1		14.014	R1107	TR1
	10.456	L1108	TR1		14.024	R1108	TR1
	10.456	L1109	TR1		14.028	R1109	TR1
	10.466	L1110	TR1		14.038	R1110	TR1
	10.466	L1111	TR1		14.044	R1111	TR1
	10.468	L1112	TR1		14.05	R1112	TR1
	10.470	L1113	TR1		14.056	R1113	TR1
	10.478	L1114	TR1		14.056	R1114	TR2
	10.478	L1115	TR2		14.058	R1115	TR1
	10.506	L1116	TR1		14.062	R1116	TR1
	10.508	L1117	TR1	14.00 km to 15.00 km	14.068	R1117	TR1
	10.508	L1118	TR1		14.07	R1118	TR1
	10.510	L1119	TR3		14.124	R1119	TR4
	10.512	L1120	TR1		14.152	R1120	TR1
	10.512	L1121	TR1		14.154	R1121	TR2
	10.514	L1122	TR1		14.162	R1122	TR2
	10.516	L1123	TR2		14.174	R1123	TR1
	10.518	L1124	TR2		14.174	R1124	TR1
	10.522	L1125	TR3		14.18	R1125	TR2
	10.524	L1126	TR1		14.18	R1126	TR2
	10.524	L1127	TR2		14.18	R1127	TR1
	10.526	L1128	BAMBOO		14.18	R1128	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	10.526	L1129	BAMBOO		14.182	R1129	TR4
	10.528	L1130	BAMBOO		14.184	R1130	TR1
	10.530	L1131	BAMBOO		14.186	R1131	TR1
	10.534	L1132	BAMBOO		14.186	R1132	TR3
	10.534	L1133	BAMBOO		14.188	R1133	TR1
	10.536	L1134	BAMBOO		14.19	R1134	TR1
	10.606	L1135	TR1		14.19	R1135	TR1
	10.608	L1136	TR1		14.198	R1136	TR1
	10.612	L1137	TR1		14.224	R1137	TR1
	10.634	L1138	TR1		14.252	R1138	TR3
	10.656	L1139	TR1		14.272	R1139	TR1
	10.670	L1140	TR1		14.276	R1140	TR1
	10.716	L1141	TR1		14.28	R1141	TR3
	10.774	L1142	TR2		14.286	R1142	TR1
	10.858	L1143	TR1		14.294	R1143	BAMBOO
	10.892	L1144	TR1		14.302	R1144	TR2
	10.982	L1145	TR1		14.302	R1145	TR1
11.00 km to 12.00 km	11.008	L1146	TR3		14.304	R1146	TR1
	11.228	L1147	TR1		14.304	R1147	TR2
	11.354	L1148	TR1		14.306	R1148	TR1
	11.404	L1149	TR1		14.308	R1149	TR1
	11.456	L1150	TR1		14.308	R1150	TR2
	11.464	L1151	TR3		14.31	R1151	TR1
	11.474	L1152	TR3		14.31	R1152	TR1
	11.504	L1153	TR2		14.31	R1153	TR2
	11.508	L1154	TR1		14.312	R1154	TR1
	11.532	L1155	TR2		14.312	R1155	TR3
	11.544	L1156	TR3		14.314	R1156	TR1
	11.564	L1157	TR4		14.316	R1157	TR2
	11.572	L1158	TR1		14.322	R1158	TR2
	11.606	L1159	TR1		14.326	R1159	TR2
	11.616	L1160	TR2		14.33	R1160	TR2
	11.628	L1161	TR3		14.33	R1161	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	11.634	L1162	TR1		14.332	R1162	TR2
	11.638	L1163	TR1		14.336	R1163	TR2
	11.658	L1164	TR1		14.338	R1164	TR1
	11.670	L1165	TR1		14.34	R1165	TR2
	11.672	L1166	TR4		14.342	R1166	TR1
	11.684	L1167	TR1		14.344	R1167	TR2
	11.700	L1168	TR2		14.346	R1168	TR1
	11.706	L1169	TR1		14.346	R1169	TR2
	11.714	L1170	TR1		14.348	R1170	TR2
	11.720	L1171	TR1		14.348	R1171	TR1
	11.730	L1172	TR3		14.352	R1172	TR1
	11.740	L1173	TR4		14.354	R1173	TR1
	11.750	L1174	TR3		14.356	R1174	TR2
	11.768	L1175	TR4		14.356	R1175	TR1
	11.780	L1176	TR1		14.358	R1176	TR1
	11.806	L1177	TR3		14.362	R1177	TR1
	11.816	L1178	TR2		14.362	R1178	TR1
	11.820	L1179	TR2		14.366	R1179	TR2
	11.852	L1180	TR3		14.366	R1180	TR1
	11.886	L1181	TR4		14.368	R1181	TR1
	11.902	L1182	TR1		14.372	R1182	TR1
	11.916	L1183	TR1		14.372	R1183	TR1
	11.916	L1184	TR1		14.378	R1184	TR2
	11.940	L1185	TR1		14.378	R1185	TR1
	11.948	L1186	TR3		14.382	R1186	TR1
	11.950	L1187	TR1		14.386	R1187	TR2
12.00 km to 13.00 km	12.024	L1188	TR1		14.39	R1188	TR1
	12.072	L1189	TR1		14.392	R1189	TR1
	12.078	L1190	TR1		14.394	R1190	TR2
	12.106	L1191	TR1		14.396	R1191	TR1
	12.142	L1192	TR1		14.4	R1192	TR2
	12.170	L1193	TR1		14.4	R1193	TR2
	12.188	L1194	TR2		14.4	R1194	TR1
	12.194	L1195	TR1		14.414	R1195	TR1
	12.198	L1196	TR1		14.434	R1196	TR1
	12.206	L1197	TR1		14.434	R1197	TR1
	12.216	L1198	TR1		14.454	R1198	TR1
	12.252	L1199	TR1		14.458	R1199	TR1
	12.280	L1200	TR1		14.468	R1200	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	12.284	L1201	TR4		14.542	R1201	TR4
	12.294	L1202	TR1		14.55	R1202	TR2
	12.302	L1203	TR4		14.554	R1203	TR1
	12.304	L1204	TR1		14.556	R1204	TR3
	12.340	L1205	TR1		14.558	R1205	TR3
	12.390	L1206	TR3		14.564	R1206	TR2
	12.406	L1207	TR1		14.568	R1207	TR2
	12.416	L1208	TR1		14.572	R1208	TR3
	12.416	L1209	TR1		14.574	R1209	TR2
	12.432	L1210	TR4		14.574	R1210	TR1
	12.448	L1211	TR4		14.582	R1211	TR2
	12.486	L1212	TR1		14.592	R1212	TR1
	12.488	L1213	TR1		14.7	R1213	TR4
	12.494	L1214	TR1		14.852	R1214	TR1
	12.496	L1215	TR1		14.924	R1215	TR2
	12.496	L1216	TR2		15.006	R1216	TR2
	12.498	L1217	TR1		15.008	R1217	TR1
	12.498	L1218	TR2		15.114	R1218	TR1
	12.500	L1219	TR1		15.178	R1219	TR4
	12.500	L1220	TR1		15.198	R1220	TR4
	12.502	L1221	TR1		15.2	R1221	TR2
	12.504	L1222	TR1		15.208	R1222	TR1
	12.506	L1223	TR1		15.216	R1223	TR1
	12.508	L1224	TR3		15.222	R1224	TR1
	12.512	L1225	TR1		15.224	R1225	TR1
	12.514	L1226	TR1		15.23	R1226	TR1
	12.518	L1227	TR1	15.00 km to 16.00 km	15.234	R1227	TR1
	12.518	L1228	TR1		15.234	R1228	TR1
	12.522	L1229	TR1		15.244	R1229	TR1
	12.524	L1230	TR1		15.25	R1230	TR1
	12.524	L1231	TR2		15.252	R1231	TR2
	12.538	L1232	TR3		15.254	R1232	TR2
	12.540	L1233	TR2		15.258	R1233	TR1
	12.562	L1234	TR2		15.27	R1234	TR1
	12.624	L1235	TR1		15.306	R1235	TR2
	12.670	L1236	TR1		15.312	R1236	TR3
	12.682	L1237	TR1		15.314	R1237	TR2
	12.690	L1238	TR1		15.32	R1238	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	12.822	L1239	TR1		15.356	R1239	BAMBOO
	12.826	L1240	TR1		15.364	R1240	TR1
	12.830	L1241	TR2		15.636	R1241	TR1
	12.838	L1242	TR1		15.638	R1242	TR1
	12.844	L1243	TR1		15.644	R1243	TR1
	12.854	L1244	TR2		15.714	R1244	TR1
	12.858	L1245	TR1		15.74	R1245	TR1
	12.862	L1246	TR1		15.75	R1246	TR1
	12.866	L1247	TR2		15.762	R1247	TR1
	12.870	L1248	TR1		15.772	R1248	TR1
	12.876	L1249	TR1		15.784	R1249	TR1
	12.882	L1250	TR2		15.792	R1250	TR1
	12.884	L1251	TR1		15.794	R1251	TR2
	12.894	L1252	TR2		15.8	R1252	TR2
	12.902	L1253	TR1		15.81	R1253	TR1
	12.906	L1254	TR1		15.818	R1254	TR1
	12.912	L1255	TR1		15.834	R1255	TR3
	12.916	L1256	TR2		15.91	R1256	TR2
	12.922	L1257	TR1		15.92	R1257	TR2
	12.934	L1258	TR1		15.932	R1258	TR2
	13.038	L1259	TR1		15.94	R1259	TR1
	13.048	L1260	TR1		15.962	R1260	TR2
	13.050	L1261	TR1		15.964	R1261	TR2
	13.052	L1262	TR1		15.966	R1262	TR2
	13.054	L1263	TR1		15.968	R1263	TR1
	13.058	L1264	TR1		15.988	R1264	TR1
	13.062	L1265	TR1		16	R1265	TR1
	13.066	L1266	TR2		16.074	R1266	TR1
13.00 km to 14.00 km	13.068	L1267	TR1		16.074	R1267	TR1
	13.070	L1268	TR1		16.116	R1268	TR1
	13.074	L1269	TR1		16.122	R1269	TR2
	13.076	L1270	TR4	16.00 km to 17.00 km	16.124	R1270	TR2
	13.090	L1271	TR1		16.124	R1271	TR2
	13.102	L1272	TR4		16.372	R1272	TR1
	13.108	L1273	TR3		16.374	R1273	TR1
	13.112	L1274	TR1		16.38	R1274	TR3
	13.114	L1275	TR4		16.382	R1275	TR3
	13.128	L1276	TR4		16.382	R1276	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	13.130	L1277	TR1		16.384	R1277	TR1
	13.132	L1278	TR1		16.384	R1278	TR1
	13.134	L1279	TR1		16.39	R1279	TR1
	13.136	L1280	TR1		16.392	R1280	TR2
	13.136	L1281	TR2		16.486	R1281	TR1
	13.142	L1282	TR1		16.506	R1282	TR1
	13.142	L1283	TR1		16.508	R1283	TR1
	13.146	L1284	TR1		16.508	R1284	TR1
	13.248	L1285	TR1		16.532	R1285	TR2
	13.288	L1286	TR4		16.542	R1286	TR1
	13.322	L1287	TR1		16.548	R1287	TR1
	13.328	L1288	TR4		16.55	R1288	TR1
	13.330	L1289	TR1		16.554	R1289	TR2
	13.332	L1290	TR1		16.554	R1290	TR1
	13.346	L1291	TR4		16.554	R1291	TR1
	13.360	L1292	TR3		16.554	R1292	TR1
	13.370	L1293	TR4		16.556	R1293	TR1
	13.372	L1294	TR4		16.558	R1294	TR1
	13.376	L1295	TR4		16.558	R1295	TR1
	13.378	L1296	TR1		16.56	R1296	TR1
	13.390	L1297	TR2		16.564	R1297	TR1
	13.394	L1298	TR3		16.566	R1298	TR1
	13.396	L1299	TR3		16.566	R1299	TR1
	13.398	L1300	TR1		16.568	R1300	TR1
	13.402	L1301	TR3		16.57	R1301	TR2
	13.406	L1302	TR4		16.57	R1302	TR1
	13.408	L1303	TR3		16.57	R1303	TR1
	13.412	L1304	TR2		16.572	R1304	TR1
	13.422	L1305	TR4		16.598	R1305	TR1
	13.424	L1306	TR4		16.598	R1306	TR1
	13.430	L1307	TR1		16.602	R1307	TR1
	13.470	L1308	TR1		16.602	R1308	TR1
	13.472	L1309	TR1		16.604	R1309	TR1
	13.474	L1310	TR1		16.604	R1310	TR1
	13.480	L1311	TR4		16.85	R1311	TR1
	13.484	L1312	TR1		16.864	R1312	TR1
	13.532	L1313	TR1		16.88	R1313	TR2
	13.534	L1314	TR1		16.884	R1314	TR3
	13.542	L1315	TR1		16.896	R1315	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	13.544	L1316	TR1		16.896	R1316	TR2
	13.546	L1317	TR4		16.9	R1317	TR1
	13.548	L1318	TR1		16.902	R1318	TR1
	13.550	L1319	TR1		16.902	R1319	TR1
	13.550	L1320	TR1		16.92	R1320	TR1
	13.550	L1321	TR1		16.92	R1321	TR1
	13.552	L1322	TR1		16.92	R1322	TR1
	13.556	L1323	TR2		16.92	R1323	TR1
	13.558	L1324	TR1		16.922	R1324	TR1
	13.560	L1325	TR1		16.922	R1325	TR1
	13.564	L1326	TR1		16.922	R1326	TR1
	13.566	L1327	TR3		16.922	R1327	TR1
	13.570	L1328	TR1		16.924	R1328	TR1
	13.572	L1329	TR1		16.93	R1329	TR1
	13.574	L1330	TR1		16.932	R1330	TR1
	13.610	L1331	TR1		16.948	R1331	TR1
	13.632	L1332	TR1		16.95	R1332	TR1
	13.646	L1333	TR1		16.952	R1333	TR1
	13.648	L1334	TR1		16.952	R1334	TR1
	13.674	L1335	TR2		16.952	R1335	TR1
	13.688	L1336	TR1		16.952	R1336	TR1
	13.690	L1337	TR1		16.952	R1337	TR1
	13.700	L1338	TR1		16.97	R1338	TR1
	13.702	L1339	TR1		16.988	R1339	TR1
	13.726	L1340	TR1		16.998	R1340	TR2
	13.770	L1341	TR1		17.002	R1341	TR1
	13.776	L1342	BAMBOO		17.002	R1342	TR2
	13.776	L1343	TR1		17.02	R1343	TR1
	13.792	L1344	BAMBOO		17.022	R1344	TR1
	13.796	L1345	TR1	17.00 km to 18.00 km	17.026	R1345	TR1
	13.796	L1346	TR1		17.028	R1346	TR1
	13.798	L1347	TR1		17.038	R1347	TR1
	13.812	L1348	TR1		17.038	R1348	TR2
	13.820	L1349	BAMBOO		17.048	R1349	TR2
	13.820	L1350	BAMBOO		17.056	R1350	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	13.836	L1351	BAMBOO		17.058	R1351	TR1
	13.838	L1352	TR3		17.06	R1352	TR1
	13.844	L1353	TR1		17.062	R1353	TR1
	13.844	L1354	TR3		17.082	R1354	TR3
	13.860	L1355	TR1		17.178	R1355	TR3
	13.884	L1356	TR1		17.184	R1356	TR3
	13.884	L1357	TR1		17.188	R1357	TR3
	13.884	L1358	TR1		17.218	R1358	TR1
	13.884	L1359	TR2		17.236	R1359	TR2
	13.892	L1360	TR1		17.256	R1360	TR4
	13.892	L1361	TR1		17.266	R1361	TR2
	13.892	L1362	TR1		17.278	R1362	TR3
	13.896	L1363	TR1		17.3	R1363	TR3
	13.914	L1364	TR1		17.308	R1364	TR2
	13.914	L1365	TR1		17.33	R1365	TR2
	13.920	L1366	TR1		17.33	R1366	TR2
	13.926	L1367	TR1		17.336	R1367	TR2
	13.928	L1368	TR1		17.356	R1368	TR2
	13.928	L1369	TR1		17.366	R1369	TR3
	13.934	L1370	TR1		17.392	R1370	TR2
	13.934	L1371	TR1		17.398	R1371	TR1
14.00 km to 15.00 km	14.134	L1372	TR1		17.41	R1372	TR3
	14.150	L1373	TR4		17.414	R1373	TR2
	14.150	L1374	TR1		17.414	R1374	TR2
	14.152	L1375	TR1		17.416	R1375	TR2
	14.154	L1376	TR3		17.416	R1376	TR2
	14.160	L1377	TR4		17.418	R1377	TR3
	14.176	L1378	TR4		17.424	R1378	TR3
	14.196	L1379	TR2		17.43	R1379	TR4
	14.302	L1380	TR1		17.478	R1380	TR4
	14.312	L1381	TR1		17.508	R1381	TR4
	14.318	L1382	TR1		17.516	R1382	TR2
	14.326	L1383	TR1		17.518	R1383	TR1
	14.330	L1384	TR1		17.52	R1384	TR1
	14.332	L1385	TR1		17.52	R1385	TR2
	14.338	L1386	TR2		17.524	R1386	TR1
	14.338	L1387	TR1		17.524	R1387	TR1
	14.340	L1388	TR1		17.524	R1388	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	14.346	L1389	TR1		17.536	R1389	TR3
	14.346	L1390	TR1		17.55	R1390	TR2
	14.352	L1391	TR2		17.552	R1391	TR3
	14.352	L1392	TR2		17.562	R1392	TR2
	14.358	L1393	TR1		17.562	R1393	TR2
	14.366	L1394	TR1		17.562	R1394	TR2
	14.384	L1395	TR1		17.568	R1395	TR1
	14.400	L1396	BAMBOO		17.568	R1396	TR1
	14.404	L1397	TR1		17.57	R1397	TR1
	14.404	L1398	TR1		17.576	R1398	TR2
	14.432	L1399	TR4		17.584	R1399	TR1
	14.446	L1400	TR4		17.604	R1400	TR1
	14.454	L1401	TR1		17.604	R1401	TR1
	14.458	L1402	TR1		17.604	R1402	TR1
	14.464	L1403	TR1		17.604	R1403	TR1
	14.472	L1404	TR1		17.604	R1404	TR2
	14.480	L1405	TR4		17.606	R1405	TR1
	14.482	L1406	TR1		17.61	R1406	TR1
	14.490	L1407	TR2		17.612	R1407	TR1
	14.492	L1408	TR3		17.612	R1408	TR1
	14.494	L1409	TR2		17.614	R1409	TR1
	14.496	L1410	TR1		17.614	R1410	TR1
	14.504	L1411	TR2		17.618	R1411	TR1
	14.506	L1412	TR3		17.62	R1412	TR3
	14.506	L1413	TR3		17.698	R1413	BAMBOO
	14.512	L1414	TR1		17.698	R1414	BAMBOO
	14.512	L1415	TR1		17.742	R1415	TR2
	14.516	L1416	TR1		17.83	R1416	TR4
	14.516	L1417	TR1		17.844	R1417	TR1
	14.518	L1418	TR1	18.00 km to 19.00 km	18.014	R1418	TR2
	14.518	L1419	TR1		18.112	R1419	TR2
	14.518	L1420	TR1		18.254	R1420	TR3
	14.518	L1421	TR1		18.266	R1421	TR3
	14.518	L1422	TR1		18.282	R1422	TR4
	14.524	L1423	TR2		18.3	R1423	TR2
	14.524	L1424	TR1		18.308	R1424	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	14.526	L1425	TR1		18.376	R1425	TR3
	14.528	L1426	TR4		18.402	R1426	TR4
	14.530	L1427	TR3		18.534	R1427	TR2
	14.530	L1428	TR2		18.698	R1428	TR4
	14.552	L1429	TR2		18.884	R1429	TR2
	14.558	L1430	TR1		18.982	R1430	TR3
	14.562	L1431	TR1		18.984	R1431	TR3
	14.592	L1432	TR2		18.988	R1432	TR3
	14.624	L1433	TR3		19	R1433	TR1
	14.630	L1434	TR3		19.002	R1434	TR1
	14.656	L1435	TR1		19.018	R1435	TR2
	14.852	L1436	BAMBOO		19.02	R1436	TR1
15.00 km to 16.00 km	15.042	L1437	TR1	19.00 km to 20.00 km	19.022	R1437	TR1
	15.144	L1438	TR1		19.024	R1438	TR2
	15.154	L1439	BAMBOO		19.034	R1439	TR2
	15.168	L1440	TR1		19.042	R1440	TR2
	15.172	L1441	TR1		19.044	R1441	TR1
	15.174	L1442	TR1		19.044	R1442	TR3
	15.176	L1443	TR2		19.048	R1443	TR1
	15.178	L1444	TR1		19.05	R1444	TR3
	15.180	L1445	TR1		19.054	R1445	TR1
	15.184	L1446	TR1		19.054	R1446	TR1
	15.186	L1447	TR1		19.054	R1447	TR1
	15.192	L1448	TR3		19.056	R1448	TR1
	15.196	L1449	TR1		19.062	R1449	TR3
	15.214	L1450	TR4		19.068	R1450	TR2
	15.222	L1451	TR3		19.078	R1451	TR2
	15.254	L1452	TR4		19.08	R1452	TR3
	15.264	L1453	TR2		19.092	R1453	TR2
	15.266	L1454	TR3		19.092	R1454	TR2
	15.278	L1455	TR3		19.092	R1455	TR2
	15.348	L1456	TR1		19.094	R1456	TR1
	15.438	L1457	TR2		19.096	R1457	TR3
	15.610	L1458	TR1		19.096	R1458	TR2
	15.614	L1459	BAMBOO		19.1	R1459	TR3
	15.678	L1460	TR2		19.104	R1460	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	15.752	L1461	TR1		19.206	R1461	TR1
	15.776	L1462	TR1		19.236	R1462	TR2
	15.780	L1463	TR1		19.248	R1463	TR2
	15.886	L1464	TR1		19.252	R1464	TR1
	15.896	L1465	TR1		19.288	R1465	TR2
	15.906	L1466	TR1		19.304	R1466	TR4
	15.906	L1467	TR1		19.338	R1467	TR2
	15.910	L1468	TR1		19.38	R1468	TR2
	15.916	L1469	TR3		19.406	R1469	TR2
	15.918	L1470	TR1		19.406	R1470	TR2
	15.922	L1471	TR1		19.43	R1471	TR3
	15.928	L1472	TR1		19.448	R1472	TR2
	15.944	L1473	TR1		19.45	R1473	TR2
	15.946	L1474	TR1		19.45	R1474	TR2
	15.964	L1475	TR2		19.46	R1475	TR2
	15.972	L1476	TR1		19.462	R1476	TR2
	15.982	L1477	TR1		19.464	R1477	TR2
	15.982	L1478	TR1		19.468	R1478	TR2
	15.984	L1479	TR1		19.52	R1479	TR4
	15.984	L1480	TR1		19.59	R1480	TR1
	15.986	L1481	TR1		19.592	R1481	TR1
	15.990	L1482	TR1		19.604	R1482	TR1
	15.992	L1483	TR1		19.608	R1483	TR1
	15.992	L1484	TR1		19.61	R1484	TR1
	15.992	L1485	TR1		19.616	R1485	TR1
	15.998	L1486	TR1		19.628	R1486	TR1
16.00 km to 17.00 km	16.000	L1487	TR1		19.63	R1487	TR2
	16.000	L1488	TR1		19.65	R1488	TR1
	16.020	L1489	TR2		19.76	R1489	TR4
	16.022	L1490	TR1		19.77	R1490	TR2
	16.022	L1491	TR1		19.78	R1491	TR1
	16.024	L1492	TR2		19.794	R1492	TR1
	16.024	L1493	TR1		19.8	R1493	TR1
	16.032	L1494	TR1		19.806	R1494	TR1
	16.032	L1495	TR2		19.806	R1495	TR1
	16.036	L1496	TR2		19.808	R1496	TR2
	16.048	L1497	TR1		19.812	R1497	TR2
	16.048	L1498	TR1		19.814	R1498	TR1
	16.050	L1499	TR1		19.814	R1499	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	16.050	L1500	TR1		19.832	R1500	TR2
	16.050	L1501	TR1		19.832	R1501	TR2
	16.050	L1502	TR1		19.834	R1502	TR2
	16.050	L1503	TR1		19.838	R1503	TR2
	16.050	L1504	TR3		19.844	R1504	TR2
	16.052	L1505	TR1		19.846	R1505	TR2
	16.052	L1506	TR2		19.848	R1506	TR2
	16.054	L1507	TR1		19.852	R1507	TR2
	16.058	L1508	TR1		19.932	R1508	TR2
	16.070	L1509	TR1		19.978	R1509	TR1
	16.118	L1510	BAMBOO		19.988	R1510	TR1
	16.120	L1511	BAMBOO		19.992	R1511	TR1
	16.138	L1512	TR4		19.998	R1512	TR2
	16.166	L1513	TR4		20.002	R1513	TR1
	16.180	L1514	TR2		20.002	R1514	TR2
	16.180	L1515	TR2		20.004	R1515	TR2
	16.182	L1516	TR1		20.004	R1516	TR1
	16.188	L1517	TR1		20.004	R1517	TR3
	16.190	L1518	TR2		20.006	R1518	TR2
	16.190	L1519	TR2		20.008	R1519	TR1
	16.192	L1520	TR1		20.008	R1520	TR1
	16.198	L1521	TR1		20.01	R1521	TR1
	16.198	L1522	TR3		20.01	R1522	TR2
	16.200	L1523	TR1		20.012	R1523	TR1
	16.202	L1524	TR2	20.00 km to 21.00 km	20.012	R1524	TR1
	16.202	L1525	TR1		20.012	R1525	TR1
	16.202	L1526	TR1		20.012	R1526	TR1
	16.202	L1527	TR1		20.012	R1527	TR2
	16.202	L1528	TR1		20.012	R1528	TR2
	16.202	L1529	TR1		20.014	R1529	TR2
	16.202	L1530	TR1		20.014	R1530	TR2
	16.202	L1531	TR2		20.044	R1531	TR2
	16.202	L1532	TR2		20.048	R1532	TR2
	16.202	L1533	TR2		20.058	R1533	TR2
	16.202	L1534	TR2		20.064	R1534	TR2
	16.204	L1535	TR1		20.084	R1535	BAMBOO

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	16.204	L1536	TR1		20.086	R1536	TR1
	16.204	L1537	TR1		20.094	R1537	TR1
	16.204	L1538	TR1		20.102	R1538	TR1
	16.204	L1539	TR1		20.102	R1539	TR1
	16.204	L1540	TR1		20.106	R1540	TR2
	16.204	L1541	TR1		20.11	R1541	TR2
	16.204	L1542	TR2		20.118	R1542	BAMBOO
	16.204	L1543	TR2		20.118	R1543	TR2
	16.206	L1544	TR1		20.12	R1544	TR2
	16.206	L1545	TR1		20.122	R1545	BAMBOO
	16.206	L1546	TR1		20.124	R1546	TR1
	16.208	L1547	TR1		20.128	R1547	TR1
	16.208	L1548	TR1		20.13	R1548	TR1
	16.212	L1549	TR1		20.132	R1549	TR2
	16.212	L1550	TR1		20.134	R1550	TR2
	16.212	L1551	TR2		20.138	R1551	TR1
	16.216	L1552	TR2		20.14	R1552	TR2
	16.220	L1553	TR3		20.144	R1553	TR1
	16.220	L1554	TR2		20.15	R1554	TR1
	16.222	L1555	TR1		20.15	R1555	TR1
	16.222	L1556	TR1		20.15	R1556	TR2
	16.222	L1557	TR2		20.152	R1557	TR1
	16.224	L1558	TR1		20.154	R1558	TR1
	16.224	L1559	TR1		20.156	R1559	TR1
	16.224	L1560	TR1		20.156	R1560	TR2
	16.224	L1561	TR1		20.16	R1561	TR2
	16.224	L1562	TR1		20.17	R1562	TR2
	16.224	L1563	TR3		20.174	R1563	TR2
	16.224	L1564	TR2		20.176	R1564	TR2
	16.226	L1565	TR2		20.178	R1565	TR2
	16.228	L1566	TR1		20.182	R1566	TR1
	16.228	L1567	TR2		20.184	R1567	TR2
	16.232	L1568	TR1		20.188	R1568	TR2
	16.234	L1569	TR2		20.192	R1569	TR1
	16.236	L1570	TR1		20.198	R1570	TR1
	16.238	L1571	TR1		20.214	R1571	TR2
	16.244	L1572	TR1		20.252	R1572	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	16.246	L1573	TR2		20.306	R1573	BAMBOO
	16.256	L1574	TR3		20.316	R1574	TR1
	16.264	L1575	TR1		20.316	R1575	TR1
	16.266	L1576	TR2		20.318	R1576	TR3
	16.268	L1577	TR1		20.318	R1577	TR2
	16.268	L1578	TR1		20.32	R1578	TR4
	16.274	L1579	TR1		20.32	R1579	TR1
	16.274	L1580	TR1		20.322	R1580	TR4
	16.388	L1581	TR4		20.322	R1581	TR1
	16.390	L1582	TR2		20.322	R1582	TR3
	16.390	L1583	TR1		20.336	R1583	TR1
	16.390	L1584	TR1		20.336	R1584	TR1
	16.392	L1585	TR1		20.338	R1585	TR1
	16.396	L1586	TR2		20.338	R1586	TR1
	16.396	L1587	TR3		20.338	R1587	TR1
	16.398	L1588	TR1		20.338	R1588	TR2
	16.398	L1589	TR1		20.34	R1589	TR1
	16.398	L1590	TR2		20.346	R1590	TR1
	16.400	L1591	TR2		20.348	R1591	TR1
	16.406	L1592	TR2		20.35	R1592	TR1
	16.410	L1593	TR1		20.352	R1593	TR1
	16.412	L1594	TR2		20.356	R1594	TR1
	16.414	L1595	TR1		20.358	R1595	TR1
	16.414	L1596	TR1		20.362	R1596	TR1
	16.414	L1597	TR2		20.362	R1597	TR1
	16.416	L1598	TR1		20.364	R1598	TR1
	16.416	L1599	TR1		20.366	R1599	TR1
	16.418	L1600	TR1		20.368	R1600	TR1
	16.418	L1601	TR1		20.37	R1601	TR1
	16.420	L1602	TR1		20.37	R1602	TR1
	16.420	L1603	TR1		20.372	R1603	TR1
	16.420	L1604	TR1		20.376	R1604	TR1
	16.420	L1605	TR1		20.38	R1605	TR1
	16.420	L1606	TR1		20.38	R1606	TR1
	16.422	L1607	TR1		20.382	R1607	TR1
	16.422	L1608	TR1		20.384	R1608	TR1
	16.422	L1609	TR2		20.386	R1609	TR1
	16.424	L1610	TR1		20.386	R1610	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	16.426	L1611	TR3		20.388	R1611	TR1
	16.426	L1612	TR2		20.39	R1612	TR1
	16.430	L1613	BAMBOO		20.392	R1613	TR1
	16.432	L1614	BAMBOO		20.392	R1614	TR1
	16.532	L1615	TR1		20.394	R1615	TR1
	16.532	L1616	TR1		20.396	R1616	TR1
	16.536	L1617	TR1		20.398	R1617	TR1
	16.538	L1618	TR1		20.398	R1618	TR1
	16.540	L1619	TR1		20.4	R1619	TR1
	16.540	L1620	TR1		20.402	R1620	TR1
	16.540	L1621	TR1		20.404	R1621	TR1
	16.540	L1622	TR1		20.406	R1622	TR1
	16.542	L1623	TR1		20.406	R1623	TR1
	16.544	L1624	TR1		20.408	R1624	TR1
	16.548	L1625	TR1		20.41	R1625	TR1
	16.556	L1626	TR1		20.414	R1626	TR1
	16.556	L1627	TR1		20.416	R1627	TR1
	16.556	L1628	TR1		20.418	R1628	TR1
	16.564	L1629	TR1		20.42	R1629	TR1
	16.564	L1630	TR1		20.422	R1630	TR1
	16.566	L1631	TR1		20.422	R1631	TR1
	16.566	L1632	TR1		20.426	R1632	TR1
	16.566	L1633	TR1		20.426	R1633	TR1
	16.566	L1634	TR1		20.428	R1634	TR1
	16.566	L1635	TR1		20.43	R1635	TR1
	16.568	L1636	TR1		20.43	R1636	TR1
	16.570	L1637	TR1		20.432	R1637	TR1
	16.570	L1638	TR1		20.434	R1638	TR1
	16.572	L1639	TR1		20.436	R1639	TR1
	16.576	L1640	TR1		20.438	R1640	TR1
	16.578	L1641	TR1		20.438	R1641	TR1
	16.580	L1642	TR1		20.44	R1642	TR1
	16.596	L1643	TR1		20.442	R1643	TR1
	16.600	L1644	TR1		20.442	R1644	TR1
	16.708	L1645	TR1		20.444	R1645	TR1
	16.718	L1646	TR2		20.446	R1646	TR1
	16.720	L1647	TR1		20.448	R1647	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	16.722	L1648	TR2		20.448	R1648	TR1
	16.728	L1649	TR1		20.45	R1649	TR1
	16.734	L1650	TR1		20.452	R1650	TR1
	16.734	L1651	TR1		20.454	R1651	TR1
	16.734	L1652	TR1		20.456	R1652	TR1
	16.736	L1653	TR1		20.46	R1653	BAMBOO
	16.738	L1654	TR1		20.46	R1654	BAMBOO
	16.738	L1655	TR1		20.462	R1655	BAMBOO
	16.738	L1656	TR2		20.462	R1656	BAMBOO
	16.746	L1657	TR1		20.464	R1657	BAMBOO
	16.748	L1658	TR1		20.468	R1658	TR1
	16.750	L1659	TR1		20.47	R1659	TR1
	16.752	L1660	TR1		20.474	R1660	TR1
	16.754	L1661	TR1		20.478	R1661	TR1
	16.756	L1662	TR1		20.482	R1662	TR1
	16.760	L1663	TR1		20.486	R1663	TR1
	16.764	L1664	TR2		20.49	R1664	TR1
	16.768	L1665	TR2		20.492	R1665	TR1
	16.826	L1666	TR2		20.494	R1666	TR1
	16.826	L1667	TR2		20.514	R1667	TR1
	16.828	L1668	TR1		20.514	R1668	TR1
	16.832	L1669	TR1		20.514	R1669	TR1
	16.836	L1670	TR1		20.514	R1670	TR1
	16.844	L1671	TR1		20.516	R1671	TR1
	16.844	L1672	TR2		20.552	R1672	TR2
	16.846	L1673	TR2		20.562	R1673	TR4
	16.882	L1674	TR1		20.582	R1674	TR2
	16.956	L1675	TR1		20.586	R1675	TR1
	16.964	L1676	TR1		20.646	R1676	TR1
	16.976	L1677	TR2		20.684	R1677	TR1
17.00 km to 18.00 km	17.006	L1678	TR3		20.766	R1678	TR1
	17.052	L1679	TR2		20.768	R1679	TR2
	17.056	L1680	TR2		20.772	R1680	TR2
	17.062	L1681	TR1		20.774	R1681	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	17.062	L1682	TR2		20.784	R1682	BAMBOO
	17.074	L1683	TR1		20.786	R1683	BAMBOO
	17.188	L1684	TR2		20.786	R1684	BAMBOO
	17.216	L1685	TR2		20.79	R1685	BAMBOO
	17.218	L1686	TR2		20.794	R1686	BAMBOO
	17.220	L1687	TR2		20.798	R1687	BAMBOO
	17.226	L1688	TR2		20.802	R1688	BAMBOO
	17.232	L1689	TR1		20.806	R1689	BAMBOO
	17.232	L1690	TR2		20.808	R1690	BAMBOO
	17.238	L1691	TR1		20.81	R1691	BAMBOO
	17.240	L1692	TR2		20.814	R1692	BAMBOO
	17.716	L1693	TR2		20.82	R1693	BAMBOO
	17.720	L1694	TR2		20.824	R1694	BAMBOO
	17.722	L1695	TR2		20.834	R1695	TR2
	17.738	L1696	TR2		20.848	R1696	TR2
	17.754	L1697	TR2		20.85	R1697	TR1
	17.760	L1698	TR2		20.85	R1698	TR1
	17.776	L1699	TR3		20.85	R1699	TR2
	17.822	L1700	TR3		20.85	R1700	TR2
	17.904	L1701	TR2		20.852	R1701	TR1
	17.904	L1702	TR2		20.854	R1702	TR1
	17.904	L1703	TR2		20.856	R1703	TR1
	17.908	L1704	TR4		20.86	R1704	TR1
	17.942	L1705	TR2		20.862	R1705	TR1
	17.946	L1706	TR3		20.864	R1706	TR1
	17.950	L1707	TR3		20.864	R1707	TR1
18.00 km to 19.00 km	18.454	L1708	TR2	21.00 km to 22.00 km	21.934	R1708	TR1
	18.460	L1709	TR2		21.942	R1709	TR1
	18.478	L1710	TR2		21.962	R1710	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	18.486	L1711	TR2		21.984	R1711	TR2
	18.500	L1712	TR2		22.016	R1712	TR2
	18.560	L1713	TR3		22.1	R1713	TR3
	18.634	L1714	TR2		22.102	R1714	TR2
	18.648	L1715	TR2		22.164	R1715	TR2
	18.816	L1716	TR4		22.168	R1716	BAMBOO
	18.884	L1717	TR2		22.172	R1717	TR1
	18.890	L1718	TR3		22.184	R1718	BAMBOO
	18.904	L1719	TR3		22.184	R1719	BAMBOO
	18.956	L1720	TR4		22.192	R1720	TR1
	19.138	L1721	TR4		22.202	R1721	TR1
	19.158	L1722	TR2		22.206	R1722	TR1
	19.162	L1723	TR3		22.212	R1723	TR1
	19.170	L1724	TR4		22.222	R1724	TR2
	19.180	L1725	TR3		22.228	R1725	TR2
	19.184	L1726	TR3		22.234	R1726	TR1
	19.200	L1727	TR1		22.292	R1727	TR1
	19.200	L1728	TR1		22.302	R1728	TR2
	19.200	L1729	TR1		22.308	R1729	TR1
	19.208	L1730	TR1		22.31	R1730	TR1
	19.210	L1731	TR1		22.312	R1731	TR1
	19.214	L1732	TR1		22.328	R1732	TR2
19.00 km to 20.00 km	19.216	L1733	TR2	22.00 km to 23.00 km	22.328	R1733	TR1
	19.222	L1734	TR4		22.328	R1734	TR1
	19.230	L1735	TR4		22.346	R1735	TR1
	19.234	L1736	TR2		22.346	R1736	TR1
	19.236	L1737	TR2		22.348	R1737	TR1
	19.236	L1738	TR2		22.35	R1738	TR1
	19.238	L1739	TR1		22.35	R1739	TR2
	19.240	L1740	TR1		22.378	R1740	TR1
	19.240	L1741	TR1		22.382	R1741	TR1
	19.250	L1742	TR2		22.384	R1742	TR1
	19.260	L1743	TR2		22.394	R1743	TR1
	19.270	L1744	TR4		22.412	R1744	TR1
	19.292	L1745	TR1		22.42	R1745	TR1
	19.506	L1746	TR1		22.422	R1746	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	19.510	L1747	TR3		22.424	R1747	TR1
	19.524	L1748	TR1		22.426	R1748	TR1
	19.524	L1749	TR1		22.428	R1749	TR1
	19.524	L1750	TR1		22.428	R1750	TR1
	19.524	L1751	TR1		22.43	R1751	TR1
	19.524	L1752	TR1		22.432	R1752	TR1
	19.526	L1753	TR1		22.432	R1753	TR1
	19.526	L1754	TR3		22.44	R1754	TR1
	19.528	L1755	TR1		22.442	R1755	BAMBOO
	19.530	L1756	TR1		22.452	R1756	TR1
	19.530	L1757	TR1		22.452	R1757	TR1
	19.532	L1758	TR1		22.454	R1758	TR1
	19.532	L1759	TR1		22.458	R1759	BAMBOO
	19.568	L1760	TR3		22.458	R1760	BAMBOO
	19.604	L1761	TR2		22.458	R1761	TR1
	19.628	L1762	TR2		22.464	R1762	BAMBOO
	19.670	L1763	TR2		22.486	R1763	TR1
	19.718	L1764	TR2		22.488	R1764	TR1
	19.738	L1765	TR1		22.488	R1765	TR1
	19.838	L1766	TR4		22.488	R1766	TR1
	19.846	L1767	TR1		22.488	R1767	TR1
20.00 km to 21.00 km	20.144	L1768	TR1		22.488	R1768	TR1
	20.198	L1769	TR2		22.488	R1769	TR1
	20.200	L1770	TR2		22.49	R1770	TR1
	20.216	L1771	TR2		22.49	R1771	TR1
	20.244	L1772	TR1		22.49	R1772	TR1
	20.244	L1773	TR1		22.496	R1773	TR1
	20.244	L1774	TR1		22.498	R1774	TR1
	20.244	L1775	TR1		22.498	R1775	TR1
	20.246	L1776	TR1		22.498	R1776	TR1
	20.248	L1777	TR1		22.498	R1777	TR1
	20.248	L1778	TR3		22.498	R1778	TR1
	20.252	L1779	TR1		22.498	R1779	TR1
	20.252	L1780	TR2		22.498	R1780	TR1
	20.254	L1781	TR1		22.498	R1781	TR1
	20.254	L1782	TR1		22.5	R1782	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	20.258	L1783	TR2		22.5	R1783	TR1
	20.272	L1784	TR1		22.5	R1784	TR1
	20.276	L1785	TR1		22.5	R1785	TR1
	20.276	L1786	TR1		22.502	R1786	BAMBOO
	20.278	L1787	TR1		22.502	R1787	TR1
	20.278	L1788	TR1		22.51	R1788	TR1
	20.280	L1789	TR1		22.512	R1789	BAMBOO
	20.284	L1790	TR3		22.512	R1790	TR1
	20.290	L1791	TR1		22.512	R1791	TR1
	20.302	L1792	TR2		22.516	R1792	TR1
	20.368	L1793	TR2		22.516	R1793	TR1
	20.380	L1794	TR1		22.518	R1794	TR1
	20.386	L1795	TR2		22.52	R1795	TR1
	20.404	L1796	BAMBOO		22.522	R1796	TR1
	20.410	L1797	BAMBOO		22.522	R1797	TR3
	20.416	L1798	BAMBOO		22.522	R1798	TR2
	20.422	L1799	BAMBOO		22.526	R1799	TR1
	20.426	L1800	BAMBOO		22.526	R1800	TR1
	20.430	L1801	BAMBOO		22.528	R1801	TR1
	20.434	L1802	BAMBOO		22.528	R1802	TR1
	20.516	L1803	TR2		22.528	R1803	TR1
	20.522	L1804	TR2		22.53	R1804	TR1
	20.530	L1805	TR1		22.53	R1805	TR1
	20.568	L1806	TR2		22.53	R1806	TR1
	20.574	L1807	TR2		22.532	R1807	TR1
	20.574	L1808	TR2		22.532	R1808	TR1
	20.576	L1809	TR2		22.534	R1809	TR1
	20.584	L1810	TR2		22.536	R1810	TR1
	20.648	L1811	TR2		22.536	R1811	TR1
	20.658	L1812	TR1		22.536	R1812	TR1
	20.666	L1813	TR2		22.536	R1813	TR1
	20.692	L1814	TR1		22.538	R1814	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	20.694	L1815	TR1		22.538	R1815	TR1
	20.694	L1816	TR1		22.538	R1816	TR1
	20.706	L1817	TR1		22.538	R1817	TR1
	20.780	L1818	TR2		22.54	R1818	TR1
	20.790	L1819	TR2		22.54	R1819	TR1
21.00 km to 22.00 km	21.404	L1820	TR1		22.54	R1820	TR1
	21.418	L1821	TR1		22.54	R1821	TR1
	21.440	L1822	TR1		22.54	R1822	TR1
	21.756	L1823	TR2		22.54	R1823	TR1
22.00 km to 23.00 km	22.176	L1824	TR1		22.54	R1824	TR2
	22.246	L1825	TR1		22.542	R1825	TR1
	22.298	L1826	TR1		22.542	R1826	TR1
	22.300	L1827	TR3		22.542	R1827	TR1
	22.308	L1828	TR1		22.542	R1828	TR1
	22.310	L1829	TR1		22.542	R1829	TR1
	22.314	L1830	TR1		22.542	R1830	TR1
	22.366	L1831	TR1		22.544	R1831	TR1
	22.460	L1832	TR1		22.546	R1832	TR1
	22.470	L1833	TR1		22.546	R1833	TR1
	22.478	L1834	TR1		22.546	R1834	TR1
	22.478	L1835	TR1		22.546	R1835	TR1
	22.478	L1836	TR1		22.548	R1836	TR1
	22.480	L1837	TR1		22.548	R1837	TR1
	22.480	L1838	TR1		22.548	R1838	TR1
	22.480	L1839	TR1		22.548	R1839	TR1
	22.480	L1840	TR1		22.55	R1840	TR1
	22.482	L1841	TR1		22.55	R1841	TR1
	22.482	L1842	TR1		22.55	R1842	TR1
	22.482	L1843	TR1		22.55	R1843	TR1
	22.482	L1844	TR1		22.55	R1844	TR1
	22.482	L1845	TR1		22.55	R1845	TR1
	22.482	L1846	TR1		22.55	R1846	TR1
	22.482	L1847	TR1		22.552	R1847	TR1
	22.482	L1848	TR1		22.554	R1848	TR1
	22.482	L1849	TR1		22.554	R1849	TR1
	22.482	L1850	TR1		22.554	R1850	TR1
	22.482	L1851	TR1		22.554	R1851	TR1
	22.484	L1852	TR1		22.554	R1852	TR1
	22.484	L1853	TR1		22.554	R1853	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.484	L1854	TR1		22.554	R1854	TR1
	22.484	L1855	TR1		22.556	R1855	TR1
	22.484	L1856	TR1		22.556	R1856	TR1
	22.484	L1857	TR1		22.556	R1857	TR1
	22.484	L1858	TR1		22.556	R1858	TR1
	22.484	L1859	TR1		22.556	R1859	TR1
	22.484	L1860	TR1		22.556	R1860	TR1
	22.484	L1861	TR1		22.556	R1861	TR1
	22.484	L1862	TR1		22.556	R1862	TR1
	22.486	L1863	TR1		22.556	R1863	TR1
	22.486	L1864	TR1		22.558	R1864	TR1
	22.486	L1865	TR1		22.558	R1865	TR1
	22.486	L1866	TR1		22.558	R1866	TR1
	22.486	L1867	TR1		22.558	R1867	TR1
	22.486	L1868	TR1		22.558	R1868	TR1
	22.486	L1869	TR1		22.558	R1869	TR1
	22.486	L1870	TR1		22.558	R1870	TR1
	22.486	L1871	TR1		22.558	R1871	TR1
	22.486	L1872	TR1		22.56	R1872	TR1
	22.486	L1873	TR1		22.56	R1873	TR1
	22.486	L1874	TR1		22.56	R1874	TR1
	22.488	L1875	TR1		22.568	R1875	TR1
	22.488	L1876	TR1		22.57	R1876	TR1
	22.488	L1877	TR1		22.572	R1877	TR1
	22.488	L1878	TR1		22.574	R1878	TR1
	22.488	L1879	TR1		22.602	R1879	TR3
	22.488	L1880	TR1		22.606	R1880	TR3
	22.488	L1881	TR1		22.61	R1881	TR2
	22.488	L1882	TR1		22.614	R1882	TR2
	22.490	L1883	TR1		22.616	R1883	TR1
	22.490	L1884	TR1		22.618	R1884	TR1
	22.490	L1885	TR1		22.63	R1885	TR1
	22.490	L1886	TR1		22.632	R1886	TR2
	22.490	L1887	TR1		22.638	R1887	TR2
	22.496	L1888	TR1		22.644	R1888	BAMBOO
	22.496	L1889	TR1		22.644	R1889	TR1
	22.498	L1890	TR1		22.662	R1890	BAMBOO

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.498	L1891	TR1		22.668	R1891	TR1
	22.498	L1892	TR1		22.672	R1892	BAMBOO
	22.498	L1893	TR1		22.672	R1893	BAMBOO
	22.502	L1894	TR1		22.68	R1894	TR2
	22.502	L1895	TR1		22.688	R1895	TR1
	22.510	L1896	TR1		22.696	R1896	BAMBOO
	22.510	L1897	TR2		22.718	R1897	BAMBOO
	22.512	L1898	TR1		22.72	R1898	BAMBOO
	22.512	L1899	TR1		22.724	R1899	BAMBOO
	22.514	L1900	TR1		22.728	R1900	BAMBOO
	22.514	L1901	TR1		22.728	R1901	BAMBOO
	22.514	L1902	TR1		22.734	R1902	BAMBOO
	22.516	L1903	TR1		22.746	R1903	TR3
	22.516	L1904	TR1		22.75	R1904	TR1
	22.518	L1905	TR1		22.75	R1905	TR1
	22.520	L1906	TR1		22.75	R1906	TR1
	22.520	L1907	TR1		22.752	R1907	TR1
	22.520	L1908	TR1		22.752	R1908	TR1
	22.522	L1909	TR1		22.752	R1909	TR1
	22.522	L1910	TR1		22.752	R1910	TR1
	22.528	L1911	TR1		22.752	R1911	TR1
	22.530	L1912	TR2		22.752	R1912	TR1
	22.532	L1913	TR1		22.754	R1913	TR1
	22.532	L1914	TR1		22.754	R1914	TR1
	22.534	L1915	TR1		22.756	R1915	TR1
	22.534	L1916	TR1		22.756	R1916	TR1
	22.534	L1917	TR1		22.76	R1917	TR1
	22.534	L1918	TR1		22.764	R1918	TR1
	22.536	L1919	TR1		22.772	R1919	BAMBOO
	22.538	L1920	TR3		22.774	R1920	BAMBOO

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.542	L1921	TR2		22.788	R1921	BAMBOO
	22.556	L1922	TR1		22.808	R1922	BAMBOO
	22.558	L1923	TR1		22.818	R1923	BAMBOO
	22.560	L1924	TR1		22.818	R1924	BAMBOO
	22.560	L1925	TR1		22.824	R1925	TR1
	22.564	L1926	TR1		22.828	R1926	TR1
	22.582	L1927	TR1		22.832	R1927	TR1
	22.588	L1928	TR1		22.832	R1928	TR1
	22.588	L1929	TR2		22.834	R1929	TR1
	22.618	L1930	TR1		22.84	R1930	TR1
	22.620	L1931	TR2		22.85	R1931	TR1
	22.628	L1932	TR1		22.854	R1932	TR1
	22.630	L1933	TR1		22.862	R1933	TR1
	22.644	L1934	TR1		22.894	R1934	TR1
	22.646	L1935	TR1		22.92	R1935	TR1
	22.646	L1936	TR1		22.92	R1936	TR2
	22.646	L1937	TR1		22.932	R1937	TR4
	22.650	L1938	TR1		22.954	R1938	TR4
	22.650	L1939	TR1		22.974	R1939	TR4
	22.650	L1940	TR1		22.974	R1940	TR1
	22.652	L1941	TR1		22.974	R1941	TR3
	22.652	L1942	TR1		22.976	R1942	TR4
	22.652	L1943	TR1		22.976	R1943	TR1
	22.652	L1944	TR1		22.976	R1944	TR1
	22.652	L1945	TR1		22.976	R1945	TR1
	22.652	L1946	TR1		22.976	R1946	TR1
	22.654	L1947	TR1		22.976	R1947	TR1
	22.654	L1948	TR1		22.978	R1948	TR1
	22.654	L1949	TR1		22.978	R1949	TR1
	22.654	L1950	TR1		22.978	R1950	TR1
	22.654	L1951	TR1		22.978	R1951	TR1
	22.654	L1952	TR1		22.978	R1952	TR1
	22.654	L1953	TR1		22.978	R1953	TR1
	22.656	L1954	TR1		22.978	R1954	TR1
	22.656	L1955	TR1		22.98	R1955	TR4
	22.656	L1956	TR1		22.98	R1956	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.656	L1957	TR1		22.98	R1957	TR1
	22.656	L1958	TR1		22.98	R1958	TR1
	22.656	L1959	TR1		22.98	R1959	TR1
	22.656	L1960	TR1		22.98	R1960	TR1
	22.656	L1961	TR1		22.98	R1961	TR1
	22.658	L1962	TR1		22.98	R1962	TR1
	22.658	L1963	TR1		22.98	R1963	TR1
	22.658	L1964	TR1		22.98	R1964	TR1
	22.660	L1965	TR1		22.98	R1965	TR1
	22.660	L1966	TR1		22.982	R1966	TR4
	22.660	L1967	TR1		22.982	R1967	TR4
	22.660	L1968	TR1		22.982	R1968	TR1
	22.660	L1969	TR1		22.982	R1969	TR1
	22.660	L1970	TR1		22.982	R1970	TR1
	22.660	L1971	TR1		22.982	R1971	TR1
	22.660	L1972	TR1		22.982	R1972	TR1
	22.662	L1973	TR1		22.982	R1973	TR1
	22.662	L1974	TR1		22.982	R1974	TR1
	22.662	L1975	TR1		22.982	R1975	TR1
	22.662	L1976	TR1		22.982	R1976	TR1
	22.664	L1977	TR1		22.984	R1977	TR1
	22.664	L1978	TR1		22.984	R1978	TR1
	22.664	L1979	TR1		22.984	R1979	TR1
	22.664	L1980	TR1		22.984	R1980	TR1
	22.664	L1981	TR1		22.984	R1981	TR1
	22.666	L1982	TR1		22.998	R1982	TR2
	22.666	L1983	TR1	23.00 km to 24.00 km	23.006	R1983	TR1
	22.666	L1984	TR1		23.014	R1984	TR3
	22.666	L1985	TR1		23.018	R1985	TR1
	22.666	L1986	TR1		23.018	R1986	TR1
	22.666	L1987	TR1		23.02	R1987	TR1
	22.666	L1988	TR1		23.02	R1988	TR1
	22.666	L1989	TR1		23.02	R1989	TR1
	22.666	L1990	TR1		23.02	R1990	TR1
	22.666	L1991	TR1		23.022	R1991	TR1
	22.668	L1992	TR1		23.022	R1992	TR1
	22.668	L1993	TR1		23.022	R1993	TR1
	22.668	L1994	TR1		23.022	R1994	TR1
	22.668	L1995	TR1		23.022	R1995	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.668	L1996	TR1		23.054	R1996	TR1
	22.668	L1997	TR1		23.286	R1997	TR3
	22.670	L1998	TR1		23.288	R1998	TR1
	22.670	L1999	TR1		23.29	R1999	TR1
	22.670	L2000	TR1		23.29	R2000	TR1
	22.670	L2001	TR1		23.29	R2001	TR1
	22.670	L2002	TR1		23.29	R2002	TR1
	22.670	L2003	TR1		23.292	R2003	TR1
	22.670	L2004	TR1		23.294	R2004	TR1
	22.670	L2005	TR1		23.296	R2005	TR2
	22.670	L2006	TR1		23.302	R2006	TR1
	22.670	L2007	TR1		23.328	R2007	TR1
	22.672	L2008	TR1		23.328	R2008	TR1
	22.672	L2009	TR1		23.33	R2009	TR1
	22.672	L2010	TR1		23.332	R2010	TR2
	22.672	L2011	TR1		23.336	R2011	TR1
	22.680	L2012	TR3		23.338	R2012	BAMBOO
	22.690	L2013	TR1		23.338	R2013	TR1
	22.692	L2014	TR1		23.34	R2014	TR1
	22.692	L2015	TR1		23.366	R2015	TR1
	22.692	L2016	TR2		23.37	R2016	TR1
	22.694	L2017	TR1		23.372	R2017	TR1
	22.694	L2018	TR1		23.372	R2018	TR1
	22.696	L2019	TR1		23.382	R2019	TR3
	22.696	L2020	TR1		23.384	R2020	TR1
	22.696	L2021	TR1		23.386	R2021	TR2
	22.696	L2022	TR1		23.418	R2022	TR4
	22.696	L2023	TR1		23.442	R2023	TR2
	22.698	L2024	TR1		23.446	R2024	TR2
	22.698	L2025	TR1		23.492	R2025	TR1
	22.698	L2026	TR1		23.498	R2026	TR1
	22.698	L2027	TR1		23.594	R2027	TR3
	22.698	L2028	TR1		23.65	R2028	TR1
	22.698	L2029	TR1		23.67	R2029	TR1
	22.702	L2030	TR1		24.036	R2030	TR1
	22.702	L2031	TR1	24.00 km to 25.00 km	24.428	R2031	TR1
	22.704	L2032	TR2		24.432	R2032	TR1
	22.708	L2033	TR1		24.432	R2033	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.708	L2034	TR1		24.436	R2034	TR1
	22.708	L2035	TR2		24.436	R2035	TR1
	22.708	L2036	TR2		24.44	R2036	TR1
	22.710	L2037	TR1		24.44	R2037	TR1
	22.710	L2038	TR1		24.44	R2038	TR1
	22.710	L2039	TR2		24.448	R2039	TR1
	22.734	L2040	TR2		24.448	R2040	TR3
	22.750	L2041	TR1		24.45	R2041	TR1
	22.752	L2042	TR1		24.478	R2042	TR1
	22.752	L2043	TR1		24.482	R2043	TR2
	22.752	L2044	TR3		24.484	R2044	TR3
	22.754	L2045	TR1		24.486	R2045	TR1
	22.754	L2046	TR1		24.486	R2046	TR1
	22.754	L2047	TR1		24.488	R2047	TR1
	22.754	L2048	TR1		24.492	R2048	TR1
	22.756	L2049	TR1		24.496	R2049	TR1
	22.756	L2050	TR1		24.496	R2050	TR2
	22.758	L2051	TR1		24.5	R2051	TR1
	22.760	L2052	TR1		24.5	R2052	TR2
	22.764	L2053	TR1		24.502	R2053	TR2
	22.764	L2054	TR1		24.512	R2054	TR1
	22.764	L2055	TR1		24.514	R2055	TR4
	22.764	L2056	TR1		24.514	R2056	TR1
	22.764	L2057	TR1		24.6	R2057	TR3
	22.766	L2058	TR1		24.616	R2058	TR4
	22.766	L2059	TR1		24.65	R2059	TR2
	22.766	L2060	TR1		24.652	R2060	TR3
	22.766	L2061	TR1		24.652	R2061	TR2
	22.766	L2062	TR1		24.66	R2062	TR2
	22.766	L2063	TR1		24.67	R2063	TR2
	22.766	L2064	TR1		24.67	R2064	TR2
	22.766	L2065	TR1		24.672	R2065	TR1
	22.766	L2066	TR1		24.68	R2066	TR2
	22.766	L2067	TR1		24.69	R2067	TR1
	22.766	L2068	TR1		24.7	R2068	TR1
	22.766	L2069	TR1		24.704	R2069	TR1
	22.766	L2070	TR1		24.718	R2070	TR1
	22.768	L2071	TR1		24.722	R2071	TR1
	22.768	L2072	TR1		24.738	R2072	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	22.768	L2073	TR1		24.76	R2073	TR1
	22.768	L2074	TR1		24.766	R2074	TR2
	22.780	L2075	TR1		24.772	R2075	TR2
	22.780	L2076	TR1		24.79	R2076	TR2
	22.786	L2077	TR1		24.796	R2077	TR1
	22.790	L2078	TR2		24.798	R2078	TR1
	22.810	L2079	TR1		24.82	R2079	TR1
	22.828	L2080	TR1		24.824	R2080	TR1
	22.888	L2081	TR1		24.836	R2081	TR4
	22.914	L2082	TR1		24.894	R2082	BAMBOO
	22.926	L2083	TR1		24.898	R2083	BAMBOO
	22.954	L2084	TR1		24.902	R2084	BAMBOO
	22.956	L2085	TR3		24.926	R2085	TR4
	22.962	L2086	TR2		24.944	R2086	TR1
	22.992	L2087	TR1		24.944	R2087	TR2
	22.994	L2088	TR1		24.964	R2088	BAMBOO
	22.996	L2089	TR1		24.97	R2089	BAMBOO
	22.998	L2090	TR1		24.978	R2090	BAMBOO
	22.998	L2091	TR1	25.00 km to 26.00 km	25.062	R2091	TR4
23.00 km to 24.00 km	23.000	L2092	TR1		25.17	R2092	TR1
	23.254	L2093	TR1		25.19	R2093	BAMBOO
	23.260	L2094	TR1		25.206	R2094	BAMBOO
	23.262	L2095	TR1		25.208	R2095	BAMBOO
	23.264	L2096	TR1		25.208	R2096	TR2
	23.264	L2097	TR1		25.228	R2097	BAMBOO
	23.264	L2098	TR1		25.236	R2098	TR1
	23.268	L2099	TR1		25.238	R2099	TR1
	23.322	L2100	TR1		25.242	R2100	TR1
	23.324	L2101	TR1		25.248	R2101	TR1
	23.338	L2102	TR1		25.254	R2102	TR2
	23.340	L2103	TR1		25.268	R2103	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	23.342	L2104	TR1		25.272	R2104	TR1
	23.344	L2105	TR1		25.316	R2105	TR1
	23.346	L2106	TR1		25.326	R2106	TR1
	23.346	L2107	TR1		25.332	R2107	TR2
	23.346	L2108	TR1		25.364	R2108	TR3
	23.346	L2109	TR1		25.372	R2109	TR1
	23.346	L2110	TR1		25.374	R2110	TR1
	23.348	L2111	TR1		25.384	R2111	TR3
	23.348	L2112	TR1		25.396	R2112	TR1
	23.350	L2113	TR1		25.396	R2113	TR1
	23.352	L2114	TR1		25.398	R2114	TR1
	23.354	L2115	TR1		25.398	R2115	TR1
	23.356	L2116	TR1		25.398	R2116	TR1
	23.356	L2117	TR1		25.398	R2117	TR2
	23.394	L2118	TR1		25.4	R2118	TR1
	23.394	L2119	TR1		25.41	R2119	TR1
	23.452	L2120	TR1		25.41	R2120	TR1
	23.460	L2121	TR1		25.418	R2121	TR1
	23.462	L2122	TR1		25.42	R2122	TR1
	23.658	L2123	TR1		25.42	R2123	TR1
	23.668	L2124	TR1		25.422	R2124	TR1
	23.862	L2125	TR1		25.422	R2125	TR1
24.00 km to 25.00 km	24.064	L2126	TR1		25.422	R2126	TR1
	24.192	L2127	TR1		25.424	R2127	TR1
	24.194	L2128	TR3		25.424	R2128	TR1
	24.202	L2129	TR2		25.424	R2129	TR1
	24.214	L2130	TR2		25.426	R2130	TR1
	24.246	L2131	TR3		25.464	R2131	TR1
	24.256	L2132	TR2		25.47	R2132	TR1
	24.258	L2133	TR3		25.47	R2133	TR1
	24.260	L2134	TR2		25.476	R2134	TR1
	24.300	L2135	TR3		25.476	R2135	TR1
	24.302	L2136	TR2		25.48	R2136	TR1
	24.314	L2137	TR3		25.48	R2137	TR2
	24.314	L2138	TR2		25.482	R2138	TR1
	24.318	L2139	TR1		25.482	R2139	TR1
	24.324	L2140	TR1		25.482	R2140	TR1
	24.436	L2141	TR2		25.482	R2141	TR1
	24.450	L2142	TR3		25.482	R2142	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	24.476	L2143	TR2		25.482	R2143	TR1
	24.504	L2144	TR1		25.482	R2144	TR1
	24.506	L2145	TR1		25.482	R2145	TR1
	24.508	L2146	TR2		25.482	R2146	TR1
	24.544	L2147	TR1		25.482	R2147	TR1
	24.568	L2148	TR4		25.482	R2148	TR1
	24.582	L2149	TR3		25.484	R2149	TR1
	24.592	L2150	TR3		25.484	R2150	TR1
	24.604	L2151	TR4		25.484	R2151	TR1
	24.638	L2152	TR2		25.484	R2152	TR1
	24.664	L2153	TR2		25.484	R2153	TR1
	24.714	L2154	TR2		25.484	R2154	TR1
	24.754	L2155	TR2		25.484	R2155	TR1
	24.800	L2156	TR1		25.484	R2156	TR1
	24.812	L2157	TR4		25.484	R2157	TR1
	24.842	L2158	TR2		25.484	R2158	TR1
	24.974	L2159	TR2		25.484	R2159	TR1
	24.988	L2160	TR2		25.484	R2160	TR1
	24.988	L2161	TR1		25.484	R2161	TR1
	24.988	L2162	TR1		25.484	R2162	TR1
	24.988	L2163	TR1		25.486	R2163	TR1
	24.990	L2164	TR1		25.488	R2164	TR1
25.00 km to 26.00 km	25.060	L2165	TR1		25.488	R2165	TR1
	25.060	L2166	TR1		25.49	R2166	TR1
	25.060	L2167	TR1		25.492	R2167	TR1
	25.060	L2168	TR1		25.492	R2168	TR1
	25.060	L2169	TR1		25.492	R2169	TR1
	25.060	L2170	TR2		25.492	R2170	TR1
	25.060	L2171	TR2		25.494	R2171	TR1
	25.062	L2172	TR1		25.496	R2172	TR1
	25.062	L2173	TR1		25.496	R2173	TR1
	25.062	L2174	TR1		25.498	R2174	TR2
	25.062	L2175	TR1		25.53	R2175	TR1
	25.062	L2176	TR1		25.544	R2176	TR2
	25.062	L2177	TR1		25.564	R2177	TR1
	25.064	L2178	TR1		25.564	R2178	TR2
	25.066	L2179	TR1		25.564	R2179	TR2
	25.066	L2180	TR1		25.566	R2180	TR2
	25.066	L2181	TR1		25.568	R2181	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	25.066	L2182	TR1		25.568	R2182	TR1
	25.066	L2183	TR1		25.57	R2183	TR1
	25.072	L2184	TR4		25.57	R2184	TR1
	25.084	L2185	TR2		25.57	R2185	TR1
	25.098	L2186	TR3		25.57	R2186	TR1
	25.102	L2187	TR1		25.57	R2187	TR2
	25.104	L2188	TR1		25.572	R2188	TR2
	25.104	L2189	TR1		25.572	R2189	TR1
	25.106	L2190	TR1		25.572	R2190	TR1
	25.154	L2191	BAMBOO		25.572	R2191	TR1
	25.196	L2192	TR2		25.572	R2192	TR1
	25.348	L2193	TR2		25.572	R2193	TR1
	25.352	L2194	TR2		25.572	R2194	TR1
	25.398	L2195	TR2		25.574	R2195	TR1
	25.398	L2196	TR2		25.574	R2196	TR2
	25.400	L2197	TR1		25.576	R2197	TR1
	25.458	L2198	TR3		25.576	R2198	TR1
	25.460	L2199	TR2		25.576	R2199	TR2
	25.462	L2200	TR2		25.578	R2200	TR1
	25.464	L2201	TR2		25.578	R2201	TR1
	25.468	L2202	TR4		25.592	R2202	TR1
	25.472	L2203	TR4		25.594	R2203	TR1
	25.502	L2204	TR1		25.594	R2204	TR1
	25.504	L2205	TR1		25.594	R2205	TR1
	25.506	L2206	TR1		25.594	R2206	TR1
	25.508	L2207	TR1		25.594	R2207	TR1
	25.510	L2208	TR1		25.594	R2208	TR1
	25.518	L2209	TR1		25.596	R2209	TR1
	25.522	L2210	TR4		25.596	R2210	TR1
	25.522	L2211	TR1		25.596	R2211	TR1
	25.522	L2212	TR1		25.596	R2212	TR1
	25.524	L2213	TR1		25.596	R2213	TR1
	25.526	L2214	TR1		25.596	R2214	TR1
	25.526	L2215	TR1		25.596	R2215	TR1
	25.528	L2216	TR1		25.596	R2216	TR1
	25.530	L2217	TR1		25.596	R2217	TR1
	25.532	L2218	TR1		25.596	R2218	TR1
	25.532	L2219	TR1		25.596	R2219	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	25.540	L2220	TR1		25.596	R2220	TR1
	25.542	L2221	TR1		25.596	R2221	TR1
	25.548	L2222	TR1		25.596	R2222	TR1
	25.550	L2223	TR3		25.598	R2223	TR1
	25.554	L2224	TR1		25.598	R2224	TR1
	25.558	L2225	TR2		25.598	R2225	TR1
	25.562	L2226	TR2		25.598	R2226	TR1
	25.564	L2227	TR1		25.598	R2227	TR1
	25.564	L2228	TR1		25.598	R2228	TR1
	25.564	L2229	TR1		25.598	R2229	TR1
	25.564	L2230	TR1		25.598	R2230	TR1
	25.564	L2231	TR1		25.6	R2231	TR1
	25.566	L2232	TR1		25.6	R2232	TR1
	25.566	L2233	TR1		25.6	R2233	TR1
	25.566	L2234	TR1		25.6	R2234	TR1
	25.568	L2235	TR1		25.6	R2235	TR1
	25.578	L2236	TR1		25.6	R2236	TR1
	25.580	L2237	TR1		25.6	R2237	TR1
	25.596	L2238	TR3		25.6	R2238	TR1
	25.620	L2239	TR1		25.602	R2239	TR1
	25.620	L2240	TR1		25.604	R2240	TR1
	25.622	L2241	TR1		25.604	R2241	TR1
	25.622	L2242	TR1		25.606	R2242	TR1
	25.622	L2243	TR1		25.606	R2243	TR1
	25.622	L2244	TR1		25.606	R2244	TR1
	25.622	L2245	TR1		25.606	R2245	TR2
	25.624	L2246	TR1		25.61	R2246	TR1
	25.626	L2247	TR1		25.61	R2247	TR1
	25.626	L2248	TR1		25.612	R2248	TR1
	25.626	L2249	TR1		25.612	R2249	TR1
	25.626	L2250	TR1		25.612	R2250	TR2
	25.628	L2251	TR1		25.612	R2251	TR2
	25.628	L2252	TR1		25.614	R2252	TR1
	25.628	L2253	TR1		25.614	R2253	TR1
	25.634	L2254	TR1		25.614	R2254	TR1
	25.634	L2255	TR1		25.614	R2255	TR1
	25.636	L2256	TR1		25.614	R2256	TR1
	25.676	L2257	TR1		25.614	R2257	TR1
	25.688	L2258	TR2		25.614	R2258	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	25.690	L2259	TR1		25.616	R2259	TR1
	25.710	L2260	TR2		25.616	R2260	TR1
	25.722	L2261	TR1		25.616	R2261	TR1
	25.800	L2262	TR1		25.616	R2262	TR1
	25.802	L2263	TR1		25.616	R2263	TR1
	25.804	L2264	TR1		25.616	R2264	TR1
	25.804	L2265	TR1		25.618	R2265	TR1
	25.804	L2266	TR1		25.618	R2266	TR1
	25.808	L2267	TR1		25.618	R2267	TR1
	25.808	L2268	TR1		25.618	R2268	TR1
	25.810	L2269	TR1		25.63	R2269	TR1
	25.820	L2270	TR1		25.63	R2270	TR1
	25.822	L2271	TR1		25.63	R2271	TR1
	25.824	L2272	TR1		25.63	R2272	TR1
	25.824	L2273	TR1		25.632	R2273	TR1
	25.824	L2274	TR1		25.632	R2274	TR1
	25.824	L2275	TR1		25.632	R2275	TR1
	25.824	L2276	TR1		25.632	R2276	TR1
	25.826	L2277	TR1		25.632	R2277	TR1
	25.826	L2278	TR1		25.634	R2278	TR1
	25.826	L2279	TR1		25.634	R2279	TR1
	25.826	L2280	TR1		25.636	R2280	TR1
	25.828	L2281	TR1		25.636	R2281	TR1
	25.844	L2282	TR1		25.636	R2282	TR1
	25.852	L2283	TR2		25.638	R2283	TR1
	25.852	L2284	TR2		25.638	R2284	TR1
	25.868	L2285	TR1		25.638	R2285	TR1
	25.868	L2286	TR1		25.64	R2286	TR1
	25.868	L2287	TR2		25.64	R2287	TR1
	25.868	L2288	TR2		25.64	R2288	TR1
	25.962	L2289	TR1		25.64	R2289	TR1
	25.964	L2290	TR1		25.64	R2290	TR1
	25.964	L2291	TR1		25.64	R2291	TR1
	25.964	L2292	TR1		25.642	R2292	TR1
	25.966	L2293	TR1		25.642	R2293	TR1
	25.966	L2294	TR1		25.642	R2294	TR1
	25.966	L2295	TR1		25.642	R2295	TR1
	25.966	L2296	TR1		25.642	R2296	TR1
	25.966	L2297	TR1		25.644	R2297	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	25.966	L2298	TR1		25.644	R2298	TR1
	25.966	L2299	TR1		25.644	R2299	TR1
	25.968	L2300	TR1		25.644	R2300	TR1
	25.968	L2301	TR1		25.644	R2301	TR1
	25.968	L2302	TR1		25.644	R2302	TR1
	25.976	L2303	TR1		25.644	R2303	TR1
	25.976	L2304	TR1		25.644	R2304	TR1
	25.976	L2305	TR1		25.646	R2305	TR1
	25.976	L2306	TR1		25.646	R2306	TR1
26.00 km to 27.00 km	26.044	L2307	TR1		25.646	R2307	TR1
	26.046	L2308	TR1		25.646	R2308	TR1
	26.046	L2309	TR1		25.646	R2309	TR1
	26.048	L2310	TR1		25.646	R2310	TR1
	26.054	L2311	BAMBOO		25.646	R2311	TR1
	26.066	L2312	BAMBOO		25.646	R2312	TR1
	26.070	L2313	TR2		25.646	R2313	TR1
	26.074	L2314	TR2		25.646	R2314	TR2
	26.140	L2315	BAMBOO		25.648	R2315	TR1
	26.142	L2316	BAMBOO		25.648	R2316	TR1
	26.146	L2317	BAMBOO		25.648	R2317	TR1
	26.150	L2318	BAMBOO		25.648	R2318	TR1
	26.152	L2319	BAMBOO		25.648	R2319	TR1
	26.162	L2320	BAMBOO		25.65	R2320	TR1
	26.166	L2321	BAMBOO		25.65	R2321	TR1
	26.168	L2322	BAMBOO		25.65	R2322	TR1
	26.170	L2323	BAMBOO		25.65	R2323	TR1
	26.172	L2324	BAMBOO		25.65	R2324	TR1
	26.174	L2325	BAMBOO		25.65	R2325	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	26.178	L2326	BAMBOO		25.652	R2326	TR1
	26.178	L2327	BAMBOO		25.652	R2327	TR1
	26.182	L2328	BAMBOO		25.652	R2328	TR1
	26.184	L2329	BAMBOO		25.652	R2329	TR1
	26.194	L2330	BAMBOO		25.652	R2330	TR1
	26.198	L2331	BAMBOO		25.652	R2331	TR1
	26.208	L2332	BAMBOO		25.652	R2332	TR1
	26.212	L2333	BAMBOO		25.652	R2333	TR1
	26.220	L2334	BAMBOO		25.654	R2334	TR1
	26.230	L2335	BAMBOO		25.654	R2335	TR1
	26.238	L2336	BAMBOO		25.654	R2336	TR1
	26.240	L2337	BAMBOO		25.656	R2337	TR1
	26.246	L2338	BAMBOO		25.656	R2338	TR1
	26.246	L2339	TR1		25.658	R2339	TR1
	26.246	L2340	TR2		25.658	R2340	TR1
	26.494	L2341	TR3		25.658	R2341	TR1
	26.494	L2342	TR3		25.658	R2342	TR1
	26.496	L2343	TR1		25.658	R2343	TR1
	26.496	L2344	TR3		25.66	R2344	TR1
	26.496	L2345	TR2		25.664	R2345	TR1
	26.496	L2346	TR2		25.67	R2346	TR1
	26.498	L2347	TR1		25.674	R2347	TR1
	26.498	L2348	TR1		25.684	R2348	TR1
	26.498	L2349	TR1		25.692	R2349	TR1
	26.498	L2350	TR1		25.696	R2350	TR1
	26.498	L2351	TR1		25.706	R2351	TR1
	26.498	L2352	TR3		25.722	R2352	TR1
	26.500	L2353	TR1		25.736	R2353	TR1
	26.500	L2354	TR1		25.736	R2354	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	26.500	L2355	TR1		25.736	R2355	TR1
	26.500	L2356	TR1		25.738	R2356	TR1
	26.500	L2357	TR1		25.738	R2357	TR1
	26.500	L2358	TR1		25.762	R2358	TR1
	26.500	L2359	TR1		25.768	R2359	TR1
	26.512	L2360	TR1		25.774	R2360	TR1
	26.512	L2361	TR1		25.778	R2361	TR1
	26.512	L2362	TR1		25.798	R2362	TR2
	26.514	L2363	TR1		25.806	R2363	TR2
	26.514	L2364	TR1		25.87	R2364	TR2
	26.516	L2365	TR1		25.928	R2365	TR1
	26.516	L2366	TR1		25.93	R2366	TR1
	26.516	L2367	TR1		25.952	R2367	TR2
	26.516	L2368	TR1		25.956	R2368	TR1
	26.516	L2369	TR1		25.962	R2369	TR2
	26.518	L2370	TR4		25.968	R2370	TR2
	26.518	L2371	TR1		25.972	R2371	TR1
	26.518	L2372	TR1		25.976	R2372	TR1
	26.520	L2373	TR1		25.984	R2373	TR1
	26.532	L2374	TR4		25.984	R2374	TR1
	26.532	L2375	TR1		25.992	R2375	TR1
	26.542	L2376	TR1		25.992	R2376	TR1
	26.544	L2377	TR1		25.992	R2377	TR1
	26.544	L2378	TR1		25.996	R2378	TR1
	26.546	L2379	TR1		25.996	R2379	TR1
	26.546	L2380	TR1		25.996	R2380	TR1
	26.546	L2381	TR1		25.996	R2381	TR1
	26.546	L2382	TR1		25.996	R2382	TR1
	26.558	L2383	TR2		25.996	R2383	TR1
	26.558	L2384	TR2		25.996	R2384	TR1
	26.558	L2385	TR2		25.996	R2385	TR1
	26.560	L2386	TR1		25.996	R2386	TR1
	26.560	L2387	TR3		25.996	R2387	TR1
	26.562	L2388	TR3		25.998	R2388	TR1
	26.568	L2389	TR1		25.998	R2389	TR1
	26.568	L2390	TR1		25.998	R2390	TR1
	26.568	L2391	TR3		25.998	R2391	TR1
	26.570	L2392	TR1		25.998	R2392	TR1
	26.570	L2393	TR1		25.998	R2393	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	26.570	L2394	TR2	26.00 km to 27.00 km	26.044	R2394	TR2
	26.572	L2395	TR1		26.054	R2395	TR2
	26.572	L2396	TR1		26.056	R2396	TR2
	26.572	L2397	TR1		26.112	R2397	TR2
	26.574	L2398	TR1		26.172	R2398	TR1
	26.574	L2399	TR1		26.172	R2399	TR2
	26.574	L2400	TR1		26.174	R2400	TR1
	26.574	L2401	TR1		26.186	R2401	TR1
	26.578	L2402	TR1		26.188	R2402	TR1
	26.578	L2403	TR1		26.192	R2403	TR1
	26.578	L2404	TR1		26.194	R2404	TR1
	26.578	L2405	TR1		26.198	R2405	TR1
	26.578	L2406	TR3		26.2	R2406	TR1
	26.580	L2407	TR1		26.202	R2407	TR1
	26.580	L2408	TR1		26.204	R2408	TR1
	26.582	L2409	TR1		26.206	R2409	TR1
	26.582	L2410	TR1		26.208	R2410	TR2
	26.582	L2411	TR1		26.21	R2411	TR1
	26.582	L2412	TR1		26.21	R2412	TR1
	26.584	L2413	TR1		26.212	R2413	TR1
	26.748	L2414	TR2		26.212	R2414	TR1
	26.750	L2415	TR2		26.216	R2415	TR1
	26.760	L2416	TR2		26.218	R2416	TR1
	26.768	L2417	TR1		26.25	R2417	TR1
	26.778	L2418	TR1		26.282	R2418	TR1
	26.780	L2419	TR1		26.482	R2419	TR1
	26.798	L2420	TR1		26.482	R2420	TR1
	26.804	L2421	TR1		26.482	R2421	TR1
	26.808	L2422	TR1		26.494	R2422	TR2
	26.808	L2423	TR2		26.52	R2423	TR1
	26.820	L2424	TR1		26.53	R2424	TR1
	26.828	L2425	TR1		26.53	R2425	TR1
	26.830	L2426	TR1		26.53	R2426	TR1
	26.832	L2427	TR1		26.536	R2427	TR2
	26.834	L2428	TR1		26.538	R2428	TR1
	26.836	L2429	TR1		26.568	R2429	TR1
	26.846	L2430	TR1		26.57	R2430	TR1
	26.850	L2431	TR1		26.57	R2431	TR1
	26.852	L2432	TR1		26.574	R2432	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	26.854	L2433	TR1		26.758	R2433	TR1
	26.856	L2434	TR1		26.77	R2434	TR1
	26.856	L2435	TR1		26.77	R2435	TR1
	26.858	L2436	TR1		26.778	R2436	TR1
	26.858	L2437	TR1		26.778	R2437	TR1
	26.870	L2438	TR1		26.858	R2438	TR2
	26.870	L2439	TR3		26.884	R2439	TR2
	26.898	L2440	TR3		26.892	R2440	TR3
	26.900	L2441	TR1		26.896	R2441	TR1
	26.902	L2442	TR1		26.914	R2442	TR1
	26.906	L2443	TR1		26.954	R2443	TR1
	26.926	L2444	TR4		26.96	R2444	TR2
	26.926	L2445	TR1		26.972	R2445	BAMBOO
	26.926	L2446	TR1		26.972	R2446	BAMBOO
	26.926	L2447	TR1		26.984	R2447	BAMBOO
	26.932	L2448	TR1		26.986	R2448	TR1
	26.932	L2449	TR1		26.992	R2449	TR1
	26.954	L2450	TR1	27.00 km to 28.00 km	27.01	R2450	BAMBOO
	26.958	L2451	TR1		27.034	R2451	TR1
	26.958	L2452	TR1		27.042	R2452	TR1
	26.960	L2453	TR1		27.042	R2453	TR2
	26.960	L2454	TR1		27.048	R2454	BAMBOO
	26.962	L2455	TR1		27.072	R2455	BAMBOO
	26.962	L2456	TR1		27.074	R2456	BAMBOO
	26.962	L2457	TR1		27.076	R2457	TR4
	26.968	L2458	TR1		27.078	R2458	BAMBOO
	26.968	L2459	TR1		27.08	R2459	TR1
	26.970	L2460	TR1		27.094	R2460	TR1
	26.970	L2461	TR1		27.098	R2461	TR1
	26.972	L2462	TR1		27.1	R2462	TR1
	26.972	L2463	TR1		27.1	R2463	TR1
	26.972	L2464	TR1		27.102	R2464	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	26.972	L2465	TR1		27.102	R2465	TR1
	26.972	L2466	TR1		27.102	R2466	TR1
	26.972	L2467	TR1		27.102	R2467	TR1
	26.974	L2468	TR1		27.104	R2468	TR1
	26.974	L2469	TR1		27.104	R2469	TR1
	26.974	L2470	TR1		27.104	R2470	TR1
	26.974	L2471	TR1		27.104	R2471	TR1
	26.974	L2472	TR1		27.104	R2472	TR1
	26.974	L2473	TR1		27.104	R2473	TR1
	26.976	L2474	TR1		27.106	R2474	TR1
	26.976	L2475	TR1		27.138	R2475	TR2
	26.976	L2476	TR1		27.146	R2476	TR1
	26.976	L2477	TR1		27.148	R2477	TR2
	26.978	L2478	TR1		27.15	R2478	TR1
	26.978	L2479	TR1		27.15	R2479	TR2
	26.980	L2480	TR1		27.152	R2480	TR1
	26.980	L2481	TR1		27.152	R2481	TR1
	26.982	L2482	TR1		27.154	R2482	TR1
	26.982	L2483	TR1		27.154	R2483	TR1
	26.988	L2484	TR2		27.154	R2484	TR2
	26.990	L2485	TR1		27.156	R2485	TR1
	26.990	L2486	TR1		27.156	R2486	TR1
	26.990	L2487	TR1		27.156	R2487	TR1
	26.992	L2488	TR1		27.156	R2488	TR1
	26.992	L2489	TR1		27.166	R2489	TR1
	26.992	L2490	TR1		27.17	R2490	TR1
	26.994	L2491	TR1		27.178	R2491	TR1
	26.994	L2492	TR1		27.188	R2492	TR1
	26.994	L2493	TR1		27.188	R2493	TR1
	26.994	L2494	TR1		27.192	R2494	TR1
	26.994	L2495	TR1		27.194	R2495	TR1
	26.996	L2496	TR1		27.204	R2496	TR1
	26.996	L2497	TR1		27.204	R2497	TR1
	26.996	L2498	TR1		27.206	R2498	TR1
	26.996	L2499	TR1		27.216	R2499	TR1
	26.996	L2500	TR1		27.216	R2500	TR1
	26.998	L2501	TR1		27.218	R2501	TR1
	26.998	L2502	TR1		27.226	R2502	TR1
	26.998	L2503	TR1		27.228	R2503	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
27.00 km to 28.00 km	27.006	L2504	TR1		27.27	R2504	TR1
	27.008	L2505	TR1		27.27	R2505	TR2
	27.016	L2506	TR1		27.274	R2506	TR1
	27.022	L2507	TR1		27.294	R2507	TR3
	27.024	L2508	TR1		27.298	R2508	TR4
	27.024	L2509	TR1		27.302	R2509	TR2
	27.024	L2510	TR1		27.302	R2510	TR2
	27.026	L2511	TR1		27.314	R2511	TR2
	27.032	L2512	TR1		27.322	R2512	TR1
	27.034	L2513	TR1		27.324	R2513	TR1
	27.036	L2514	TR2		27.324	R2514	TR1
	27.040	L2515	TR1		27.326	R2515	TR3
	27.040	L2516	TR1		27.328	R2516	TR2
	27.042	L2517	TR1		27.33	R2517	TR2
	27.044	L2518	TR1		27.336	R2518	TR1
	27.046	L2519	TR1		27.344	R2519	TR1
	27.046	L2520	TR1		27.348	R2520	TR2
	27.046	L2521	TR1		27.348	R2521	TR2
	27.054	L2522	TR3		27.372	R2522	TR2
	27.056	L2523	TR1		27.376	R2523	TR1
	27.056	L2524	TR1		27.376	R2524	TR1
	27.058	L2525	TR1		27.376	R2525	TR1
	27.064	L2526	TR1		27.378	R2526	TR1
	27.064	L2527	TR3		27.378	R2527	TR1
	27.068	L2528	TR1		27.378	R2528	TR1
	27.070	L2529	TR1		27.378	R2529	TR1
	27.074	L2530	TR1		27.382	R2530	TR4
	27.076	L2531	TR1		27.386	R2531	TR1
	27.082	L2532	TR2		27.386	R2532	TR1
	27.090	L2533	TR1		27.388	R2533	TR1
	27.092	L2534	TR1		27.392	R2534	TR1
	27.096	L2535	TR1		27.392	R2535	TR1
	27.096	L2536	TR1		27.392	R2536	TR1
	27.098	L2537	TR1		27.392	R2537	TR1
	27.100	L2538	TR1		27.392	R2538	TR1
	27.106	L2539	TR1		27.392	R2539	TR1
	27.112	L2540	TR1		27.394	R2540	TR1
	27.126	L2541	TR3		27.394	R2541	TR1
	27.136	L2542	TR1		27.394	R2542	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	27.138	L2543	TR1		27.394	R2543	TR1
	27.138	L2544	TR1		27.394	R2544	TR1
	27.140	L2545	TR1		27.394	R2545	TR1
	27.140	L2546	TR1		27.396	R2546	TR1
	27.140	L2547	TR1		27.402	R2547	TR4
	27.142	L2548	TR1		27.41	R2548	TR4
	27.142	L2549	TR1		27.41	R2549	TR2
	27.142	L2550	TR1		27.416	R2550	TR4
	27.144	L2551	TR1		27.428	R2551	TR2
	27.144	L2552	TR1		27.43	R2552	TR1
	27.144	L2553	TR1		27.432	R2553	TR1
	27.172	L2554	TR1		27.432	R2554	TR2
	27.172	L2555	TR2		27.442	R2555	TR1
	27.174	L2556	TR1		27.456	R2556	TR4
	27.176	L2557	TR1		27.464	R2557	TR2
	27.178	L2558	TR1		27.466	R2558	TR1
	27.190	L2559	BAMBOO		27.466	R2559	TR2
	27.196	L2560	TR1		27.468	R2560	TR1
	27.218	L2561	TR1		27.468	R2561	TR1
	27.218	L2562	TR1		27.468	R2562	TR1
	27.218	L2563	TR1		27.47	R2563	TR1
	27.218	L2564	TR1		27.474	R2564	TR1
	27.220	L2565	TR1		27.474	R2565	TR1
	27.220	L2566	TR1		27.474	R2566	TR1
	27.220	L2567	TR1		27.474	R2567	TR1
	27.220	L2568	TR1		27.476	R2568	TR1
	27.220	L2569	TR1		27.476	R2569	TR1
	27.222	L2570	TR1		27.476	R2570	TR1
	27.224	L2571	TR1		27.48	R2571	TR1
	27.232	L2572	TR1		27.48	R2572	TR1
	27.232	L2573	TR1		27.48	R2573	TR1
	27.234	L2574	TR1		27.48	R2574	TR1
	27.234	L2575	TR1		27.482	R2575	TR1
	27.236	L2576	TR1		27.504	R2576	TR1
	27.256	L2577	TR1		27.514	R2577	TR4
	27.270	L2578	TR1		27.538	R2578	TR1
	27.278	L2579	TR2		27.582	R2579	TR4
	27.278	L2580	TR2		27.602	R2580	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	27.280	L2581	TR2		27.612	R2581	TR4
	27.288	L2582	TR3		27.654	R2582	TR2
	27.298	L2583	TR1		27.68	R2583	TR1
	27.298	L2584	TR1		27.68	R2584	TR1
	27.298	L2585	TR1		27.708	R2585	TR2
	27.298	L2586	TR1		27.716	R2586	TR3
	27.300	L2587	TR1		27.724	R2587	TR1
	27.300	L2588	TR1		27.742	R2588	TR3
	27.300	L2589	TR1		27.756	R2589	TR2
	27.300	L2590	TR1		27.764	R2590	TR2
	27.300	L2591	TR1		27.784	R2591	TR4
	27.302	L2592	TR1		27.784	R2592	TR3
	27.302	L2593	TR1		27.79	R2593	TR3
	27.302	L2594	TR1		27.792	R2594	TR2
	27.302	L2595	TR1		27.794	R2595	TR4
	27.302	L2596	TR1		27.796	R2596	TR4
	27.304	L2597	TR1		27.806	R2597	TR4
	27.304	L2598	TR1		27.812	R2598	TR2
	27.304	L2599	TR1		27.816	R2599	TR2
	27.304	L2600	TR1		27.818	R2600	TR1
	27.304	L2601	TR1		27.83	R2601	TR2
	27.314	L2602	TR1		27.83	R2602	TR1
	27.314	L2603	TR1		27.846	R2603	TR2
	27.316	L2604	TR1		27.85	R2604	TR1
	27.316	L2605	TR1		27.85	R2605	TR1
	27.318	L2606	TR4		27.85	R2606	TR1
	27.322	L2607	TR1		27.856	R2607	TR3
	27.342	L2608	TR3		27.862	R2608	TR1
	27.422	L2609	TR1		27.874	R2609	TR3
	27.422	L2610	TR1		27.886	R2610	TR1
	27.428	L2611	TR1		27.896	R2611	TR1
	27.430	L2612	TR1		27.906	R2612	TR1
	27.436	L2613	TR1		27.908	R2613	TR1
	27.436	L2614	TR1		27.908	R2614	TR1
	27.440	L2615	TR1		27.912	R2615	TR3
	27.440	L2616	TR1		27.914	R2616	TR1
	27.442	L2617	TR1		27.914	R2617	TR1
	27.446	L2618	TR1		27.938	R2618	TR4
	27.448	L2619	TR1		27.992	R2619	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	27.448	L2620	TR1		27.992	R2620	TR2
	27.450	L2621	TR1		27.994	R2621	TR1
	27.452	L2622	TR1		27.996	R2622	TR1
	27.478	L2623	TR1		27.996	R2623	TR1
	27.486	L2624	TR1		27.996	R2624	TR2
	27.494	L2625	TR4		27.998	R2625	TR1
	27.534	L2626	TR3		28.006	R2626	TR1
	27.592	L2627	TR1		28.012	R2627	TR2
	27.596	L2628	TR1		28.016	R2628	TR1
	27.604	L2629	TR1		28.016	R2629	TR2
	27.626	L2630	TR3		28.026	R2630	TR1
	27.644	L2631	TR2		28.03	R2631	TR1
	27.646	L2632	TR3		28.03	R2632	TR1
	27.676	L2633	TR1		28.032	R2633	TR1
	27.678	L2634	TR1		28.032	R2634	TR1
	27.678	L2635	TR1		28.032	R2635	TR1
	27.678	L2636	TR1		28.032	R2636	TR1
	27.694	L2637	TR1		28.05	R2637	TR1
	27.696	L2638	TR1		28.05	R2638	TR1
	27.696	L2639	TR1		28.05	R2639	TR1
	27.698	L2640	TR1		28.05	R2640	TR1
	27.698	L2641	TR1	28.00 km to 29.00 km	28.052	R2641	TR2
	27.698	L2642	TR1		28.058	R2642	TR1
	27.706	L2643	TR2		28.074	R2643	TR1
	27.710	L2644	TR3		28.076	R2644	TR1
	27.724	L2645	TR2		28.076	R2645	TR2
	27.726	L2646	TR1		28.08	R2646	BAMBOO
	27.728	L2647	TR1		28.112	R2647	TR1
	27.728	L2648	TR1		28.216	R2648	TR2
	27.730	L2649	TR1		28.224	R2649	TR2
	27.730	L2650	TR1		28.228	R2650	TR1
	27.730	L2651	TR1		28.278	R2651	TR3
	27.730	L2652	TR1		28.294	R2652	TR3
	27.732	L2653	TR1		28.344	R2653	TR4
	27.734	L2654	TR2		28.346	R2654	TR4
	27.738	L2655	TR2		28.37	R2655	TR3
	27.738	L2656	TR2		28.378	R2656	TR1
	27.740	L2657	TR1		28.434	R2657	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	27.742	L2658	TR1		28.434	R2658	TR3
	27.742	L2659	TR1		28.44	R2659	TR3
	27.744	L2660	TR1		28.442	R2660	TR3
	27.744	L2661	TR1		28.446	R2661	TR1
	27.744	L2662	TR1		28.448	R2662	TR3
	27.752	L2663	TR1		28.45	R2663	TR3
	27.752	L2664	TR1		28.458	R2664	TR1
	27.756	L2665	TR1		28.458	R2665	TR3
	27.782	L2666	TR1		28.458	R2666	TR3
	27.782	L2667	TR1		28.488	R2667	TR1
	27.782	L2668	TR1		28.488	R2668	TR3
	27.782	L2669	TR1		28.492	R2669	BAMBOO
	27.784	L2670	TR1		28.492	R2670	BAMBOO
	27.784	L2671	TR1		28.492	R2671	TR1
	27.790	L2672	TR1		28.492	R2672	TR1
	27.798	L2673	TR1		28.492	R2673	TR1
	27.798	L2674	TR1		28.526	R2674	TR1
	27.798	L2675	TR1		28.528	R2675	TR1
	27.800	L2676	TR1		28.534	R2676	TR2
	27.800	L2677	TR1		28.54	R2677	TR1
	27.800	L2678	TR1		28.542	R2678	TR1
	27.808	L2679	TR2		28.542	R2679	TR2
	27.810	L2680	TR2		28.544	R2680	BAMBOO
	27.820	L2681	TR2		28.544	R2681	TR1
	27.844	L2682	TR1		28.548	R2682	BAMBOO
	27.848	L2683	TR1		28.55	R2683	BAMBOO
	27.848	L2684	TR1		28.552	R2684	BAMBOO
	27.848	L2685	TR1		28.552	R2685	TR1
	27.848	L2686	TR1		28.554	R2686	BAMBOO
	27.848	L2687	TR1		28.554	R2687	TR1
	27.850	L2688	TR1		28.556	R2688	TR1
	27.850	L2689	TR1		28.556	R2689	TR1
	27.852	L2690	TR1		28.558	R2690	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	27.852	L2691	TR1		28.56	R2691	TR1
	27.854	L2692	TR1		28.56	R2692	TR1
	27.864	L2693	TR1		28.56	R2693	TR1
	27.876	L2694	TR1		28.56	R2694	TR1
	27.878	L2695	TR1		28.562	R2695	TR1
	27.878	L2696	TR2		28.562	R2696	TR1
	27.880	L2697	TR1		28.562	R2697	TR1
	27.910	L2698	TR1		28.564	R2698	TR1
	27.912	L2699	TR1		28.564	R2699	TR1
	27.912	L2700	TR1		28.566	R2700	TR1
	27.912	L2701	TR1		28.566	R2701	TR1
	27.912	L2702	TR1		28.57	R2702	TR1
	27.912	L2703	TR1		28.572	R2703	TR1
	27.912	L2704	TR1		28.572	R2704	TR1
	27.912	L2705	TR1		28.574	R2705	TR1
	27.922	L2706	TR1		28.576	R2706	TR1
28.00 km to 29.00 km	28.376	L2707	TR2		28.576	R2707	TR1
	28.406	L2708	TR1		28.586	R2708	TR1
	28.640	L2709	TR1		28.588	R2709	TR1
	28.642	L2710	TR1		28.588	R2710	TR1
	28.644	L2711	TR1		28.588	R2711	TR1
	28.644	L2712	TR1		28.588	R2712	TR2
	28.644	L2713	TR1		28.59	R2713	TR1
	28.644	L2714	TR1		28.59	R2714	TR1
	28.644	L2715	TR1		28.59	R2715	TR1
	28.646	L2716	TR1		28.592	R2716	TR1
	28.646	L2717	TR1		28.592	R2717	TR1
	28.648	L2718	TR1		28.592	R2718	TR1
	28.650	L2719	TR1		28.592	R2719	TR1
	28.834	L2720	TR3		28.592	R2720	TR1
	28.844	L2721	TR2		28.592	R2721	TR1
	28.870	L2722	TR1		28.592	R2722	TR1
	28.870	L2723	TR1		28.594	R2723	TR1
	28.870	L2724	TR1		28.594	R2724	TR1
	28.872	L2725	TR1		28.594	R2725	TR1
	28.872	L2726	TR1		28.594	R2726	TR3
	28.872	L2727	TR1		28.598	R2727	TR1
	28.872	L2728	TR1		28.598	R2728	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	28.872	L2729	TR1		28.614	R2729	BAMBOO
	28.872	L2730	TR1		28.634	R2730	BAMBOO
	28.872	L2731	TR1		28.644	R2731	BAMBOO
	28.874	L2732	TR1		28.724	R2732	TR1
	28.874	L2733	TR1		28.724	R2733	TR1
	28.874	L2734	TR1		28.728	R2734	TR1
	28.874	L2735	TR1		28.752	R2735	TR1
	28.874	L2736	TR1		28.78	R2736	TR2
	28.874	L2737	TR1		28.782	R2737	TR2
	28.874	L2738	TR1		28.802	R2738	TR1
	28.876	L2739	TR1		28.804	R2739	TR1
	28.876	L2740	TR1		28.804	R2740	TR3
	28.876	L2741	TR1		28.808	R2741	TR1
	28.876	L2742	TR1		28.812	R2742	TR1
	28.876	L2743	TR1		28.812	R2743	TR2
	28.876	L2744	TR1		28.816	R2744	TR1
	28.876	L2745	TR1		28.82	R2745	TR1
	28.878	L2746	TR1		28.82	R2746	TR1
	28.878	L2747	TR1		28.824	R2747	TR1
	28.880	L2748	TR1		28.826	R2748	TR1
	28.880	L2749	TR1		28.826	R2749	TR1
	28.882	L2750	TR1		28.828	R2750	TR1
	28.882	L2751	TR1		28.828	R2751	TR1
	28.886	L2752	TR1		28.828	R2752	TR1
	28.890	L2753	TR3		28.832	R2753	TR3
	28.904	L2754	TR1		28.84	R2754	TR1
	28.914	L2755	TR1		28.84	R2755	TR1
	28.914	L2756	TR1		28.84	R2756	TR1
	28.916	L2757	TR1		28.842	R2757	TR1
	28.916	L2758	TR1		28.842	R2758	TR2
	28.916	L2759	TR1		28.844	R2759	TR1
	28.972	L2760	TR1		28.844	R2760	TR1
	28.976	L2761	TR2		28.844	R2761	TR3
29.00 km to 30.00 km	29.032	L2762	TR2		28.844	R2762	TR3
	29.188	L2763	TR1		28.846	R2763	TR1
	29.190	L2764	TR1		28.846	R2764	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	29.190	L2765	TR1		28.846	R2765	TR1
	29.190	L2766	TR1		28.846	R2766	TR1
	29.192	L2767	TR1		28.846	R2767	TR1
	29.194	L2768	TR1		28.846	R2768	TR1
	29.194	L2769	TR1		28.846	R2769	TR2
	29.196	L2770	TR1		28.848	R2770	TR1
	29.258	L2771	TR3		28.848	R2771	TR1
	29.262	L2772	TR1		28.848	R2772	TR1
	29.262	L2773	TR1		28.848	R2773	TR1
	29.262	L2774	TR1		28.848	R2774	TR2
	29.262	L2775	TR1		28.848	R2775	TR2
	29.264	L2776	TR1		28.85	R2776	TR1
	29.264	L2777	TR1		28.864	R2777	TR1
	29.266	L2778	TR1		28.864	R2778	TR2
	29.266	L2779	TR1		28.868	R2779	TR1
	29.266	L2780	TR1		28.868	R2780	TR1
	29.266	L2781	TR1		28.868	R2781	TR1
	29.266	L2782	TR1		28.87	R2782	TR1
	29.268	L2783	TR1		28.87	R2783	TR1
	29.268	L2784	TR1		28.87	R2784	TR1
	29.268	L2785	TR1		28.872	R2785	TR1
	29.286	L2786	TR3		28.874	R2786	TR1
	29.294	L2787	TR1		28.874	R2787	TR1
	29.300	L2788	TR1		28.874	R2788	TR1
	29.300	L2789	TR1		28.874	R2789	TR1
	29.300	L2790	TR1		28.876	R2790	TR1
	29.300	L2791	TR1		28.876	R2791	TR1
	29.302	L2792	TR1		28.878	R2792	TR1
	29.302	L2793	TR1		28.878	R2793	TR1
	29.302	L2794	TR1		28.878	R2794	TR1
	29.302	L2795	TR1		28.878	R2795	TR1
	29.308	L2796	TR1		28.878	R2796	TR2
	29.308	L2797	TR1		28.88	R2797	TR1
	29.310	L2798	TR1		28.882	R2798	TR1
	29.312	L2799	TR1		28.882	R2799	TR1
	29.312	L2800	TR1		28.882	R2800	TR2
	29.312	L2801	TR1		28.884	R2801	TR1
	29.314	L2802	TR1		28.884	R2802	TR1
	29.314	L2803	TR1		28.884	R2803	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	29.314	L2804	TR1		28.886	R2804	TR1
	29.314	L2805	TR1		28.89	R2805	TR1
	29.316	L2806	TR1		28.89	R2806	TR1
	29.316	L2807	TR1		29.06	R2807	TR1
	29.316	L2808	TR1		29.062	R2808	TR1
	29.316	L2809	TR1		29.076	R2809	TR1
	29.316	L2810	TR1		29.076	R2810	TR1
	29.318	L2811	TR1		29.076	R2811	TR1
	29.318	L2812	TR1		29.078	R2812	TR1
	29.320	L2813	TR1		29.078	R2813	TR1
	29.320	L2814	TR1		29.078	R2814	TR1
	29.332	L2815	TR1		29.08	R2815	TR1
	29.332	L2816	TR1		29.08	R2816	TR1
	29.336	L2817	TR1		29.08	R2817	TR1
	29.336	L2818	TR1		29.082	R2818	TR1
	29.342	L2819	TR1		29.082	R2819	TR1
	29.344	L2820	TR1		29.082	R2820	TR1
	29.344	L2821	TR1		29.092	R2821	BAMBOO
	29.344	L2822	TR1	29.00 km to 30.00 km	29.094	R2822	BAMBOO
	29.344	L2823	TR1		29.094	R2823	BAMBOO
	29.344	L2824	TR1		29.098	R2824	BAMBOO
	29.352	L2825	TR1		29.1	R2825	BAMBOO
	29.352	L2826	TR1		29.102	R2826	BAMBOO
	29.354	L2827	TR1		29.104	R2827	BAMBOO
	29.356	L2828	TR1		29.106	R2828	BAMBOO
	29.356	L2829	TR1		29.11	R2829	BAMBOO
	29.356	L2830	TR1		29.116	R2830	BAMBOO
	29.356	L2831	TR1		29.122	R2831	BAMBOO
	29.356	L2832	TR1		29.232	R2832	TR1
	29.356	L2833	TR1		29.234	R2833	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	29.356	L2834	TR1		29.234	R2834	TR1
	29.358	L2835	TR1		29.234	R2835	TR1
	29.358	L2836	TR1		29.234	R2836	TR1
	29.358	L2837	TR1		29.234	R2837	TR1
	29.358	L2838	TR1		29.234	R2838	TR1
	29.358	L2839	TR1		29.236	R2839	TR1
	29.358	L2840	TR1		29.238	R2840	TR1
	29.360	L2841	TR1		29.238	R2841	TR1
	29.360	L2842	TR1		29.238	R2842	TR1
	29.360	L2843	TR1		29.238	R2843	TR1
	29.360	L2844	TR1		29.238	R2844	TR1
	29.360	L2845	TR1		29.24	R2845	TR1
	29.360	L2846	TR1		29.242	R2846	TR1
	29.360	L2847	TR1		29.242	R2847	TR1
	29.362	L2848	TR1		29.242	R2848	TR1
	29.364	L2849	TR1		29.242	R2849	TR1
	29.364	L2850	TR1		29.242	R2850	TR1
	29.364	L2851	TR1		29.244	R2851	TR1
	29.364	L2852	TR1		29.244	R2852	TR1
	29.364	L2853	TR1		29.244	R2853	TR1
	29.364	L2854	TR1		29.246	R2854	TR1
	29.364	L2855	TR1		29.246	R2855	TR1
	29.364	L2856	TR1		29.248	R2856	TR4
	29.366	L2857	TR1		29.248	R2857	TR1
	29.366	L2858	TR1		29.254	R2858	TR1
	29.366	L2859	TR1		29.256	R2859	TR1
	29.368	L2860	TR1		29.258	R2860	TR1
	29.370	L2861	TR1		29.258	R2861	TR1
	29.370	L2862	TR1		29.258	R2862	TR1
	29.370	L2863	TR1		29.258	R2863	TR1
	29.370	L2864	TR1		29.258	R2864	TR1
	29.372	L2865	TR1		29.258	R2865	TR1
	29.372	L2866	TR1		29.258	R2866	TR1
	29.376	L2867	TR1		29.258	R2867	TR1
	29.376	L2868	TR1		29.258	R2868	TR1
	29.380	L2869	TR1		29.258	R2869	TR1
	29.380	L2870	TR1		29.26	R2870	TR1
	29.380	L2871	TR1		29.26	R2871	TR1
	29.382	L2872	TR1		29.26	R2872	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	29.402	L2873	TR1		29.26	R2873	TR1
	29.436	L2874	TR1		29.26	R2874	TR1
	29.502	L2875	TR2		29.26	R2875	TR1
	29.522	L2876	TR1		29.26	R2876	TR1
	29.610	L2877	TR3		29.262	R2877	TR1
	29.750	L2878	TR4		29.262	R2878	TR1
	29.754	L2879	TR1		29.262	R2879	TR1
	29.786	L2880	TR1		29.262	R2880	TR1
	29.940	L2881	TR1		29.262	R2881	TR1
	29.942	L2882	TR1		29.262	R2882	TR1
30.00 km to 31.00 km	30.184	L2883	TR1		29.262	R2883	TR2
	30.184	L2884	TR3		29.264	R2884	TR1
	30.190	L2885	TR2		29.264	R2885	TR1
	30.192	L2886	TR3		29.264	R2886	TR1
	30.194	L2887	TR4		29.264	R2887	TR1
	30.194	L2888	TR1		29.322	R2888	TR2
	30.194	L2889	TR2		29.358	R2889	BAMBOO
	30.194	L2890	TR2		29.392	R2890	TR4
	30.200	L2891	TR3		29.396	R2891	TR3
	30.296	L2892	BAMBOO		29.418	R2892	TR1
	30.314	L2893	TR3		29.422	R2893	TR1
	30.316	L2894	TR3		29.424	R2894	TR1
	30.326	L2895	TR3		29.424	R2895	TR1
	30.334	L2896	TR2		29.424	R2896	TR1
	30.340	L2897	TR1		29.424	R2897	TR1
	30.342	L2898	TR1		29.424	R2898	TR1
	30.344	L2899	TR1		29.432	R2899	TR4
	30.346	L2900	TR1		29.464	R2900	TR3
	30.350	L2901	TR1		29.474	R2901	TR3
	30.350	L2902	TR1		29.492	R2902	TR3
	30.354	L2903	TR3		29.538	R2903	TR1
	30.360	L2904	TR4		29.54	R2904	TR1
	30.362	L2905	BAMBOO		29.54	R2905	TR1
	30.370	L2906	TR3		29.54	R2906	TR1
	30.406	L2907	TR1		29.54	R2907	TR1
	30.410	L2908	TR1		29.54	R2908	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	30.410	L2909	TR1		29.54	R2909	TR1
	30.410	L2910	TR1		29.542	R2910	TR1
	30.410	L2911	TR1		29.542	R2911	TR1
	30.410	L2912	TR1		29.542	R2912	TR1
	30.410	L2913	TR1		29.544	R2913	TR1
	30.412	L2914	TR1		29.544	R2914	TR2
	30.412	L2915	TR1		29.554	R2915	TR3
	30.412	L2916	TR2		29.568	R2916	TR1
	30.414	L2917	TR1		29.57	R2917	TR3
	30.414	L2918	TR1		29.572	R2918	TR1
	30.414	L2919	TR1		29.572	R2919	TR3
	30.416	L2920	TR1		29.574	R2920	TR1
	30.416	L2921	TR1		29.574	R2921	TR1
	30.416	L2922	TR1		29.574	R2922	TR1
	30.416	L2923	TR1		29.574	R2923	TR1
	30.416	L2924	TR1		29.576	R2924	TR1
	30.416	L2925	TR1		29.578	R2925	TR1
	30.416	L2926	TR1		29.578	R2926	TR1
	30.416	L2927	TR1		29.598	R2927	TR3
	30.416	L2928	TR1		29.602	R2928	TR1
	30.416	L2929	TR1		29.602	R2929	TR1
	30.416	L2930	TR1		29.604	R2930	TR1
	30.416	L2931	TR1		29.606	R2931	TR1
	30.416	L2932	TR1		29.606	R2932	TR1
	30.416	L2933	TR1		29.616	R2933	TR1
	30.416	L2934	TR1		29.62	R2934	TR2
	30.416	L2935	TR1		29.624	R2935	TR1
	30.416	L2936	TR1		29.636	R2936	TR1
	30.418	L2937	TR1		29.662	R2937	TR3
	30.418	L2938	TR1		29.668	R2938	TR2
	30.418	L2939	TR1		29.674	R2939	TR1
	30.418	L2940	TR1		29.676	R2940	TR1
	30.418	L2941	TR1		29.69	R2941	BAMBOO
	30.418	L2942	TR1		29.738	R2942	TR1
	30.418	L2943	TR1		29.742	R2943	TR2
	30.418	L2944	TR1		29.756	R2944	BAMBOO

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	30.418	L2945	TR1		29.762	R2945	BAMBOO
	30.418	L2946	TR1		29.77	R2946	BAMBOO
	30.418	L2947	TR1		29.78	R2947	BAMBOO
	30.418	L2948	TR1		29.808	R2948	BAMBOO
	30.418	L2949	TR1		29.812	R2949	BAMBOO
	30.418	L2950	TR1		29.824	R2950	TR1
	30.418	L2951	TR1		29.828	R2951	TR1
	30.418	L2952	TR1		29.912	R2952	TR1
	30.418	L2953	TR1		29.916	R2953	TR1
	30.418	L2954	TR1		30.044	R2954	TR3
	30.418	L2955	TR2		30.048	R2955	TR2
	30.422	L2956	TR1		30.076	R2956	TR2
	30.422	L2957	TR1		30.088	R2957	TR2
	30.422	L2958	TR1		30.092	R2958	BAMBOO
	30.422	L2959	TR1		30.098	R2959	TR2
	30.422	L2960	TR1		30.102	R2960	TR1
	30.422	L2961	TR1		30.102	R2961	TR2
	30.422	L2962	TR1		30.106	R2962	TR1
	30.422	L2963	TR1		30.108	R2963	TR1
	30.422	L2964	TR1		30.122	R2964	TR2
	30.424	L2965	TR1	30.00 km to 31.00 km	30.134	R2965	TR2
	30.424	L2966	TR1		30.138	R2966	TR4
	30.424	L2967	TR1		30.144	R2967	TR4
	30.424	L2968	TR1		30.154	R2968	BAMBOO
	30.424	L2969	TR1		30.16	R2969	BAMBOO
	30.424	L2970	TR1		30.172	R2970	BAMBOO
	30.424	L2971	TR1		30.172	R2971	TR2
	30.424	L2972	TR1		30.174	R2972	TR1
	30.424	L2973	TR1		30.174	R2973	TR1
	30.426	L2974	TR1		30.184	R2974	TR2
	30.426	L2975	TR1		30.192	R2975	TR3
	30.426	L2976	TR1		30.192	R2976	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	30.426	L2977	TR1		30.192	R2977	TR2
	30.426	L2978	TR1		30.43	R2978	TR1
	30.428	L2979	TR1		30.43	R2979	TR1
	30.428	L2980	TR1		30.432	R2980	TR1
	30.428	L2981	TR1		30.436	R2981	TR1
	30.428	L2982	TR1		30.436	R2982	TR2
	30.428	L2983	TR1		30.442	R2983	TR1
	30.428	L2984	TR2		30.444	R2984	TR1
	30.430	L2985	TR1		30.446	R2985	TR1
	30.430	L2986	TR1		30.448	R2986	TR1
	30.430	L2987	TR1		30.45	R2987	TR1
	30.430	L2988	TR1		30.46	R2988	TR1
	30.432	L2989	TR1		30.486	R2989	TR2
	30.434	L2990	TR1		30.492	R2990	TR3
	30.456	L2991	TR3		30.502	R2991	TR2
	30.478	L2992	TR2		30.508	R2992	TR1
	30.492	L2993	TR1		30.508	R2993	TR1
	30.494	L2994	TR1		30.512	R2994	TR1
	30.494	L2995	TR1		30.518	R2995	TR1
	30.494	L2996	TR1		30.522	R2996	TR1
	30.496	L2997	TR1		30.536	R2997	BAMBOO
	30.498	L2998	TR1		30.542	R2998	TR1
	30.500	L2999	TR1		30.544	R2999	TR1
	30.500	L3000	TR1		30.546	R3000	TR1
	30.500	L3001	TR1		30.548	R3001	TR1
	30.504	L3002	TR1		30.564	R3002	TR3
	30.506	L3003	TR1		30.588	R3003	TR1
	30.512	L3004	TR1		30.588	R3004	TR1
	30.516	L3005	TR1		30.588	R3005	TR1
	30.516	L3006	TR1		30.588	R3006	TR1
	30.518	L3007	TR1		30.588	R3007	TR1
	30.520	L3008	TR1		30.594	R3008	TR1
	30.520	L3009	TR1		30.596	R3009	TR1
	30.522	L3010	TR1		30.596	R3010	TR1
	30.526	L3011	TR1		30.596	R3011	TR1
	30.536	L3012	TR4		30.596	R3012	TR1
	30.546	L3013	TR3		30.596	R3013	TR1
	30.582	L3014	TR1		30.596	R3014	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	30.598	L3015	TR2		30.596	R3015	TR1
	30.602	L3016	TR1		30.596	R3016	TR1
	30.602	L3017	TR1		30.596	R3017	TR1
	30.608	L3018	TR1		30.598	R3018	TR1
	30.612	L3019	TR1		30.598	R3019	TR2
	30.618	L3020	TR1		30.6	R3020	TR1
	30.620	L3021	TR1		30.6	R3021	TR1
	30.624	L3022	TR1		30.6	R3022	TR1
	30.638	L3023	TR1		30.602	R3023	TR1
	30.638	L3024	TR1		30.602	R3024	TR1
	30.638	L3025	TR1		30.604	R3025	TR1
	30.638	L3026	TR1		30.604	R3026	TR1
	30.640	L3027	TR1		30.604	R3027	TR1
	30.642	L3028	TR1		30.604	R3028	TR1
	30.642	L3029	TR1		30.604	R3029	TR1
	30.644	L3030	TR1		30.606	R3030	TR1
	30.644	L3031	TR1		30.606	R3031	TR1
	30.646	L3032	TR1		30.606	R3032	TR1
	30.648	L3033	TR1		30.606	R3033	TR1
	30.648	L3034	TR1		30.606	R3034	TR1
	30.648	L3035	TR2		30.608	R3035	TR1
	30.650	L3036	TR1		30.608	R3036	TR1
	30.650	L3037	TR2		30.608	R3037	TR1
	30.654	L3038	TR1		30.608	R3038	TR1
	30.664	L3039	TR1		30.608	R3039	TR1
	30.664	L3040	TR1		30.608	R3040	TR1
	30.678	L3041	TR1		30.61	R3041	TR1
	30.678	L3042	TR1		30.61	R3042	TR1
	30.678	L3043	TR1		30.61	R3043	TR1
	30.680	L3044	TR1		30.612	R3044	TR2
	30.680	L3045	TR1		30.614	R3045	TR2
	30.680	L3046	TR1		30.616	R3046	TR1
	30.682	L3047	TR1		30.616	R3047	TR1
	30.682	L3048	TR1		30.618	R3048	TR1
	30.684	L3049	TR1		30.618	R3049	TR1
	30.684	L3050	TR1		30.618	R3050	TR1
	30.686	L3051	TR1		30.624	R3051	TR1
	30.686	L3052	TR1		30.624	R3052	TR1
	30.690	L3053	TR1		30.624	R3053	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	30.690	L3054	TR1		30.624	R3054	TR1
	30.692	L3055	TR1		30.628	R3055	TR2
	30.692	L3056	TR1		30.634	R3056	TR1
	30.716	L3057	TR2		30.634	R3057	TR1
	30.732	L3058	TR2		30.636	R3058	TR1
	30.742	L3059	TR1		30.636	R3059	TR2
	30.766	L3060	TR1		30.638	R3060	TR1
	30.800	L3061	TR1		30.64	R3061	TR1
	30.804	L3062	TR1		30.64	R3062	TR1
	30.804	L3063	TR2		30.64	R3063	TR1
	30.806	L3064	TR1		30.646	R3064	TR1
	30.806	L3065	TR1		30.646	R3065	TR2
	30.812	L3066	TR4		30.648	R3066	TR1
	30.872	L3067	TR1		30.65	R3067	TR1
	30.904	L3068	TR2		30.664	R3068	TR1
	30.906	L3069	TR1		30.682	R3069	TR2
	30.908	L3070	TR2		30.682	R3070	TR2
	30.912	L3071	TR1		30.684	R3071	TR2
	30.914	L3072	TR1		30.686	R3072	TR4
	30.936	L3073	TR2		30.692	R3073	TR2
	30.942	L3074	TR2		30.694	R3074	TR1
	30.954	L3075	TR2		30.706	R3075	TR1
	30.958	L3076	TR1		30.706	R3076	TR1
	30.960	L3077	TR1		30.708	R3077	TR2
	30.962	L3078	TR1		30.712	R3078	TR1
	30.962	L3079	TR2		30.712	R3079	TR1
	30.970	L3080	TR1		30.712	R3080	TR1
	30.970	L3081	TR1		30.714	R3081	TR1
	30.972	L3082	TR1		30.714	R3082	TR1
	31.114	L3083	TR1		30.716	R3083	TR4
	31.116	L3084	TR1		30.72	R3084	TR1
	31.140	L3085	TR2		30.72	R3085	TR1
	31.292	L3086	TR3		30.72	R3086	TR1
31.00 km to 32.00 km	31.330	L3087	TR1		30.722	R3087	TR1
	31.336	L3088	TR1		30.722	R3088	TR1
	31.362	L3089	TR1		30.722	R3089	TR1
	31.386	L3090	TR1		30.722	R3090	TR1
	31.404	L3091	TR1		30.724	R3091	TR1
	31.436	L3092	TR1		30.724	R3092	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	31.444	L3093	TR2		30.726	R3093	TR1
	31.496	L3094	TR1		30.726	R3094	TR1
	31.696	L3095	TR2		30.726	R3095	TR2
	31.772	L3096	TR2		30.726	R3096	TR2
	31.772	L3097	TR2		30.73	R3097	TR1
	31.786	L3098	TR2		30.73	R3098	TR1
	31.794	L3099	TR2		30.73	R3099	TR2
	31.828	L3100	TR2		30.732	R3100	TR1
	31.832	L3101	TR1		30.732	R3101	TR1
	31.834	L3102	TR1		30.732	R3102	TR3
	31.836	L3103	TR1		30.734	R3103	TR1
	31.842	L3104	TR2		30.734	R3104	TR1
	31.876	L3105	TR1		30.734	R3105	TR1
	31.926	L3106	TR1		30.734	R3106	TR1
	31.950	L3107	TR1		30.734	R3107	TR1
	31.998	L3108	TR2		30.736	R3108	TR1
	32.008	L3109	TR2		30.736	R3109	TR1
	32.104	L3110	TR2		30.738	R3110	TR1
	32.106	L3111	TR1		30.738	R3111	TR1
	32.110	L3112	TR2		30.738	R3112	TR1
	32.128	L3113	TR1		30.74	R3113	TR1
	32.136	L3114	TR1		30.74	R3114	TR2
	32.146	L3115	TR3		30.74	R3115	TR2
	32.160	L3116	TR2		30.742	R3116	TR1
	32.186	L3117	TR3		30.742	R3117	TR2
	32.262	L3118	TR1		30.746	R3118	TR1
	32.264	L3119	TR1		30.76	R3119	TR1
32.00 km to 33.00 km	32.268	L3120	TR2		30.76	R3120	TR1
	32.284	L3121	TR2		30.76	R3121	TR1
	32.288	L3122	TR2		30.762	R3122	BAMBOO
	32.330	L3123	TR2		30.764	R3123	TR4
	32.372	L3124	TR2		30.764	R3124	TR2
	32.372	L3125	TR2		30.772	R3125	TR2
	32.374	L3126	TR2		30.776	R3126	TR2
	32.386	L3127	TR2		30.78	R3127	TR1
	32.388	L3128	TR1		30.79	R3128	TR1
	32.392	L3129	TR1		30.79	R3129	TR1
	32.544	L3130	TR1		30.79	R3130	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	32.794	L3131	TR1		30.796	R3131	TR1
	32.798	L3132	TR3		30.798	R3132	TR1
	32.814	L3133	TR1		30.818	R3133	TR1
	32.818	L3134	TR1		30.824	R3134	TR3
	32.818	L3135	TR3		30.922	R3135	TR2
	32.824	L3136	TR1		30.924	R3136	TR1
	32.828	L3137	TR3		30.928	R3137	TR2
	32.844	L3138	TR1		30.934	R3138	TR1
	32.856	L3139	TR1		31.228	R3139	TR2
	32.860	L3140	TR1		31.234	R3140	TR1
	32.860	L3141	TR1		31.24	R3141	TR2
	32.860	L3142	TR2		31.388	R3142	TR1
	32.868	L3143	TR1		31.402	R3143	TR1
	32.878	L3144	TR1		31.434	R3144	TR1
	32.882	L3145	TR3		31.436	R3145	TR2
	32.890	L3146	TR1		31.486	R3146	TR4
	32.918	L3147	TR4		31.496	R3147	BAMBOO
	33.020	L3148	TR3		31.496	R3148	BAMBOO
	33.032	L3149	TR1		31.498	R3149	BAMBOO
	33.044	L3150	TR1		31.498	R3150	BAMBOO
	33.044	L3151	TR1		31.504	R3151	BAMBOO
	33.046	L3152	TR1		31.504	R3152	BAMBOO
	33.046	L3153	TR1		31.506	R3153	BAMBOO
	33.046	L3154	TR1		31.512	R3154	TR2
	33.046	L3155	TR1		31.574	R3155	TR1
	33.046	L3156	TR1		31.6	R3156	TR1
	33.048	L3157	TR4		31.632	R3157	TR2
	33.050	L3158	TR1		31.646	R3158	TR1
	33.056	L3159	TR2		31.72	R3159	BAMBOO
	33.056	L3160	TR2		31.722	R3160	BAMBOO
	33.058	L3161	TR1		31.724	R3161	BAMBOO
33.00 km to 34.00 km				31.00 km to 32.00 km			

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	33.060	L3162	TR2		31.726	R3162	BAMBOO
	33.062	L3163	TR1		31.728	R3163	BAMBOO
	33.062	L3164	TR1		31.752	R3164	TR1
	33.064	L3165	TR3		31.78	R3165	TR2
	33.072	L3166	TR1		31.862	R3166	TR2
	33.074	L3167	TR3		31.866	R3167	TR2
	33.092	L3168	TR2		31.982	R3168	TR1
	33.122	L3169	TR3		31.998	R3169	TR2
	33.234	L3170	TR4	32.00 km to 33.00 km	32.088	R3170	TR1
	33.272	L3171	TR4		32.124	R3171	TR1
	33.278	L3172	TR4		32.146	R3172	TR2
	33.296	L3173	TR4		32.208	R3173	TR2
	33.340	L3174	TR4		32.212	R3174	TR2
	33.532	L3175	TR1		32.214	R3175	TR2
	33.570	L3176	TR1		32.26	R3176	TR2
	33.584	L3177	TR1		32.294	R3177	TR2
	33.584	L3178	TR3		32.316	R3178	TR2
	33.584	L3179	TR3		32.336	R3179	TR1
	33.602	L3180	TR1		32.344	R3180	TR1
	33.612	L3181	TR1		32.346	R3181	TR1
	33.652	L3182	TR4		32.356	R3182	TR2
	33.680	L3183	TR3		32.374	R3183	TR1
	33.684	L3184	TR1		32.376	R3184	TR2
	33.704	L3185	TR1		32.4	R3185	TR2
	33.712	L3186	TR1		32.406	R3186	TR1
	33.724	L3187	TR2		32.418	R3187	TR3
	33.728	L3188	TR1		32.484	R3188	TR1
	33.728	L3189	TR1		32.504	R3189	TR1
	33.736	L3190	TR1		32.524	R3190	TR1
	33.736	L3191	TR1		32.544	R3191	TR2
	33.740	L3192	TR1		32.606	R3192	TR1
	33.740	L3193	TR1		32.608	R3193	TR1
	33.742	L3194	TR1		32.61	R3194	TR1
	33.746	L3195	TR1		32.61	R3195	TR1
	33.746	L3196	TR1		32.61	R3196	TR1
	33.748	L3197	TR1		32.61	R3197	TR1
	33.750	L3198	TR1		32.612	R3198	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	33.750	L3199	TR1		32.612	R3199	TR1
	33.752	L3200	TR1		32.624	R3200	TR3
	33.760	L3201	TR1		32.626	R3201	TR1
	33.778	L3202	TR1		32.626	R3202	TR1
	33.778	L3203	TR1		32.628	R3203	TR1
	33.782	L3204	TR1		32.632	R3204	TR1
	33.790	L3205	TR3		32.632	R3205	TR2
	33.790	L3206	TR2		32.64	R3206	TR1
	33.802	L3207	TR2		32.71	R3207	TR2
	33.814	L3208	TR4		32.758	R3208	TR1
	33.822	L3209	TR1		32.76	R3209	TR1
	33.822	L3210	TR1		32.762	R3210	TR1
	33.822	L3211	TR1		32.784	R3211	TR1
	33.824	L3212	TR1		32.798	R3212	TR1
	33.824	L3213	TR1		32.798	R3213	TR1
	33.838	L3214	TR1		32.808	R3214	TR1
	33.838	L3215	TR1		32.816	R3215	TR1
	33.838	L3216	TR1		32.816	R3216	TR3
	33.838	L3217	TR1		32.818	R3217	TR4
	33.838	L3218	TR1		32.83	R3218	TR2
	33.846	L3219	TR2		32.836	R3219	TR3
	33.894	L3220	TR1		32.862	R3220	TR1
	33.900	L3221	TR1		32.862	R3221	TR1
	33.904	L3222	TR1		32.864	R3222	TR1
	33.906	L3223	TR2		32.868	R3223	TR1
	33.916	L3224	TR1		32.874	R3224	TR2
	33.924	L3225	TR1		32.874	R3225	TR2
	33.924	L3226	TR3		32.924	R3226	TR1
	33.926	L3227	TR1		32.958	R3227	TR2
	33.926	L3228	TR2		33.11	R3228	TR4
	33.930	L3229	TR1		33.11	R3229	TR1
	33.934	L3230	TR1		33.11	R3230	TR1
	33.934	L3231	TR1		33.11	R3231	TR1
	33.938	L3232	TR1	33.00 km to 34.00 km	33.11	R3232	TR1
	33.938	L3233	TR1		33.11	R3233	TR3
	33.940	L3234	TR2		33.11	R3234	TR3
	33.944	L3235	TR1		33.11	R3235	TR3
	33.950	L3236	TR2		33.11	R3236	TR2
	33.956	L3237	TR1		33.112	R3237	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	33.958	L3238	TR1		33.114	R3238	TR4
	33.962	L3239	TR1		33.114	R3239	TR3
	33.964	L3240	TR1		33.13	R3240	TR4
	33.964	L3241	TR1		33.14	R3241	TR3
	33.978	L3242	TR1		33.264	R3242	TR3
	33.978	L3243	TR1		33.42	R3243	TR2
	33.980	L3244	TR1		33.492	R3244	TR1
	33.982	L3245	TR1		33.492	R3245	TR1
	33.982	L3246	TR1		33.492	R3246	TR1
	33.982	L3247	TR1		33.494	R3247	TR1
	33.990	L3248	TR1		33.494	R3248	TR1
	33.994	L3249	TR1		33.496	R3249	TR1
	33.998	L3250	TR1		33.498	R3250	TR1
34.00 km to 35.00 km	34.004	L3251	TR1		33.516	R3251	TR1
	34.008	L3252	TR1		33.52	R3252	TR4
	34.012	L3253	TR1		33.524	R3253	TR1
	34.014	L3254	TR1		33.566	R3254	TR1
	34.018	L3255	TR1		33.57	R3255	TR2
	34.022	L3256	TR1		33.574	R3256	TR2
	34.024	L3257	TR1		33.58	R3257	TR1
	34.026	L3258	TR1		33.582	R3258	TR2
	34.028	L3259	TR1		33.582	R3259	TR2
	34.030	L3260	TR4		33.59	R3260	TR2
	34.034	L3261	TR1		33.594	R3261	TR1
	34.036	L3262	TR1		33.606	R3262	TR1
	34.036	L3263	TR1		33.618	R3263	TR1
	34.036	L3264	TR1		33.618	R3264	TR2
	34.038	L3265	TR1		33.642	R3265	TR1
	34.038	L3266	TR1		33.646	R3266	TR1
	34.040	L3267	TR1		33.646	R3267	TR3
	34.042	L3268	TR1		33.648	R3268	TR1
	34.042	L3269	TR1		33.648	R3269	TR1
	34.044	L3270	TR1		33.656	R3270	TR1
	34.046	L3271	TR1		33.656	R3271	TR1
	34.048	L3272	TR1		33.664	R3272	TR1
	34.050	L3273	TR1		33.664	R3273	TR1
	34.050	L3274	TR1		33.664	R3274	TR1
	34.054	L3275	TR1		33.666	R3275	TR1
	34.066	L3276	TR1		33.682	R3276	TR4

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	34.072	L3277	TR1		33.682	R3277	TR1
	34.074	L3278	TR1		33.682	R3278	TR2
	34.074	L3279	TR1		33.684	R3279	TR1
	34.074	L3280	TR1		33.684	R3280	TR1
	34.074	L3281	TR1		33.686	R3281	TR1
	34.076	L3282	TR1		33.686	R3282	TR1
	34.076	L3283	TR1		33.69	R3283	TR1
	34.078	L3284	TR1		33.69	R3284	TR1
	34.080	L3285	TR1		33.69	R3285	TR2
	34.080	L3286	TR1		33.69	R3286	TR2
	34.082	L3287	TR1		33.692	R3287	TR1
	34.082	L3288	TR1		33.692	R3288	TR1
	34.084	L3289	TR1		33.692	R3289	TR1
	34.084	L3290	TR1		33.692	R3290	TR1
	34.084	L3291	TR1		33.692	R3291	TR2
	34.086	L3292	TR1		33.692	R3292	TR2
	34.086	L3293	TR1		33.696	R3293	TR1
	34.086	L3294	TR1		33.698	R3294	TR3
	34.086	L3295	TR1		33.704	R3295	TR3
	34.086	L3296	TR1		33.706	R3296	TR3
	34.088	L3297	TR1		33.706	R3297	TR2
	34.088	L3298	TR1		33.708	R3298	TR3
	34.088	L3299	TR1		33.712	R3299	TR3
	34.088	L3300	TR1		33.718	R3300	TR1
	34.094	L3301	TR1		33.724	R3301	TR1
	34.094	L3302	TR1		33.724	R3302	TR1
	34.094	L3303	TR1		33.728	R3303	TR2
	34.094	L3304	TR1		33.73	R3304	TR4
	34.094	L3305	TR1		33.734	R3305	TR3
	34.096	L3306	TR1		33.734	R3306	TR2
	34.096	L3307	TR1		33.744	R3307	TR3
	34.096	L3308	TR1		33.746	R3308	TR3
	34.096	L3309	TR1		33.754	R3309	TR2
	34.096	L3310	TR1		33.754	R3310	TR1
	34.096	L3311	TR1		33.754	R3311	TR1
	34.096	L3312	TR2		33.754	R3312	TR1
	34.098	L3313	TR1		33.758	R3313	TR1
	34.098	L3314	TR1		33.758	R3314	TR1
	34.098	L3315	TR1		33.76	R3315	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	34.098	L3316	TR1		33.774	R3316	TR1
	34.100	L3317	TR1		33.78	R3317	TR2
	34.100	L3318	TR1		33.782	R3318	TR2
	34.100	L3319	TR1		33.784	R3319	TR2
	34.100	L3320	TR1		33.814	R3320	TR2
	34.100	L3321	TR1		33.814	R3321	TR1
	34.104	L3322	TR1		33.854	R3322	TR1
	34.106	L3323	TR1		33.866	R3323	TR1
	34.106	L3324	TR1		33.866	R3324	TR1
	34.106	L3325	TR1		33.872	R3325	TR2
	34.106	L3326	TR1		33.876	R3326	TR4
	34.110	L3327	TR1		33.882	R3327	TR3
	34.120	L3328	TR2		33.886	R3328	TR4
	34.132	L3329	TR1		33.888	R3329	TR1
	34.134	L3330	TR1		33.892	R3330	TR4
	34.134	L3331	TR1		33.892	R3331	TR1
	34.134	L3332	TR1		33.912	R3332	TR1
	34.136	L3333	TR1		33.914	R3333	TR4
	34.136	L3334	TR1		33.916	R3334	TR1
	34.138	L3335	TR1		33.916	R3335	TR1
	34.140	L3336	TR1		33.918	R3336	TR1
	34.140	L3337	TR1		33.92	R3337	TR1
	34.140	L3338	TR1		33.926	R3338	TR1
	34.142	L3339	TR1		33.932	R3339	TR1
	34.142	L3340	TR1		33.932	R3340	TR1
	34.144	L3341	TR1		33.932	R3341	TR1
	34.144	L3342	TR1		33.936	R3342	TR1
	34.144	L3343	TR1		33.936	R3343	TR1
	34.144	L3344	TR1		33.936	R3344	TR1
	34.144	L3345	TR1		33.936	R3345	TR1
	34.144	L3346	TR1		33.938	R3346	TR4
	34.144	L3347	TR2		33.938	R3347	TR1
	34.146	L3348	TR1		33.938	R3348	TR1
	34.146	L3349	TR1		33.94	R3349	TR1
	34.146	L3350	TR1		33.94	R3350	TR1
	34.148	L3351	TR1		33.94	R3351	TR1
	34.148	L3352	TR1		33.942	R3352	TR1
	34.152	L3353	TR2		33.942	R3353	TR1
	34.158	L3354	TR1		33.944	R3354	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	34.184	L3355	TR1		33.944	R3355	TR1
	34.190	L3356	TR1		33.944	R3356	TR1
	34.210	L3357	TR3		33.95	R3357	TR1
	34.226	L3358	TR4		33.95	R3358	TR1
	34.234	L3359	TR4		33.952	R3359	TR1
	34.250	L3360	TR1		33.952	R3360	TR1
	34.256	L3361	TR1		33.952	R3361	TR3
	34.260	L3362	TR1		33.954	R3362	TR1
	34.264	L3363	TR1		33.956	R3363	TR1
	34.274	L3364	TR1		33.956	R3364	TR1
	34.286	L3365	TR1		33.956	R3365	TR1
	34.288	L3366	TR1		33.956	R3366	TR1
	34.290	L3367	TR2		33.956	R3367	TR1
	34.292	L3368	TR1		33.958	R3368	TR1
	34.302	L3369	TR4		33.958	R3369	TR1
	34.316	L3370	TR1		33.958	R3370	TR1
	34.320	L3371	TR1		33.958	R3371	TR1
	34.322	L3372	TR1		33.958	R3372	TR1
	34.322	L3373	TR1		33.958	R3373	TR1
	34.322	L3374	TR1		33.96	R3374	TR1
	34.322	L3375	TR1		33.96	R3375	TR1
	34.324	L3376	TR1		33.96	R3376	TR1
	34.326	L3377	TR1		33.962	R3377	TR1
	34.328	L3378	TR1		33.962	R3378	TR1
	34.328	L3379	TR1		33.964	R3379	TR1
	34.328	L3380	TR1		33.978	R3380	TR1
	34.334	L3381	TR1		33.978	R3381	TR1
	34.334	L3382	TR1		33.978	R3382	TR1
	34.334	L3383	TR1		33.978	R3383	TR1
	34.334	L3384	TR1		33.98	R3384	TR1
	34.494	L3385	TR1		33.98	R3385	TR1
	34.496	L3386	TR1		33.98	R3386	TR1
	34.498	L3387	TR1		33.98	R3387	TR1
	34.500	L3388	TR1		33.98	R3388	TR1
	34.508	L3389	TR1		33.98	R3389	TR1
	34.650	L3390	TR1		33.98	R3390	TR1
	34.674	L3391	TR1		33.98	R3391	TR1
	34.674	L3392	TR1		33.982	R3392	TR1
	34.676	L3393	TR1		33.982	R3393	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	34.676	L3394	TR1		33.982	R3394	TR1
	34.676	L3395	TR1		33.982	R3395	TR1
	34.676	L3396	TR1		33.982	R3396	TR1
	34.678	L3397	TR1		33.982	R3397	TR1
	34.678	L3398	TR1		33.982	R3398	TR1
	34.678	L3399	TR1		33.984	R3399	TR1
	34.678	L3400	TR1		33.984	R3400	TR1
	34.680	L3401	TR1		33.984	R3401	TR1
	34.682	L3402	TR1		33.984	R3402	TR1
	34.682	L3403	TR1		33.984	R3403	TR1
	34.682	L3404	TR1		33.984	R3404	TR1
	34.692	L3405	TR1		33.984	R3405	TR1
	34.692	L3406	TR1		33.984	R3406	TR1
	34.694	L3407	TR1		33.984	R3407	TR1
	34.694	L3408	TR1		33.984	R3408	TR1
	34.694	L3409	TR2		33.986	R3409	TR4
	34.696	L3410	TR1		33.986	R3410	TR1
	34.698	L3411	TR1		33.986	R3411	TR1
	34.702	L3412	TR1		33.986	R3412	TR1
	34.704	L3413	TR1		33.986	R3413	TR1
	34.704	L3414	TR1		33.986	R3414	TR1
	34.706	L3415	TR2		33.986	R3415	TR1
	34.708	L3416	TR1		33.986	R3416	TR1
	34.718	L3417	TR2		33.986	R3417	TR1
	34.722	L3418	TR1		33.986	R3418	TR1
	34.722	L3419	TR2		33.986	R3419	TR1
	34.728	L3420	TR1		33.986	R3420	TR1
	34.730	L3421	TR1		33.988	R3421	TR4
	34.730	L3422	TR1		33.988	R3422	TR1
	34.738	L3423	TR2		33.988	R3423	TR1
	34.742	L3424	TR1		33.988	R3424	TR1
	34.744	L3425	TR2		33.99	R3425	TR1
	34.750	L3426	TR2		33.99	R3426	TR1
	34.750	L3427	TR1		33.99	R3427	TR1
	34.750	L3428	TR1		33.99	R3428	TR1
	34.766	L3429	TR1		33.992	R3429	TR1
	34.766	L3430	TR1		33.992	R3430	TR1
	34.768	L3431	TR1		33.992	R3431	TR1
	34.770	L3432	TR3		33.992	R3432	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	34.770	L3433	TR2		33.992	R3433	TR1
	34.778	L3434	TR2		33.992	R3434	TR1
	34.790	L3435	TR1		33.992	R3435	TR1
	34.850	L3436	TR1		33.992	R3436	TR1
	34.852	L3437	TR2		33.994	R3437	TR1
	34.878	L3438	TR1		33.998	R3438	TR1
	34.880	L3439	TR1		33.998	R3439	TR1
	34.880	L3440	TR1		33.998	R3440	TR1
	34.880	L3441	TR1		33.998	R3441	TR1
	34.892	L3442	TR1		33.998	R3442	TR1
	34.892	L3443	TR2		33.998	R3443	TR1
	34.898	L3444	TR1		34	R3444	TR4
	34.900	L3445	TR1		34	R3445	TR1
	34.922	L3446	TR2		34	R3446	TR1
	34.926	L3447	TR1		34	R3447	TR1
	34.932	L3448	TR2		34.002	R3448	TR4
	34.938	L3449	TR1		34.002	R3449	TR1
	34.938	L3450	TR1		34.002	R3450	TR1
	34.938	L3451	TR2		34.002	R3451	TR1
	34.940	L3452	TR1		34.002	R3452	TR1
	34.940	L3453	TR1		34.002	R3453	TR1
	34.940	L3454	TR1		34.002	R3454	TR1
	34.942	L3455	TR1		34.018	R3455	TR3
	34.942	L3456	TR3		34.022	R3456	TR3
	34.964	L3457	TR1	34.00 km to 35.00 km	34.038	R3457	TR4
	34.966	L3458	TR2		34.066	R3458	TR3
	34.970	L3459	TR2		34.068	R3459	TR3
	34.972	L3460	TR2		34.074	R3460	TR1
	34.976	L3461	TR1		34.078	R3461	TR1
	34.978	L3462	TR1		34.08	R3462	TR4
	34.980	L3463	TR1		34.08	R3463	TR1
	34.982	L3464	TR1		34.08	R3464	TR1
	34.982	L3465	TR1		34.082	R3465	TR1
	34.986	L3466	TR1		34.082	R3466	TR1
	34.986	L3467	TR1		34.084	R3467	TR1
35.00 km to 36.00 km	35.008	L3468	TR2		34.084	R3468	TR1
	35.012	L3469	TR3		34.084	R3469	TR1
	35.012	L3470	TR3		34.084	R3470	TR1
	35.016	L3471	TR4		34.084	R3471	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	35.016	L3472	TR1		34.084	R3472	TR1
	35.016	L3473	TR1		34.086	R3473	TR1
	35.016	L3474	TR1		34.086	R3474	TR1
	35.018	L3475	TR2		34.088	R3475	TR1
	35.020	L3476	TR1		34.09	R3476	TR1
	35.020	L3477	TR1		34.09	R3477	TR1
	35.038	L3478	TR3		34.094	R3478	TR1
	35.038	L3479	TR2		34.094	R3479	TR1
	35.042	L3480	TR3		34.094	R3480	TR1
	35.044	L3481	TR1		34.094	R3481	TR1
	35.046	L3482	TR1		34.094	R3482	TR1
	35.048	L3483	TR1		34.094	R3483	TR1
	35.048	L3484	TR1		34.096	R3484	TR1
	35.050	L3485	TR1		34.096	R3485	TR1
	35.050	L3486	TR3		34.096	R3486	TR1
	35.052	L3487	TR1		34.096	R3487	TR1
	35.054	L3488	TR1		34.096	R3488	TR1
	35.056	L3489	TR1		34.096	R3489	TR1
	35.058	L3490	TR1		34.098	R3490	TR1
	35.058	L3491	TR1		34.098	R3491	TR1
	35.060	L3492	TR1		34.1	R3492	TR1
	35.062	L3493	TR1		34.1	R3493	TR1
	35.096	L3494	TR1		34.102	R3494	TR1
	35.098	L3495	TR1		34.102	R3495	TR1
	35.098	L3496	TR3		34.104	R3496	TR1
	35.100	L3497	TR4		34.104	R3497	TR1
	35.100	L3498	TR2		34.104	R3498	TR1
	35.100	L3499	TR2		34.106	R3499	TR1
	35.102	L3500	TR3		34.106	R3500	TR1
	35.104	L3501	TR1		34.108	R3501	TR3
	35.108	L3502	TR4		34.11	R3502	TR1
	35.110	L3503	TR1		34.11	R3503	TR1
	35.112	L3504	TR1		34.112	R3504	TR1
	35.114	L3505	TR1		34.112	R3505	TR1
	35.114	L3506	TR3		34.112	R3506	TR1
	35.118	L3507	TR1		34.12	R3507	TR2
	35.120	L3508	TR1		34.13	R3508	TR1
	35.120	L3509	TR1		34.13	R3509	TR1
	35.120	L3510	TR3		34.13	R3510	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	35.120	L3511	TR2		34.13	R3511	TR1
	35.126	L3512	TR1		34.132	R3512	TR1
	35.128	L3513	TR1		34.144	R3513	TR2
	35.130	L3514	TR1		34.146	R3514	TR2
	35.130	L3515	TR1		34.158	R3515	TR1
	35.130	L3516	TR1		34.168	R3516	TR1
	35.132	L3517	TR1		34.172	R3517	TR1
	35.134	L3518	TR1		34.182	R3518	TR1
	35.134	L3519	TR1		34.192	R3519	TR1
	35.134	L3520	TR1		34.194	R3520	TR1
	35.134	L3521	TR2		34.232	R3521	TR1
	35.136	L3522	TR1		34.234	R3522	TR1
	35.136	L3523	TR1		34.252	R3523	TR4
	35.138	L3524	TR1		34.27	R3524	TR1
	35.138	L3525	TR1		34.318	R3525	TR4
	35.138	L3526	TR1		34.324	R3526	TR1
	35.138	L3527	TR1		34.324	R3527	TR1
	35.140	L3528	TR1		34.326	R3528	TR1
	35.140	L3529	TR1		34.326	R3529	TR1
	35.140	L3530	TR1		34.326	R3530	TR1
	35.140	L3531	TR1		34.326	R3531	TR1
	35.140	L3532	TR1		34.326	R3532	TR1
	35.142	L3533	TR1		34.326	R3533	TR1
	35.142	L3534	TR3		34.326	R3534	TR1
	35.144	L3535	TR1		34.326	R3535	TR1
	35.144	L3536	TR1		34.326	R3536	TR1
	35.144	L3537	TR1		34.326	R3537	TR1
	35.144	L3538	TR1		34.326	R3538	TR1
	35.158	L3539	TR1		34.326	R3539	TR1
	35.174	L3540	TR2		34.326	R3540	TR1
	35.176	L3541	TR1		34.328	R3541	TR1
	35.398	L3542	TR2		34.328	R3542	TR1
	35.474	L3543	TR1		34.328	R3543	TR1
	35.714	L3544	TR1		34.328	R3544	TR1
	35.714	L3545	TR1		34.328	R3545	TR1
	35.724	L3546	TR1		34.338	R3546	TR4
	35.726	L3547	TR1		34.344	R3547	TR1
	35.726	L3548	TR1		34.346	R3548	TR1
	35.726	L3549	TR1		34.348	R3549	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	35.738	L3550	TR1		34.348	R3550	TR1
	35.738	L3551	TR1		34.356	R3551	TR3
	35.738	L3552	TR2		34.36	R3552	TR1
	35.740	L3553	TR2		34.362	R3553	TR1
	35.752	L3554	TR1		34.362	R3554	TR3
	35.968	L3555	TR1		34.372	R3555	TR2
36.00 km to 37.00 km	36.062	L3556	TR1		34.382	R3556	TR4
	36.224	L3557	TR1		34.382	R3557	TR1
	36.290	L3558	TR2		34.382	R3558	TR1
	36.298	L3559	TR3		34.382	R3559	TR1
	36.318	L3560	TR2		34.382	R3560	TR1
	36.320	L3561	TR2		34.382	R3561	TR1
	36.324	L3562	TR2		34.382	R3562	TR1
	36.326	L3563	TR2		34.382	R3563	TR2
	36.376	L3564	TR2		34.384	R3564	TR1
	36.382	L3565	TR1		34.384	R3565	TR1
	36.390	L3566	TR2		34.384	R3566	TR1
	36.392	L3567	TR2		34.384	R3567	TR1
	36.402	L3568	TR1		34.384	R3568	TR1
	36.404	L3569	TR1		34.384	R3569	TR2
	36.404	L3570	TR1		34.384	R3570	TR2
	36.410	L3571	TR1		34.384	R3571	TR2
	36.412	L3572	TR1		34.384	R3572	TR2
	36.414	L3573	TR1		34.384	R3573	TR2
	36.416	L3574	TR1		34.386	R3574	TR2
	36.418	L3575	TR1		34.39	R3575	TR1
	36.418	L3576	TR2		34.39	R3576	TR1
	36.420	L3577	TR1		34.39	R3577	TR1
	36.422	L3578	TR1		34.392	R3578	TR2
	36.432	L3579	TR1		34.392	R3579	TR1
	36.432	L3580	TR1		34.392	R3580	TR1
	36.466	L3581	TR1		34.392	R3581	TR1
	36.508	L3582	TR1		34.392	R3582	TR1
	36.520	L3583	TR1		34.394	R3583	TR1
	36.524	L3584	TR1		34.394	R3584	TR1
	36.540	L3585	TR1		34.396	R3585	TR1
	36.610	L3586	TR2		34.396	R3586	TR1
	36.612	L3587	TR1		34.398	R3587	TR1
	36.632	L3588	TR1		34.398	R3588	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	36.640	L3589	TR2		34.404	R3589	TR1
	36.648	L3590	TR2		34.404	R3590	TR1
	36.648	L3591	TR2		34.406	R3591	TR2
	36.664	L3592	TR4		34.408	R3592	TR1
	36.694	L3593	TR2		34.408	R3593	TR2
	36.776	L3594	TR1		34.41	R3594	TR1
	36.776	L3595	TR2		34.41	R3595	TR1
	36.778	L3596	TR1		34.412	R3596	TR1
	36.788	L3597	TR2		34.424	R3597	TR1
	36.794	L3598	TR2		34.424	R3598	TR1
	36.846	L3599	TR4		34.426	R3599	TR4
	36.864	L3600	TR2		34.426	R3600	TR1
	36.888	L3601	TR2		34.426	R3601	TR1
	36.888	L3602	TR2		34.428	R3602	TR2
	36.906	L3603	TR2		34.43	R3603	TR1
	36.912	L3604	TR1		34.444	R3604	TR2
	36.922	L3605	TR1		34.444	R3605	TR1
	36.936	L3606	TR1		34.444	R3606	TR1
	36.948	L3607	TR2		34.446	R3607	TR1
	36.954	L3608	TR1		34.446	R3608	TR1
	36.956	L3609	TR2		34.448	R3609	TR1
	36.960	L3610	TR1		34.448	R3610	TR1
	36.992	L3611	TR4		34.448	R3611	TR1
37.00 km to 38.00 km	37.078	L3612	TR2		34.45	R3612	TR1
	37.124	L3613	TR2		34.45	R3613	TR1
	37.178	L3614	TR1		34.45	R3614	TR1
	37.180	L3615	TR1		34.452	R3615	TR1
	37.186	L3616	TR3		34.452	R3616	TR1
	37.192	L3617	TR2		34.452	R3617	TR1
	37.202	L3618	TR2		34.454	R3618	TR1
	37.214	L3619	TR2		34.454	R3619	TR1
	37.292	L3620	TR2		34.454	R3620	TR1
	37.302	L3621	TR2		34.456	R3621	TR1
	37.304	L3622	TR2		34.464	R3622	TR1
	37.338	L3623	TR2		34.464	R3623	TR1
	37.338	L3624	TR2		34.464	R3624	TR1
	37.348	L3625	TR1		34.466	R3625	TR1
	37.362	L3626	TR2		34.482	R3626	TR1
	37.376	L3627	TR1		34.486	R3627	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	37.392	L3628	TR1		34.504	R3628	TR1
	37.400	L3629	TR1		34.508	R3629	TR4
	37.416	L3630	TR1		34.512	R3630	TR2
	37.418	L3631	TR1		34.522	R3631	TR1
	37.426	L3632	TR1		34.522	R3632	TR2
	37.440	L3633	TR1		34.524	R3633	TR1
	37.448	L3634	TR2		34.526	R3634	TR4
	37.450	L3635	TR1		34.526	R3635	TR1
	37.452	L3636	TR1		34.528	R3636	TR1
	37.456	L3637	TR1		34.528	R3637	TR1
	37.458	L3638	TR1		34.528	R3638	TR1
	37.462	L3639	TR1		34.53	R3639	TR3
	37.514	L3640	TR2		34.53	R3640	TR3
	37.556	L3641	TR2		34.534	R3641	TR1
	37.570	L3642	TR1		34.536	R3642	TR1
	37.574	L3643	TR1		34.538	R3643	TR1
	37.580	L3644	TR1		34.55	R3644	TR3
	37.582	L3645	TR1		34.556	R3645	TR4
	37.592	L3646	TR1		34.556	R3646	TR1
	37.670	L3647	BAMBOO		34.558	R3647	TR3
	37.670	L3648	BAMBOO		34.582	R3648	TR1
	37.670	L3649	BAMBOO		34.582	R3649	TR1
	37.672	L3650	BAMBOO		34.584	R3650	TR1
	37.674	L3651	BAMBOO		34.596	R3651	TR1
	37.680	L3652	TR2		34.604	R3652	TR1
	37.682	L3653	TR1		34.606	R3653	TR1
	37.698	L3654	TR1		34.606	R3654	TR1
	37.706	L3655	TR2		34.634	R3655	TR4
	37.710	L3656	TR1		34.64	R3656	TR1
	37.718	L3657	TR1		34.642	R3657	TR1
	37.718	L3658	TR1		34.644	R3658	TR1
	37.718	L3659	TR2		34.644	R3659	TR2
	37.720	L3660	TR1		34.646	R3660	TR1
	37.744	L3661	TR3		34.656	R3661	TR1
	37.746	L3662	TR1		34.656	R3662	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	37.748	L3663	TR1		34.656	R3663	TR1
	37.748	L3664	TR1		34.656	R3664	TR1
	37.748	L3665	TR1		34.656	R3665	TR1
	37.748	L3666	TR1		34.658	R3666	TR1
	37.748	L3667	TR1		34.658	R3667	TR1
	37.750	L3668	TR2		34.658	R3668	TR1
	37.756	L3669	TR4		34.658	R3669	TR1
	37.756	L3670	TR2		34.658	R3670	TR1
	37.756	L3671	TR2		34.662	R3671	TR1
	37.760	L3672	TR1		34.672	R3672	TR1
	37.760	L3673	TR1		34.674	R3673	TR1
	37.762	L3674	TR1		34.674	R3674	TR1
	37.766	L3675	TR2		34.676	R3675	TR1
	37.768	L3676	TR4		34.676	R3676	TR1
	37.774	L3677	TR3		34.676	R3677	TR1
	37.776	L3678	TR1		34.678	R3678	TR3
	37.784	L3679	TR3		34.68	R3679	TR1
	37.788	L3680	TR2		34.68	R3680	TR1
	37.790	L3681	TR1		34.68	R3681	TR1
	37.792	L3682	TR1		34.68	R3682	TR1
	37.794	L3683	TR1		34.68	R3683	TR1
	37.798	L3684	TR1		34.682	R3684	TR1
	37.798	L3685	TR1		34.688	R3685	TR1
	37.800	L3686	TR1		34.692	R3686	TR1
	37.800	L3687	TR1		34.696	R3687	TR1
	37.832	L3688	TR1		34.7	R3688	TR1
	37.836	L3689	TR1		34.7	R3689	TR1
	37.838	L3690	TR1		34.702	R3690	TR1
	37.840	L3691	TR1		34.704	R3691	TR1
	37.844	L3692	TR3		34.706	R3692	TR1
	37.844	L3693	TR2		34.706	R3693	TR1
	37.852	L3694	TR2		34.722	R3694	TR1
	37.854	L3695	TR1		34.722	R3695	TR1
	37.856	L3696	TR1		34.722	R3696	TR3
	37.862	L3697	TR4		34.724	R3697	TR1
	37.866	L3698	TR1		34.724	R3698	TR1
38.00 km to 39.00 km	38.038	L3699	TR1		34.724	R3699	TR1
	38.038	L3700	TR1		34.724	R3700	TR1
	38.038	L3701	TR1		34.724	R3701	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	38.038	L3702	TR1		34.748	R3702	TR1
	38.040	L3703	TR1		34.774	R3703	TR1
	38.042	L3704	TR1		34.776	R3704	TR1
	38.044	L3705	TR1		34.804	R3705	TR1
	38.044	L3706	TR1		34.804	R3706	TR1
	38.050	L3707	TR1		34.814	R3707	TR1
	38.060	L3708	TR2		34.844	R3708	TR2
	38.062	L3709	TR1		34.846	R3709	TR2
	38.070	L3710	TR3		34.926	R3710	TR1
	38.072	L3711	TR2		34.926	R3711	TR1
	38.072	L3712	TR2		34.926	R3712	TR1
	38.074	L3713	TR2		34.928	R3713	TR1
	38.076	L3714	TR1		34.928	R3714	TR1
	38.076	L3715	TR1		34.928	R3715	TR1
	38.078	L3716	TR1		34.928	R3716	TR1
	38.084	L3717	TR1		34.928	R3717	TR1
	38.092	L3718	TR1		34.93	R3718	TR1
	38.094	L3719	TR1		34.93	R3719	TR1
	38.102	L3720	TR2		34.93	R3720	TR1
	38.110	L3721	TR1		34.93	R3721	TR1
	38.114	L3722	TR1		34.93	R3722	TR1
	38.128	L3723	TR2		34.932	R3723	TR1
	38.128	L3724	TR2		34.932	R3724	TR1
	38.132	L3725	TR1		34.932	R3725	TR1
	38.154	L3726	TR1		34.932	R3726	TR1
	38.166	L3727	TR2		34.934	R3727	TR1
	38.168	L3728	TR1		34.934	R3728	TR1
	38.168	L3729	TR1		34.934	R3729	TR1
	38.184	L3730	TR1		34.934	R3730	TR1
	38.188	L3731	TR1		34.934	R3731	TR1
	38.190	L3732	TR1		34.934	R3732	TR1
	38.196	L3733	TR1		34.936	R3733	TR1
	38.198	L3734	TR1		34.936	R3734	TR1
	38.200	L3735	TR1		34.936	R3735	TR1
	38.200	L3736	TR2		34.936	R3736	TR1
	38.202	L3737	TR1		34.938	R3737	TR1
	38.210	L3738	TR1		34.938	R3738	TR1
	38.222	L3739	TR1		34.938	R3739	TR1
	38.222	L3740	TR1		34.938	R3740	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	38.224	L3741	TR1		34.938	R3741	TR1
	38.224	L3742	TR1		34.94	R3742	TR1
	38.224	L3743	TR1		34.94	R3743	TR1
	38.226	L3744	TR1		34.94	R3744	TR1
	38.226	L3745	TR1		34.942	R3745	TR1
	38.230	L3746	TR3		34.942	R3746	TR1
	38.264	L3747	TR1		34.942	R3747	TR1
	38.300	L3748	TR1		34.942	R3748	TR1
	38.382	L3749	BAMBOO		34.942	R3749	TR1
	38.390	L3750	BAMBOO		34.944	R3750	TR1
	38.408	L3751	TR2		34.944	R3751	TR1
	38.414	L3752	BAMBOO		34.944	R3752	TR1
	38.470	L3753	TR2		34.944	R3753	TR3
	38.510	L3754	TR3		34.946	R3754	TR1
	38.510	L3755	TR2		34.946	R3755	TR1
	38.514	L3756	TR1		34.946	R3756	TR1
	38.520	L3757	TR1		34.948	R3757	TR1
	38.522	L3758	TR1		34.948	R3758	TR1
	38.524	L3759	TR1		34.948	R3759	TR1
	38.526	L3760	TR2		34.948	R3760	TR1
	38.528	L3761	TR3		34.952	R3761	TR1
	38.528	L3762	TR2		34.954	R3762	TR1
	38.532	L3763	TR2		34.954	R3763	TR1
	38.538	L3764	TR1		34.954	R3764	TR1
	38.542	L3765	TR1		34.954	R3765	TR1
	38.544	L3766	TR1		34.956	R3766	TR1
	38.548	L3767	TR1		34.956	R3767	TR1
	38.568	L3768	TR4		34.956	R3768	TR1
	38.578	L3769	TR3		34.958	R3769	TR1
	38.582	L3770	TR1		34.958	R3770	TR1
	38.582	L3771	TR3		34.958	R3771	TR1
	38.586	L3772	TR1		34.96	R3772	TR1
	38.586	L3773	TR1		34.96	R3773	TR1
	38.588	L3774	TR1		34.962	R3774	TR1
	38.594	L3775	TR1		34.962	R3775	TR1
	38.594	L3776	TR1		34.966	R3776	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	38.594	L3777	TR2		34.968	R3777	TR1
	38.596	L3778	TR1		34.968	R3778	TR1
	38.598	L3779	TR1		35.02	R3779	TR4
	38.622	L3780	TR2		35.056	R3780	TR1
	38.658	L3781	TR1		35.056	R3781	TR1
	38.664	L3782	TR1		35.056	R3782	TR1
	38.668	L3783	TR1		35.056	R3783	TR2
	38.674	L3784	TR1		35.058	R3784	TR1
	38.674	L3785	TR1		35.058	R3785	TR1
	38.674	L3786	TR3		35.062	R3786	TR1
	38.676	L3787	TR1		35.062	R3787	TR1
	38.676	L3788	TR1		35.062	R3788	TR1
	38.682	L3789	TR1		35.064	R3789	TR2
	38.690	L3790	TR2		35.064	R3790	TR2
	38.698	L3791	TR1		35.068	R3791	TR1
	38.760	L3792	TR1		35.068	R3792	TR2
	38.766	L3793	TR2		35.072	R3793	TR1
	38.792	L3794	TR3		35.072	R3794	TR1
	39.176	L3795	TR2		35.082	R3795	TR1
	39.178	L3796	TR1		35.082	R3796	TR1
	39.192	L3797	TR1		35.084	R3797	TR1
	39.192	L3798	TR2		35.084	R3798	TR1
	39.268	L3799	TR3		35.09	R3799	TR1
	39.272	L3800	TR1		35.092	R3800	TR1
	39.294	L3801	TR2		35.092	R3801	TR1
	39.294	L3802	TR2		35.092	R3802	TR1
	39.296	L3803	TR2		35.094	R3803	TR1
	39.306	L3804	TR2		35.12	R3804	TR1
	39.308	L3805	TR2		35.12	R3805	TR1
	39.322	L3806	TR1		35.122	R3806	TR1
	39.322	L3807	TR2		35.122	R3807	TR1
	39.328	L3808	TR3		35.124	R3808	TR1
	39.342	L3809	TR2		35.124	R3809	TR1
	39.362	L3810	TR1		35.126	R3810	TR1
	39.362	L3811	TR1		35.134	R3811	TR1
	39.364	L3812	TR2		35.144	R3812	TR2
	39.364	L3813	TR1		35.154	R3813	TR1
	39.366	L3814	TR2		35.154	R3814	TR1
	39.366	L3815	TR3		35.154	R3815	TR1

39.00 km to 40.00 km

35.00 km to 36.00 km

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	39.368	L3816	TR1		35.154	R3816	TR1
	39.368	L3817	TR1		35.154	R3817	TR2
	39.368	L3818	TR1		35.156	R3818	TR1
	39.372	L3819	TR4		35.156	R3819	TR1
	39.378	L3820	TR4		35.158	R3820	TR1
	39.382	L3821	TR2		35.168	R3821	TR4
	39.396	L3822	TR2		35.168	R3822	TR1
	39.402	L3823	TR2		35.17	R3823	TR1
	39.414	L3824	TR2		35.17	R3824	TR1
	39.420	L3825	TR3		35.17	R3825	TR1
	39.422	L3826	TR3		35.172	R3826	TR1
	39.424	L3827	TR1		35.178	R3827	TR2
	39.424	L3828	TR1		35.182	R3828	TR3
	39.424	L3829	TR1		35.186	R3829	TR1
	39.434	L3830	TR1		35.192	R3830	TR2
	39.434	L3831	TR3		35.194	R3831	TR1
	39.434	L3832	TR2		35.194	R3832	TR1
	39.452	L3833	TR1		35.194	R3833	TR1
	39.452	L3834	TR2		35.196	R3834	TR1
	39.452	L3835	TR2		35.198	R3835	TR1
	39.454	L3836	TR2		35.198	R3836	TR1
	39.462	L3837	TR1		35.198	R3837	TR1
	39.464	L3838	TR2		35.2	R3838	TR1
	39.466	L3839	TR1		35.2	R3839	TR1
	39.468	L3840	TR1		35.2	R3840	TR1
	39.468	L3841	TR2		35.218	R3841	TR3
	39.472	L3842	TR2		35.256	R3842	TR1
	39.478	L3843	TR1		35.284	R3843	TR3
	39.496	L3844	TR1		35.39	R3844	TR2
	39.496	L3845	TR1		35.39	R3845	TR2
	39.506	L3846	TR3		35.39	R3846	TR2
	39.510	L3847	TR1		35.4	R3847	TR3
	39.512	L3848	TR2		35.402	R3848	TR2
	39.512	L3849	TR1		35.422	R3849	TR3
	39.516	L3850	TR1		35.44	R3850	TR4
	39.516	L3851	TR3		35.52	R3851	TR4
	39.522	L3852	TR2		35.664	R3852	TR3
	39.538	L3853	TR2		35.68	R3853	TR1
	39.682	L3854	TR1		35.682	R3854	TR4

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	39.738	L3855	TR3		35.682	R3855	TR1
	39.744	L3856	TR3		35.682	R3856	TR2
	39.784	L3857	TR1		35.702	R3857	TR1
	39.816	L3858	TR2		35.702	R3858	TR1
	39.836	L3859	TR4		35.704	R3859	TR4
	39.836	L3860	TR3		35.706	R3860	TR1
	39.836	L3861	TR3		35.706	R3861	TR3
	39.856	L3862	TR3		35.71	R3862	TR3
	39.856	L3863	TR3		35.718	R3863	TR4
	39.878	L3864	TR1		35.722	R3864	TR3
	39.882	L3865	TR3		35.74	R3865	TR2
	39.884	L3866	TR4		35.756	R3866	TR1
	39.884	L3867	TR3		35.756	R3867	TR2
	39.884	L3868	TR3		35.768	R3868	TR1
	39.888	L3869	TR3		35.806	R3869	TR4
	39.888	L3870	TR2		35.826	R3870	TR1
	39.888	L3871	TR2	36.00 km to 37.00 km	36.254	R3871	TR1
	39.896	L3872	TR3		36.286	R3872	TR1
	39.904	L3873	TR3		36.294	R3873	TR1
	39.910	L3874	TR3		36.296	R3874	TR2
	39.912	L3875	TR2		36.306	R3875	TR2
	39.990	L3876	TR1		36.312	R3876	TR2
40.00 km to 41.00 km	40.004	L3877	TR1		36.344	R3877	TR1
	40.006	L3878	TR1		36.346	R3878	TR1
	40.006	L3879	TR2		36.36	R3879	TR1
	40.018	L3880	TR3		36.398	R3880	TR1
	40.020	L3881	TR1		36.418	R3881	TR1
	40.020	L3882	TR2		36.448	R3882	TR1
	40.022	L3883	TR1		36.448	R3883	TR1
	40.028	L3884	BAMBOO		36.482	R3884	TR1
	40.032	L3885	TR3		36.67	R3885	TR3
	40.036	L3886	TR1		36.7	R3886	TR2
	40.042	L3887	TR1		36.742	R3887	TR2
	40.046	L3888	TR2		36.764	R3888	TR2
	40.056	L3889	TR1		36.818	R3889	TR2
	40.058	L3890	TR4		36.832	R3890	TR3
	40.058	L3891	TR1		36.882	R3891	TR3
	40.058	L3892	TR1		36.896	R3892	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	40.058	L3893	TR1		36.896	R3893	TR3
	40.058	L3894	TR2		36.906	R3894	TR2
	40.062	L3895	TR1		36.91	R3895	TR3
	40.062	L3896	TR1		36.912	R3896	TR2
	40.086	L3897	TR1		36.92	R3897	TR1
	40.118	L3898	TR1		36.93	R3898	TR1
	40.550	L3899	TR3		36.93	R3899	TR3
	40.572	L3900	TR1		36.948	R3900	TR3
	40.588	L3901	TR4		36.956	R3901	TR3
	40.598	L3902	TR2		36.966	R3902	TR3
	40.604	L3903	TR4		37.014	R3903	TR2
	40.610	L3904	TR4		37.016	R3904	TR3
	40.622	L3905	TR2		37.032	R3905	TR3
	40.628	L3906	TR1		37.048	R3906	TR3
	40.636	L3907	TR2		37.058	R3907	TR2
	40.654	L3908	TR4		37.058	R3908	TR2
	40.676	L3909	TR1		37.058	R3909	TR2
	40.680	L3910	TR1		37.064	R3910	TR2
	40.682	L3911	TR2		37.074	R3911	TR3
	40.700	L3912	TR2		37.102	R3912	TR2
	40.722	L3913	TR1		37.114	R3913	TR2
	40.726	L3914	TR2		37.118	R3914	TR2
	40.736	L3915	TR3		37.13	R3915	TR3
	40.744	L3916	TR4	37.00 km to 38.00 km	37.196	R3916	TR3
	40.744	L3917	TR2		37.206	R3917	TR1
	40.752	L3918	TR2		37.296	R3918	TR3
	40.756	L3919	TR2		37.364	R3919	TR2
	40.772	L3920	TR2		37.378	R3920	TR2
	40.782	L3921	TR2		37.424	R3921	TR1
	40.816	L3922	TR2		37.424	R3922	TR1
	40.820	L3923	TR2		37.458	R3923	TR2
	40.842	L3924	TR2		37.472	R3924	TR2
	40.854	L3925	TR2		37.504	R3925	TR2
	40.856	L3926	TR2		37.53	R3926	TR1
	40.860	L3927	TR2		37.564	R3927	TR1
	40.888	L3928	TR2		37.574	R3928	TR1
	40.898	L3929	TR2		37.68	R3929	TR1
	40.898	L3930	TR2		37.684	R3930	TR1
	40.924	L3931	TR2		37.686	R3931	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	40.966	L3932	TR3		37.686	R3932	TR1
	40.972	L3933	TR2		37.686	R3933	TR1
	41.004	L3934	TR1		37.686	R3934	TR1
	41.058	L3935	TR4		37.688	R3935	TR1
	41.104	L3936	TR4		37.692	R3936	TR3
	41.128	L3937	TR3		37.7	R3937	TR3
	41.134	L3938	TR4		37.702	R3938	TR1
	41.140	L3939	TR4		37.704	R3939	TR1
	41.148	L3940	TR4		37.704	R3940	TR1
	41.152	L3941	TR3		37.704	R3941	TR1
	41.160	L3942	TR3		37.706	R3942	TR1
	41.172	L3943	TR4		37.71	R3943	TR1
	41.174	L3944	TR2		37.718	R3944	TR1
	41.176	L3945	TR1		37.726	R3945	TR4
	41.190	L3946	TR2		37.726	R3946	TR1
	41.196	L3947	TR3		37.726	R3947	TR2
	41.196	L3948	TR2		37.752	R3948	TR3
	41.214	L3949	TR1		37.764	R3949	TR3
	41.264	L3950	TR1		37.796	R3950	TR1
	41.264	L3951	TR1		37.798	R3951	TR1
41.00 km to 42.00 km	41.368	L3952	TR4		37.798	R3952	TR1
	41.466	L3953	TR2		37.802	R3953	TR1
	41.520	L3954	TR1		37.804	R3954	TR1
	41.532	L3955	TR1		37.848	R3955	TR3
	41.562	L3956	TR3		37.85	R3956	TR1
	41.586	L3957	TR1		37.852	R3957	TR1
	41.678	L3958	TR3		37.908	R3958	TR1
	41.734	L3959	TR1		37.912	R3959	TR2
	41.742	L3960	TR2		37.93	R3960	TR1
	41.890	L3961	TR2		37.956	R3961	TR1
	41.896	L3962	TR2		37.964	R3962	TR1
	41.900	L3963	TR4		37.964	R3963	TR1
	41.906	L3964	TR1		37.968	R3964	TR1
	41.914	L3965	TR1		37.97	R3965	TR1
	41.916	L3966	TR2		37.97	R3966	TR1
	41.920	L3967	TR4		38.018	R3967	TR1
	41.920	L3968	TR1	38.00 km to 39.00 km	38.024	R3968	TR1
	41.922	L3969	TR2		38.026	R3969	TR1
	41.922	L3970	TR2		38.032	R3970	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	41.940	L3971	TR4		38.034	R3971	TR2
	41.948	L3972	TR4		38.04	R3972	TR3
	41.960	L3973	TR1		38.04	R3973	TR2
	41.968	L3974	TR2		38.044	R3974	TR1
42.00 km to 43.00 km	42.066	L3975	TR1		38.05	R3975	TR2
	42.114	L3976	TR1		38.066	R3976	TR1
	42.114	L3977	TR1		38.07	R3977	TR1
	42.114	L3978	TR3		38.072	R3978	TR1
	42.134	L3979	TR1		38.072	R3979	TR1
	42.240	L3980	TR1		38.078	R3980	TR1
	42.246	L3981	TR2		38.078	R3981	TR1
	42.294	L3982	TR4		38.08	R3982	TR1
	42.356	L3983	TR2		38.086	R3983	TR1
	42.388	L3984	TR4		38.09	R3984	TR1
	42.536	L3985	TR1		38.092	R3985	TR1
	42.544	L3986	TR1		38.094	R3986	TR1
	42.794	L3987	TR2		38.094	R3987	TR1
43.00 km to 44.00 km	43.080	L3988	TR2		38.098	R3988	TR1
	43.898	L3989	TR1		38.126	R3989	TR1
	43.954	L3990	TR1		38.136	R3990	TR1
	43.956	L3991	TR2		38.144	R3991	TR1
44.00 km to 45.00 km	44.084	L3992	TR2		38.146	R3992	TR1
	44.090	L3993	TR2		38.158	R3993	TR3
	44.096	L3994	TR2		38.168	R3994	TR1
	44.542	L3995	TR2		38.174	R3995	TR1
	44.544	L3996	TR2		38.184	R3996	TR1
	44.552	L3997	TR3		38.202	R3997	TR1
	44.586	L3998	TR2		38.212	R3998	TR1
	44.606	L3999	TR2		38.214	R3999	TR1
	44.686	L4000	TR1		38.222	R4000	TR1
	44.694	L4001	TR4		38.224	R4001	TR2
	44.742	L4002	TR1		38.488	R4002	TR1
	44.744	L4003	TR1		38.49	R4003	TR1
	44.794	L4004	TR4		38.49	R4004	TR2
	44.826	L4005	TR1		38.498	R4005	TR1
	44.834	L4006	TR1		38.518	R4006	TR1
	44.840	L4007	TR1		38.52	R4007	TR1
	44.844	L4008	TR4		38.52	R4008	TR1
	44.854	L4009	TR1		38.524	R4009	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
	44.856	L4010	TR1		38.526	R4010	TR2
	44.874	L4011	TR2		38.548	R4011	TR1
	45.006	L4012	TR1		38.548	R4012	TR2
	45.022	L4013	TR1		38.558	R4013	BAMBOO
					38.562	R4014	TR1
					38.566	R4015	TR1
					38.57	R4016	TR1
					38.572	R4017	TR1
					38.572	R4018	TR1
					38.576	R4019	TR1
					38.576	R4020	TR1
					38.576	R4021	TR2
					38.58	R4022	TR1
					38.582	R4023	TR1
					38.582	R4024	TR1
					38.582	R4025	TR1
					38.584	R4026	TR1
					38.584	R4027	TR2
					38.586	R4028	TR2
					38.592	R4029	TR1
					38.602	R4030	TR1
					38.606	R4031	TR1
					38.606	R4032	TR1
					38.622	R4033	TR2
					38.624	R4034	TR1
					38.624	R4035	TR2
					38.626	R4036	TR1
					38.634	R4037	TR1
					38.636	R4038	TR1
					38.638	R4039	TR1
					38.64	R4040	TR2
					38.642	R4041	TR1
					38.644	R4042	TR1
					38.646	R4043	TR1
					38.648	R4044	TR1
					38.648	R4045	TR2
					38.652	R4046	TR1
					38.652	R4047	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					38.652	R4048	TR2
					38.656	R4049	TR1
					38.656	R4050	TR2
					38.664	R4051	TR2
					38.666	R4052	TR2
					38.666	R4053	TR2
					38.668	R4054	TR1
					38.674	R4055	TR1
					38.674	R4056	TR2
					38.678	R4057	TR3
					38.706	R4058	TR4
					38.736	R4059	BAMBOO
					38.778	R4060	TR4
					38.788	R4061	TR1
					38.788	R4062	TR1
					38.788	R4063	TR1
					38.788	R4064	TR1
					38.79	R4065	TR1
					38.79	R4066	TR1
					38.79	R4067	TR1
					38.79	R4068	TR1
					38.792	R4069	TR1
					38.792	R4070	TR1
					38.792	R4071	TR1
					38.792	R4072	TR1
					38.794	R4073	TR1
					38.794	R4074	TR1
					38.794	R4075	TR1
					38.794	R4076	TR1
					38.798	R4077	TR1
					38.798	R4078	TR1
					38.8	R4079	TR1
					38.8	R4080	TR1
					38.982	R4081	TR3
				39.00 km to 40.00 km	39	R4082	TR2
					39	R4083	TR1
					39	R4084	TR1
					39.01	R4085	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					39.014	R4086	TR1
					39.016	R4087	TR2
					39.018	R4088	TR1
					39.018	R4089	TR1
					39.018	R4090	TR1
					39.018	R4091	TR2
					39.018	R4092	TR2
					39.14	R4093	TR1
					39.14	R4094	TR2
					39.152	R4095	TR1
					39.152	R4096	TR1
					39.154	R4097	TR2
					39.156	R4098	TR1
					39.16	R4099	TR2
					39.16	R4100	TR1
					39.16	R4101	TR1
					39.16	R4102	TR1
					39.164	R4103	TR2
					39.166	R4104	TR1
					39.172	R4105	TR1
					39.174	R4106	TR2
					39.176	R4107	TR2
					39.188	R4108	TR2
					39.2	R4109	TR1
					39.2	R4110	TR3
					39.212	R4111	TR1
					39.212	R4112	TR1
					39.23	R4113	TR2
					39.244	R4114	TR1
					39.27	R4115	TR2
					39.292	R4116	TR4
					39.304	R4117	TR2
					39.32	R4118	TR1
					39.328	R4119	TR2
					39.334	R4120	TR1
					39.344	R4121	TR2
					39.348	R4122	TR2
					39.35	R4123	TR2
					39.364	R4124	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					39.37	R4125	TR2
					39.372	R4126	TR2
					39.378	R4127	TR2
					39.384	R4128	TR1
					39.388	R4129	TR2
					39.398	R4130	TR2
					39.404	R4131	TR3
					39.416	R4132	BAMBOO
					39.422	R4133	TR1
					39.428	R4134	TR1
					39.496	R4135	TR1
					39.498	R4136	TR1
					39.498	R4137	TR1
					39.5	R4138	TR1
					39.506	R4139	TR1
					39.506	R4140	TR1
					39.506	R4141	TR1
					39.506	R4142	TR1
					39.506	R4143	TR1
					39.506	R4144	TR1
					39.508	R4145	TR1
					39.508	R4146	TR1
					39.508	R4147	TR1
					39.508	R4148	TR1
					39.536	R4149	TR1
					39.614	R4150	BAMBOO
					39.704	R4151	TR2
					39.718	R4152	TR4
					39.718	R4153	TR3
					39.724	R4154	TR2
					39.734	R4155	TR1
					39.736	R4156	TR1
					39.738	R4157	TR2
					39.748	R4158	TR2
					39.75	R4159	TR1
					39.766	R4160	TR1
					39.786	R4161	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					39.786	R4162	TR3
					39.786	R4163	TR2
					39.786	R4164	TR2
					39.786	R4165	TR2
					39.788	R4166	TR1
					39.788	R4167	TR1
					39.788	R4168	TR3
					39.79	R4169	TR4
					39.79	R4170	TR1
					39.792	R4171	TR1
					39.792	R4172	TR1
					39.792	R4173	TR1
					39.794	R4174	TR1
					39.796	R4175	TR1
					39.798	R4176	TR1
					39.8	R4177	TR1
					39.802	R4178	TR1
					39.802	R4179	TR1
					39.808	R4180	TR1
					39.808	R4181	TR2
					39.814	R4182	TR2
					39.816	R4183	TR1
					39.816	R4184	TR1
					39.818	R4185	TR2
					39.82	R4186	TR1
					39.832	R4187	TR1
					39.834	R4188	TR1
					39.838	R4189	TR1
					39.84	R4190	TR1
					39.84	R4191	TR1
					39.842	R4192	TR1
					39.846	R4193	TR1
					39.846	R4194	TR2
					39.848	R4195	TR1
					39.85	R4196	TR1
					39.9	R4197	TR1
					39.924	R4198	TR1
					39.93	R4199	TR2
					39.938	R4200	TR1

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					39.946	R4201	TR1
					39.962	R4202	TR3
					39.988	R4203	TR1
					39.992	R4204	TR2
					39.996	R4205	TR2
					40.002	R4206	TR2
					40.006	R4207	TR1
					40.008	R4208	TR1
					40.01	R4209	TR2
					40.01	R4210	TR2
					40.012	R4211	TR1
					40.02	R4212	TR1
					40.026	R4213	TR2
					40.032	R4214	TR1
					40.032	R4215	TR1
					40.032	R4216	TR1
					40.04	R4217	TR1
					40.046	R4218	TR2
					40.054	R4219	TR1
					40.062	R4220	TR3
					40.076	R4221	TR1
				40.00 km to 41.00 km	40.084	R4222	TR1
					40.084	R4223	TR1
					40.086	R4224	TR1
					40.086	R4225	TR1
					40.09	R4226	TR1
					40.09	R4227	TR1
					40.092	R4228	TR1
					40.094	R4229	TR1
					40.094	R4230	TR2
					40.098	R4231	TR2
					40.114	R4232	TR2
					40.148	R4233	TR1
					40.148	R4234	TR2
					40.152	R4235	TR2
					40.152	R4236	TR2
					40.154	R4237	TR2
					40.168	R4238	TR1
					40.168	R4239	TR2

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					40.17	R4240	TR1
					40.186	R4241	TR2
					40.436	R4242	TR1
					40.438	R4243	TR1
					40.474	R4244	TR2
					40.476	R4245	TR1
					40.476	R4246	TR3
					40.644	R4247	TR2
					40.652	R4248	TR2
					40.666	R4249	TR1
					40.678	R4250	TR1
					40.68	R4251	TR1
					40.684	R4252	TR1
					40.706	R4253	TR2
					40.714	R4254	TR2
					40.728	R4255	TR1
					40.734	R4256	TR1
					40.744	R4257	TR4
					40.782	R4258	TR2
					40.782	R4259	TR2
					40.796	R4260	TR1
					40.804	R4261	TR1
					40.806	R4262	TR1
					40.852	R4263	TR2
				41.00 km to 42.00 km	41.032	R4264	TR1
					41.042	R4265	TR1
					41.288	R4266	TR1
					41.372	R4267	TR1
					41.49	R4268	TR1
					41.494	R4269	TR2
					41.5	R4270	TR2
					41.55	R4271	TR4
					41.556	R4272	TR4
					41.706	R4273	TR1
					41.844	R4274	TR3
					41.854	R4275	TR4
					41.858	R4276	TR2
					41.876	R4277	TR3
					41.886	R4278	TR4

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					41.888	R4279	TR3
					41.898	R4280	TR4
					41.928	R4281	TR2
					41.936	R4282	TR4
					41.938	R4283	TR4
					41.946	R4284	TR4
					42.118	R4285	TR1
					42.2	R4286	TR1
					42.218	R4287	TR1
					42.218	R4288	TR3
					42.242	R4289	TR3
					42.342	R4290	TR2
					42.348	R4291	TR1
					42.468	R4292	TR3
					42.536	R4293	TR2
				42.00 km to 43.00 km	42.562	R4294	TR1
					42.8	R4295	TR2
					42.81	R4296	TR2
					42.896	R4297	TR2
					42.902	R4298	TR2
					42.93	R4299	TR1
					42.934	R4300	TR1
					42.94	R4301	TR1
					42.98	R4302	TR3
					42.988	R4303	TR3
					42.998	R4304	TR3
					43.032	R4305	TR3
					43.036	R4306	TR3
					43.048	R4307	TR3
					43.102	R4308	TR3
					43.122	R4309	TR4
					43.206	R4310	TR1
				43.00 km to 44.00 km	43.272	R4311	TR2
					43.274	R4312	TR2
					43.282	R4313	TR4
					43.32	R4314	TR4
					43.342	R4315	TR3
					43.35	R4316	TR2
					43.37	R4317	TR3

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					43.402	R4318	TR1
					43.44	R4319	TR3
					43.446	R4320	TR1
					43.454	R4321	TR4
					43.458	R4322	TR1
					43.462	R4323	TR2
					43.468	R4324	TR3
					43.482	R4325	TR2
					43.494	R4326	TR4
					43.506	R4327	TR1
					43.864	R4328	TR4
					43.876	R4329	TR1
					43.882	R4330	TR3
					43.972	R4331	TR4
					43.98	R4332	TR4
					43.988	R4333	TR3
				44.00 km to 45.00 km	44.018	R4334	TR4
					44.044	R4335	TR3
					44.062	R4336	TR4
					44.076	R4337	TR4
					44.084	R4338	TR3
					44.094	R4339	TR3
					44.1	R4340	TR4
					44.112	R4341	TR4
					44.114	R4342	TR4
					44.128	R4343	TR3
					44.136	R4344	TR4
					44.15	R4345	TR3
					44.152	R4346	TR3
					44.176	R4347	BAMBOO
					44.186	R4348	BAMBOO
					44.202	R4349	TR3
					44.238	R4350	TR1
					44.248	R4351	TR4
					44.256	R4352	TR4
					44.272	R4353	TR3
					44.28	R4354	TR4

Left Side				Right Side			
Stretch	Existing Chainage (KM)	Tree Number	Girth	Stretch	Existing Chainage (KM)	Tree Number	Girth
					44.284	R4355	TR3
					44.45	R4356	TR1
					44.45	R4357	TR1
					44.454	R4358	TR2
					44.462	R4359	TR1
					44.47	R4360	TR4
					44.48	R4361	TR4
					44.49	R4362	TR4
					44.494	R4363	TR2
					44.5	R4364	TR1
					44.508	R4365	TR2
					44.524	R4366	TR4
					44.588	R4367	TR4
					44.662	R4368	TR2
					44.688	R4369	TR1
					44.696	R4370	TR1
					44.724	R4371	TR4
					44.732	R4372	TR4
					44.812	R4373	TR3
					44.814	R4374	TR4
					45.016	R4375	TR4
					45.0223	R4376	TR3

Annexure 12: For Workers Health & Safety in Common Operation and During Construction

House Keeping Practices

- Maintain washrooms and canteens clean
- Keep all walkways clear and unobstructed at all times
- Ensure that spillages of oil and grease does not take place and cleaned immediately, if any spillage take place.
- Stack raw materials and finished products clear of walkways or inside roads
- Do not leave tools on the floor or in any location where they can be easily dislodged
- Keep windows and light fitting clean
- Maintain the workplace floors dry and in a non-slippery condition
- Provide and maintain proper drainage system to prevent water ponding
- Use metal bins for oily and greasy rags and store all flammable materials in appropriate bins, racks or cabinets. Ensure that the meal bins for storing oily and grease rags should be covered with lids.
- Ensure that protruding nails in boards or walls are moved or bent over so that they do not constitute a hazard to people
- Make sure that hazardous/dangerous chemicals are kept in the goods stores with the appropriate labeling, display of the material-safety-data-sheet (MSDS) and other precautionary measures
- Display 'no smoking' signs in areas with high fire risks, e.g. paint stores, wood working area and others

Safe Layout in the construction plant, camp and quarry areas

- Arrange border to perimeter fencing
- Ensure good visibility and safe access at site entrances
- Provide adequate warning signs at the entrance and exit where necessary
- Provide adequate space/area for loading and unloading, storage of materials, plant and machinery
- Display emergency procedure and statutory notices at conspicuous location
- Consider welfare facilities required
- Provide areas for dumping garbage and other waste materials, and also arrange for their regular clearance.
- Arrange storage, transport and use of fuel, other flammable materials and explosives in line with the license requirements to be obtained from appropriate authorities
- Plan emergency assembly points, fire escape routes and locate fire-fighting equipment
- Provide access roads and plant movement areas within the site.
- Ensure the availability of first aid facilities and display notices at the various works to show the location of these facilities
- Provide proper drainage and sewage & drainage facilities

Tree Felling

- Use hard hats during tree felling
- Ensure tools such as the axes are in good condition

- Determine proper foot and body position when using the axe. Do not cut above your head
- Wear appropriate foot protection
- Carry a first aid kit to the site
- Determine possible hazards in the area, e.g. electrical or telephone or other utility lines
- Prior to felling, determine the safest direction for the fall
- Determine the proper hinge size before directing the tree fall.

Noise Hazards and its control

- Note that indications of noise levels are:
  - You have to shout to be heard;
  - Your hearing is dulled just after work;
  - You get head noises or ringing in the ears after work;
  - You have difficulty hearing people while others are talking
- Use sound level meters to measure. If the sound level exceeds 85 dB(A), then preventive measures should be taken
- Make personnel aware of noisy areas by using suitable warning signs and insisting that ear protectors should necessarily be worn.
- Reduce noise at source by improved maintenance, replacing noisy machines, screening with noise absorbing material, making changes to the process/equipment, controlling machine speeds, ensuring that two noise-generating machines are not running at the same time, using cutting oils and hydraulic breakers.
- Appoint a competent person to carry out a detailed noise assessment of the site, designate ear protection zone, and give instructions on the necessary precautionary measures to be observed by site personnel, including the use of suitable type of ear protections.
- Wear and maintain ear muffs and ear plug as required
- In construction or repair work, noise should be kept to a low-level bearing in mind the disturbance to local residents.

Road Works

- The use of signage is most important to caution the road users of possible unsafe conditions due to the road works.
- Use the appropriate signage devices as required by the site conditions/situation. The devices include regulatory signs, delineators, barricades, cones, pavement markings, lanterns and traffic control lights.
- In using signs, make sure that they are (i) simple, easy-to-understand and convey only one message, (ii) luminescent and with reflective properties, and (iii) broad, prominent and of appropriate size.
- In using barricades, make sure that you keep traffic away from work areas and you guide the drivers to keep along a safe, alternative path.
- Ensure that proper personal protective equipment (PPE) is provided to all the workers.
- Cover existing road signs and install new ones at appropriate locations taking into account the distances that would be required and reaction times.

- Plan layout and traffic management so that hazard is not created.
- Deploy flagmen, who control traffic at the work areas. The flag should be 600mm x 600mm fastened to a 1m length staff.
- Flagmen should wear reflective safety vests along with hard hats
- If required, use wireless devices for flagmen to co-ordinate from either ends of the road, where works are being carried out.

Electrical hazards in construction areas

- Treat all wires as live wires
- Never touch dangling wires, but report them to your manager
- Unless you are a qualified electrician, do not attempt electrical repairs
- Never use electrical equipment if your hands are wet or you are standing in water
- If electrical equipment is sparking or smoking, turn the power off and report the condition to your supervisor
- Never use electrical wires that have physical damage
- Never allow equipment or traffic to run over electrical wires.

Use and Storage of Gas/LPG

- Store filled gas/LPG cylinder in the open area, i.e. outside of the building
- Transport, store, use and secure cylinders in upright position
- Ensure proper ventilation at the ground level in locations where gas/LPG is in use
- Avoid physical damage to the cylinders
- Never weld or cut on or near the cylinders
- Store empty cylinders secured and upright
- Make sure that the cylinder is closed immediately after use
- Investigate immediately if there is the smell of LPG or gas
- Never use destenched gas/LPG on site.
- Make sure that there is no other unrelated fire in the vicinity of the cylinder

Operation of Excavators

- Ensure that excavators are operated by authorized persons who have been adequately trained.
- Prevent unauthorized movement or use of the excavators
- Check regularly and maintain the machine thoroughly
- Ensure that all relevant information, including those related to instruction, training, supervision and safe system of work are provided to the operators.
- Ensure that the operation and maintenance manuals, manufacturer's specifications, inspection and maintenance log books are provided for the use of the mechanics, service engineers or other safety personnel during periodic maintenance, inspection and examination.
- During tipping or running alongside the trenches, excavators must be provided with stop blocks.
- Excavators must be rested on firm ground during operation
- Avoid operating the machine too close to an overhang, deep ditch or hope and be alter to potential carving edges, falling rocks and slides, rough terrain and obstacles.

- Locate and identify underground services by checking with all utility companies before excavations.
- Ensure that all excavations are supervised by experienced and competent persons.
- When reversing or in caste the operator's view is restricted, adequate supervision and signaling should be provided.
- Ensure that the type and capacity of the excavator are properly chosen for the intended purposes and site conditions. Never use a machine for any purposes other than it is designed for.
- Check and report for excessive wear and any breakage of the bucket, blade, edge, tooth and other working tools of the excavator.
- Check that all linkages/hinges are properly lubricated and ensure that the linkage pins are secured. Never use improper linkage pins.
- Never dismount or mount a moving machine
- Work only with adequate ventilation and lighting
- Ensure that the protective front screen of the driving cabin is fixed in position during excavations to avoid eye injury to the operator.
- Ensure switch-off of the unattended vehicle.

Operation of trucks and dumpers

- Ensure that only trained, authorized and licensed drivers operate the vehicles
- Enlist the help of another worker before reversing the vehicle
- Switch-off the engine of an unattended vehicle
- Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall.
- Wear safety boots or shoes to avoid injuries during loading and unloading.
- Carryout periodic servicing to the manufacturer's requirements. All records of maintenance and repairs should be in writing or kept on site.
- Keep the vehicle tidy and the cabin free from tools and material, which might obstruct the controls.
- Keep to speed limits.
- No passenger should be carried on a dumper except the driver
- Never drive the vehicle across a slope
- Provide stop blocks when the vehicle is tipping into or running alongside excavations
- Do not overload the vehicle.
- Carry only well secured loads
- Park only on level ground, in neutral with the parking brake applied
- Never mount of dismount from a moving vehicle

Gas Welding

- Use the following personal protective equipment during welding
  - Face or hand shield fitted with filters
  - Goggles, particularly when chipping slag
  - Gloves long enough to protect wrists and forearms against heats, sparks, molten metal and radiation
  - High-top boots to prevent sparks from entering footwear.

- Screen of the work area with sturdy opaque or translucent materials because glare can cause eye injury.
- Key for opening the acetylene cylinder valve must be one the valve stem while the cylinder is in use so that the cylinder valve may be immediately shut-off in an emergency.
- Ventilate the workplace using air blowers and exhaust fans to remove poisonous fumes and gases that are given off during welding
- Take precautions against flying sparks and hot slag where welding is beign done near flammable materials and check the area before leaving.
- Do not weld material degreased with solvents until completely dry.
- Do not use gas cylinders for supporting work or as rollers
- Do not use oil grease on oxygen cylinder fittings
- Do not use cylinders with damaged valves.
- Do not use too much force if valves are stuck.
- Replace valve caps after use
- Search for leaks in equipment by using a solution of soapy water.
- Shut the cylinder valve if acetylene from a cylinder catches fire at the valve or regulator due to leakage at a connection.
- Treat all gas cylinders as “full” unless you are sure otherwise.
- Never attempt to transfer acetylene from one cylinder to another or attempt to refill an acetylene cylinder.
- Place portable fire extinguishers near the welding area
- Secure all cylinders against accidental displacement.
- Always lift gas cylinders. Do not slide them along the ground or drop them from trucks.
- Keep gas cylinders in vertical position both in storage and when in use
- Keep the work place dry, secure, free from combustible materials and obstruction.
- Store the acetylene and oxygen cylinders separately, and in a proper store.
- Keep the gas cylinders from source of heat, flammable materials, corrosive chemicals and fumes.

Manual Handling and Lifting

- Use mechanical equipment in lace of manual handling as far as possible.
- Assess the manpower required to handle or life the load safety and arrange the manpower accordingly.
- In handling hazardous materials, the workers shall be informed of the hazards and safety precautions.
- All relevant persons shall be trained in the proper methods of lifting and carrying.
- Where team work is required, select the persons whose ages and physical builds are compatible for teaming up. Coordinate the actions of the team members by giving necessary instructions.
- Always lighten or suitably shape the load for manual handling as far as possible Keep a look out for splinters, sharp edges, loose banding and nails.
- Clear path or obstruction and tripping hazards.

- Stack and secure goods safety on trucks, otherwise they fall off and injure passers-by.
- Use personal protective equipment such as gloves, safety shoes, etc.
- Adopt the following procedure when you lift a load:
- Stand close to the object. Have a firm footing with feet spread on either side of the road.
- Bend the knees and keep your back as straight as you can
- Grasp object firmly. Be sure grip will not slip
- Breath in and throw the shoulder backwards.
- Straighten the legs, continuing to keep the back as straight as you can.
- Hold object firmly close to the body
- Always lift smoothly. Avoid jerky motions. Turn with feet instead of twisting the back.

Handling chemicals and hazardous substances

- Always substitute hazardous chemicals with harmless or less hazardous ones wherever possible.
- Enclose the process using chemicals or provide other engineering controls such as local exhaust ventilation, a fume cupboard or a safety cabinet.
- Exercise great care in the storage and use of chemicals because they may be explosive, poisonous, corrosive or combustible.
- Separate different chemicals physically
- Store chemicals classified as dangerous goods in a properly constructed and approved goods store. Keep proper records of all chemicals and hazardous substances delivered, stored and used on site.
- Consider unknown substances and liquids as dangerous until proven otherwise.
- All containers should be clearly labeled to indicate contents. Never use a wrongly labeled container for chemicals.
- Prohibit smoking in the vicinity of dangerous chemicals
- Ensure that you are wearing the correct personal protective equipment before you handle chemicals
- Maintain the Material Safety Data Sheet of all chemicals for reference on safety precautions to be taken and the use of suitable PPE.
- When opening containers, hold a rag over the cap or lid, as some volatile liquids tend to spurt up when released.
- Wash before you eat and do not eat at the work place.
- If the skin is splashed with a chemical, rinse it immediately with plenty of clean water. Eye should be flushed thoroughly with water followed by immediate medical attention.
- Eye fountain, emergency shower and breathing apparatus should be available in the vicinity of the workplace.
- Safety instructions for handling emergency situations should be displayed prominently at both the storage and use locations.

First Aid

- Provide first aid boxes at every site

- Ensure that training on the use of the first aid box is provided to a handful of staff working in the site.
- Display the list of persons who are trained on providing first aid.
- Ensure that every first aid box is marked plainly "First Aid" in English and local language.
- The responsible person or first aider should replenish the contents of the first aid box as necessary.

Personal protective Equipment

- Consider the provision of personal protective equipment only after all measures for removing or controlling safety hazards have been provided reasonably impractical.
- Ensure that sufficient personal protective equipment are provided and that they are readily available for every person who may need to use them.
- The management should ensure that all persons make full and proper use of the personal protective equipment provided.
- Provide instruction and training in the proper use and care of any specific protective equipment where necessary
- Do not willfully misuse, interfere with or ill-treat any protective clothing and equipment provided.
- Ensure that the personal protective equipment are in good condition. Report immediately any damage to the management for replacement. Always keep the personal protective equipment as clean as possible.

Eye Protection

- Issue eye protection equipment where there is a foreseeable risk of eye injury
- Ensure an adequate supply of goggles/shields is available.
- Keep the goggles clean and make sure they are good fit.
- Do not watch welding operations unless your eyes are protected from the damaging effect of flash.

Head Protection

- No person shall enter a construction site unless he is wearing a suitable safety helmet
- Wear a safety helmet:
  - When there is the risk of being hit by falling objects
  - While on or near a construction site
  - During adverse weather conditions
  - When in any area designated as a "hard hat" area.
- Provide identification labels to all helmets in some way to prevent random exchange among wearers, with one helmet exclusive to each person.
- Inspect helmets for cracks of sign of impact or rough treatment before each usage. Destroy, remove and replace all worn, defective or damaged helmets.

Hearing Protection

- Provide ear plugs or ear muffs as required. Use re-usable ear plugs when the reduction required (15-25 dBA) is not excessive. Use ear muffs where a large attenuation of upto 40 dBA is demanded.
- Do not use dry cotton wool for hearing protection because it cannot provide any.

- Provide disposable ear plugs for infrequent visitors and ensure that they are never re-used.
- Provide re-usable ear plugs for those who need to work continuously for a long period in a high noise area.
- Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- Avoid wearing spectacles with ear muffs.
- Use soap and water or the recommended solvent for cleaning ear muffs.
- Provide ear muffs for those who may need to get in and out of a high noise area frequently.

Respiratory Protective Equipment

- Wear suitable respirable for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags.
- Ensure that he explanators can provide adequate protection.
- Provide training to all persons using the respirators for their correct fitting, use, limitations and symptoms of exposure.
- Clean and inspect all respirators before and after use.
- Store respirators properly when not in use.

Safety Footwear

- Wear suitable footwear for work
- Use safety footwear on site or in other dangerous areas
- Wear suitable safety shoes or ankle boots when working anywhere where there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects, etc.
- All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
- Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury.
- Keep shoe lace knots tight.

Hand Protection

- Wear suitable gloves for selected activities such as welding & cutting and manual handling of materials & equipment.
- Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery
- wash hands properly with disinfectant soap and clean water before drinking, eating or smoking. Wash hands immediately after each operation on site when the situation warrants.

Fire Prevention, Fighting and Equipment

Before fire breaks cut

- Store flammable material in proper areas having adequate fire protection systems.
- Display sufficient warning signs.
- Train selected personnel to use these fire extinguishers
- Inspect fire extinguishers regularly and replace as necessary
- Fire escape route should be kept clear at all times and clearly indicated.

- Know the escape route and assembly point.
- Display escape route maps prominently on each floor
- Carryout fire drill regularly. Designate fire officers
- Install fire alarm wherever required and test regularly.
- Provide sufficient exit signs at prominent locations for directing people to the escape staircases and routes.

When fire breaks out.

- Alert all persons
- Put off the fire with appropriate fire extinguishers only when you are sure that you are safe to do so.
- Escape if you are in danger through the fire escape route to assembly point
- Fire officers to carryout head count at the assembly point.

Incident and accident investigations

- Carryout the investigation as quickly as possible.
- Conduct interviews with as many witnesses as necessary
- Do not rely on any one sole source of evidence
- Use the following tools:
- Checklists for obtaining basic and typical information for accidents
    - Notebook
    - Tape records
    - Camera
    - Measuring tape
    - Special equipment for the particular investigation
- Obtain answers to the following questions:
    - When did the accident occur?
    - Where did it occur?
    - Who was injured and what was damaged?
    - What caused the accident?
    - Why did it occur?
    - How could it have been prevented?
    - How can a recurrence be prevented?
- Prepare a short but sufficient investigation report that contains the following:
    - A summary of what had happened
    - A summary of events prior to the accident
    - Information gathered during the investigation
    - Details of witnesses
    - Information on injury or loss sustained
    - Conclusions and possible causes of the accident
    - Recommendations to prevent recurrence
    - Supporting materials (photos, diagrams, etc.)

Annexure 13: Guidelines for Siting, Management and Redevelopment of Construction Camps

Introduction

Construction camp accommodates a mix of activities, which are highly polluting in nature causing considerable environmental impact and its proper siting, management and redevelopment is crucial to avoid, minimize and mitigate those impacts. The ESMP clearly distinguishes between various impacts that may occur at various stages of the camp like (i) siting, (ii) setting up, (iii) operation and (iv) closure / redevelopment and provide respective mitigation measures to some extent. In addition to that, this guideline has been prepared to provide the Contractor with comprehensive and systematic information on various steps to be undertaken during these four stages, so that s/he can execute his/her role in an environmentally sound manner. Various mitigation measures have been synthesized into this guideline so that it serves as a single and standalone document for the Contractor.

Criteria for Siting the Camp

To the extent, possible barren land or wastelands shall be preferred during site selection and fertile land and agricultural land shall be avoided. All such sites must be above the HFL with adequate drainage facility. In areas prone to floods, cyclones, cloudbursts or heavy rainfall, selection of the site should be made keeping in mind the safety of the camp and the workers. In addition, the Contractor should take care of the following criteria for locating the site:

- A minimum of 250 m away from any major settlement or village in downwind direction.
- A minimum of 200 m of any major surface water course or body
- Not within 500 m from ecologically sensitive areas like wild life sanctuary, mangroves etc.
- Sufficiently wide access roads (at least 5.5 m Wide) for heavy vehicle movements

After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the CSE without which any activity shouldn't be started on the site

Finalization 0f Selected Site

After identification of the site, the Contractor should fill up the prescribed reporting format provided in ESMP and submit the same for approval to the CSE. Environmental Officer of CSE shall approve the selected site/s, after considering the compliance with the ESMP clauses. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the CSE. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSE for the selected site, the Contractor has to enter into an

agreement with the landowner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

Designing of Camp / Preparation of Layout Plan

The Contractor should design a layout plan of the camp with adequate space for (i) site office along with store room, rest area and sanitary facilities, (ii) plants, machineries, (iii) workshops, (iv) vehicle washing area, (v) fuel handling area, (vi) room for raw material unloading and stocking, (vii) space for storage and handling of solid wastes (viii) security cabin etc. The laying out of these should be undertaken in such a manner that it facilitates smooth functioning of both man and machine. Fuel pumps, storage facility for inflammable and hazardous chemicals/ materials shall be provided inside the camp, but at a safe distance from office. Electric safety practices shall be integrated/ incorporated during the lay-out plan preparation. Prevailing wind direction shall be kept in mind while planning out the lay-out of internal facilities. Cutting of trees should be minimum and the existing ones need to be integrated into the lay-out plan with proper planning. The roads within the camp should be well planned with adequate space for movement of vehicles and their parking.

Setting Up of Construction Camp

Site preparation:

The stripping, stacking and preservation of top soil will be mandatory in case of farm lands and fertile areas and absolutely no material stacking or equipment installment or vehicle parking or any other activity should be allowed prior to the satisfactory completion of this activity as per guidelines in EMP. Thereafter, the site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. A compound wall of 2.0 m height should be constructed all around the camp to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and as detailed in the EMP, it should be integrated with storm water drain and sedimentation trenches as given in annexure in EMP. No. of trees planted should not be less than three times the number of trees cut. The approved layout plan should be strictly adhered to while setting up the camp.

Setting up of plants and machineries:

Adequate arrangements should be made for avoiding fu gitive emissions from plants and camp premises. This will include (i) control of air pollution through provision of in-built dust extraction systems like bag filter, damper and cyclone filter for bitumen hot mix plant, (ii) a chimney of appropriate height (as per SPCB guideline) from ground level attached with dust extraction system and scrubber for the hot mix plant, (iii) a chimney of appropriate height for the DG set (iv) water sprinkling facilities for the concrete batching plant, wet mix macadam plant as well as in the camp premises and (v) garden net to prevent fugitive emissions from storage place of cement and aggregates.. It has to be also ensured that effluent from the

sludge tank of the scrubber is recycled and reused and the sludge is used for land filling with top soil spread on it.

To ensure that noise levels are within the limit, all plants and machineries should have their own silencers or any other noise control devices. All pollution control devices should be provided with back-up power. Following conditions should be complied regarding the sound level conditions:

- The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55dB (A) during day time (6am - 6pm) and 45 dB(A) during night time (6 pm - 6am).
- The total sound power level of the DG set shall be less than 96+10 log 10(KVA) dB(A) where KVA is the nominal power rating of DG set.
- The DG set shall be provided with acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB(A).
- The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A).
- A proper, routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer.
- Concrete flooring with slope drains and oil interceptors should be proposed for hot mix plant area and workshop, vehicle washing and fuel handling area as per EMP, so that oil and lubricants that may spill on the floor does not contaminate any soil or water body. In case of any oil spills, it should be cleaned properly. There shall also be provisions for storage of used oil until it is disposed as per comprehensive waste management plan prepared by Contractor and approved by CSE.

Sanitation Facilities:

Adequate no. of toilets shall be provided separately for males and females (depending on their strength), screened from those of men and provided with markings in vernacular language. All such facilities must have adequate water supply with proper drainage and effluent treatment system like septic tank with soak pit. Soak pit should have a sealed bottom, honey comb wall and 75 cm. thick, 2 mm sand envelope around that. The sewage system for the camp must be properly sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place. Portable toilets may be brought to use and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the construction camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site.

Waste Disposal:

While preparing the layout plan, the Contractor should allocate adequate space for storage and handling of various wastes generated until they are disposed off in pre-identified disposal sites. The Contractor should provide separate garbage bins for biodegradable, non-

biodegradable and domestic hazardous wastes in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor. The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling. POL (petroleum, oil and lubricants) waste shall be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the State Pollution Control Board and valid registration from the Central Pollution Control Board. Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.

First aid / safety facilities:

At every camp site, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances should be provided. Workplaces which are remote and far away from regular hospitals should have indoor health units with one bed for every 250 workers. Details of nearest clinics as well as major hospitals like their location, distance from camp, phone nos. facilities offered by the hospital should be displayed in the camp office at clearly visible location in a legible manner. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipments and firefighting equipments as detailed out in ESMP should be made available in the camp and provided to the staff / workers. Operation manuals and training should be provided to machine operators. Warning signs should be placed at accident prone areas as well as at the entrance of the site.

Training to workers:

Workers shall be trained in smooth operation of plants and machines, the irregular maintenance and various safety measures to be followed as well as about the need for adherence to these measures.

Information dissemination:

There should be a sign board of size 6’ x 4’ mentioning the project details and Contractor’s details to disseminate the information to the public. There should be a second sign board displaying the latest air and noise monitoring data against the standards specified.

Warning signboards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken at those respective places. Once the construction camp is set up, the date of commissioning of the camp should be intimated to the Head Office and concerned District Office of the SPCB.

Operation of Construction Camp

During the operation phase of the camp it is important to ensure that all vehicles and machineries are maintained regularly and their PUC certificates are renewed at regular intervals. All pollution control devices should be monitored and maintained properly at regular intervals. In case of process disturbance/ failure of pollution control equipment's, the respective units should be shut down and should not be restarted until the control measures are rectified to achieve the desired efficiency. All units should operate only between 6 am and 10 pm. or as specified by SPCB in the consent letter. Oil and grease waste generated from garages in construction camps should be drained out through oil interceptors and they should be maintained properly. Necessary arrangements should be made for regular sprinkling of water for dust suppression. Raw materials and products should be transported with proper cover to prevent spreading of dust.

Hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and iv) appropriate waste management practices. While it is of utmost importance to ensure that firefighting equipment's like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipment's provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

Environmental monitoring should be undertaken by the Contractor as stipulated in the EMP. If any standard is set by SPCB for hot mix plant emissions, the Contractor should collect samples of emission from all the chimneys and analyse for the parameters at least once in a month. The CTE certificate from SPCB should be renewed at regular intervals and the same should be intimated to CSE. A register should be maintained at the site office which provides (i) a one-page format for each migrant labourer which will give their personal profile (including name, age, sex, educational qualification, address, blood group and any major illness), along with a copy of any ID proof and an original photograph, (ii) a copy of the ID card of local labourers. A copy of the details of the migrant labourers should be submitted to the local police station.

Demobilization and Redevelopment of the Site

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and POL waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. All the areas within the camp site should be levelled and spread over with stored top soil. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural Jhum land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of landowner and CSE.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been redeveloped to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSE by the Contractor:

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about status of re-development of the site. CSE shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the works completion' certificate is issued/recommended. The EO shall ensure through site inspection that the Contractor and CSE have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be. Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor, Supervision Consultant and PD office.

Annexure 14: Site Selection, Layout Plan and Basic Amenities at Labour Camp

Construction camps include, but may not be limited to, office space; laboratory; vehicle repair and maintenance workshop/s; fuel pumps and associated areas; parking spaces; accommodation or quarters for engineers, workers and labour; basic amenities such as mess, kitchen, potable water supply, first aid room, garbage collection and disposal facility, sanitation (toilets, bathrooms, washing areas and water supply for such needs), material stack yards or storage areas, circulation areas, hot-mix plants, batching plants, crushers and any other space/area associated with similar activities.

Site Selection Criteria

- No construction camp, including batching plant, hot mix plant, material stock yards and storage facility will be proposed within 500 m from a) a settlement/habitation b) water source c) reserved or protected forest limits d) migratory corridor of the wildlife to avoid conflicts and stress on local infrastructures facilities and natural resources.
- To the extent possible prime agricultural land shall be avoided.
- The location should have proper drainage facilities.
- Location criteria should finally confirm with the stipulated conditions with the Contract Agreement.
- Location of plants at down wind direction of settlement or dense forest area shall be avoided.

The selected site/s shall be approved by Environmental Officer of SC and PWD/PIU after considering the compliance with the ESMP clauses including the activities proposed for such a site. Contractor shall enclose copy of the agreement with the land owner and permission of the local authorities as may be applicable.

Layout

The lay-out of a construction camp site has to be carefully planned and prepared keeping in view the various activities proposed for a particular site. The lay-out plan will contain details pertaining to, but not limited to, the cardinal points, wind direction, dimensions, surrounding features and proposed activities. This shall be submitted with complete details provided in the prescribed reporting format to the SC for written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site.

The SC will carefully examine the proposals in light of the various ESMP and regulatory provisions and provide suggestions, as necessary. Both the Resident Engineer and the Environmental Officer shall be responsible for satisfactory and timely completion of this ESMP requirement.

Some of the principles governing a lay-out plan have been listed below:

- The prevailing wind direction shall be kept in mind while planning out the lay-out of internal facilities.
- Tree felling shall be avoided and it should be tried to integrate the existing ones into the lay-out plan with proper planning.
- The stripping, stacking and preservation of top soil will be mandatory in case of farm lands and fertile areas and absolutely no material stacking or equipment installment or vehicle parking or any other activity shall be allowed prior to the satisfactory completion of this activity.
- The proposed top soil stacking areas along with the quantity shall be clearly depicted on the lay-out plan.
- Proper circulation paths and parking spaces need to be provided.
- Fuel pumps, storage facility for inflammable and hazardous chemicals/ materials shall be screened at safe distance from office, mess and residential areas inside the camp.
- Proper fire safety precautions including safe exits, warning signs need to be provided at all locations including vulnerable areas like plant sites, kitchen, workshops, fuel pumps, stores etc.
- Electric safety practices shall be integrated/incorporated during the lay-out plan preparation.
- All sites must be graded and rendered free from depressions such that water does not get stagnant
- Appropriate drainage shall be provided. Typical layout plan is given.
- Camp site shall be fenced at direction with a security at the entry gate
- Contractor is encouraged to take up plantation along the boundaries of the camp with indigenous species.
- Contractor shall obtain permission from the concerned authority to fell tree(s) which is unavoidable.

BASIC AMENITIES/FACILITIES

Accommodation for Labours

The height of the workers and labour accommodation shall not be less than 3 m from floor level to lowest part of the roof. Sheds shall be kept clean, with proper cross ventilation, and the space provided shall be on the basis of 3.5 sq.m per head or as per the relevant regulation, whichever is higher. Fire and electrical safety pre-cautions shall be adhered to. Cooking, sanitation and washing areas shall be provided separately as per the ESMP clauses.

Drinking Water

- Effective arrangements shall be made to provide and maintain at suitable points conveniently situated for all workers employed therein a sufficient supply of wholesome drinking water.
- All such points shall be legibly marked "drinking water" in a language understood by majority of the workers

- and no such point shall be situated within six meters of any washing place, urinal, latrine, spittoon, open drain carrying sludge or effluent or any other source of contamination.
- An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing and laundry purposes.
- The drinking water system must be monitored in accordance with IS:10500 or the water quality parameters as prescribed by State Pollution Control Board. The water supply system used for cooking purposes that is drained seasonally must be cleaned, flushed, and disinfected prior to use. Furthermore, a water sample of satisfactory bacteriologic quality

First Aid

- Contractor shall provide and maintain First Aid facility so as to be readily accessible during all working hours. First-Aid boxes or cupboards equipped with the prescribed contents, and the number of such boxes or cupboards to be provided and maintained shall not be less than one for every one hundred and fifty workers ordinarily employed
- Nothing except the prescribed contents shall be kept in a first-aid box or cupboard
- Each first-aid box or cupboard shall be kept in the charge of a separate responsible person who holds a certificate in first-aid treatment recognised by the Government of Assam /Govt of India and who shall always be readily available during the working hours

Canteen Facilities

A cooked food canteen on a moderate scale shall be provided by the Contractor for the benefit of workers wherever it is considered necessary.

Sanitation Facilities

- There shall be adequate supply of water, close to latrines and urinals.
- Within the precincts of every workplace, latrines and urinals shall be provided in an accessible place, and the accommodation, separately for each of these, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. Except in workplaces provided with water - flushed latrines connected with a water borne sewage system, all latrines shall be provided with dry - earth system (receptacles) which shall be cleaned at least two times daily kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year
- Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located so as to be accessible, without any individual passing through any sleeping room
- Where the toilet rooms are shared, such as in multifamily shelters and in barracks type facilities, separated toilet rooms must be provided for each sex. These rooms

must be distinctly marked "for men" and "for women" by signs printed in English and in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols. If the facilities for each sex are in the same building, they must be separated by solid walls or partitions extending from the floor to the roof or ceiling

- The floor from the wall and for a distance not less than 15 inches measured from the outward edge of the urinals must be constructed of materials impervious to moisture where
- water under pressure is available, urinals must be provided with an adequate water flush
- Urinals troughs in privies must drain freely into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit

Scale of Accommodation in latrines and Urinals[7]

There shall be provided within the precincts of every work place, latrines and urinals in an accessible place, and the accommodation, separately each for this, shall not be less than at the following scale:

No. Of seats

- 2 – where number of persons does not exceed 50
- 3 – where number of persons exceed 50 but does not exceed 100
- 3 – additional each 100 persons or part thereof

In particular cases, the Engineer shall have the power to increase the requirement, wherever necessary.

Anti-malarial Precautions

Contractor shall, at his own expense, conform to all anti-malarial instructions given to him by the Engineer, including filing up any pits which may have been dug by him. Contractor shall supply mosquito repellent to his labours, drivers, operators and labours through contract agency.

Child Labour Provision

The Contractor shall not emply Child Labour for any works or in any manner under the execution of the construction of the project road at any time.

[7]Source: Civil Works Contract for Widening & Strengrhing of existing carriageway to 2-lane road from Jagatpur to Duhuria (km 0/0 to km 49/0 of MDR), OWD, Government of Odisha.

Awareness and Education of HiV/AIDS and Malaria

The Contractor shall provide/carry out HIV/AIDS and Malaria awareness through fixing appropriate poster in local language with sketch and training programme to its labour and management, at least twice per year during the construction period.

Waste Disposal

The sewage system for the camp must be designed, built and operated to the satisfaction of the concerned State Govt. Department so that no health hazard occurs and no pollution to the air, ground or adjacent watercourse takes place. Compliance with the relevant legislation must be strictly adhered to.

- Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner to the satisfaction of relevant norms.
- Septic system shall be constructed for collection and treatment of sanitary sewage. It should be installed in areas of stable soils that nearly level, well drained and permeable, with enough separation between the drained field and the ground water table or other receiving areas. Discharge of septic tank, if any, shall confirm to standard8.
- Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta by incineration at the workplace shall be made by means of a suitable incinerator approved by the local medical health or municipal authorities. Alternatively, excreta may be disposed off by putting a layer of night soils at the bottom of permanent tank prepared for the purpose and covering it with 15 cm layer of waste or refuse and then covering it with a layer of earth for a fortnight (by then it will turn into manure).
- On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the the Engineer.

Annexure 15: Generic Guidelines for Environment Friendly ConstructionMethodology

The contractor shall be deemed to have acquainted himself with the requirements of all the current statutes, ordinances, by-laws, rules and regulations or their instruments having the force of law including without limitation those relating to protection of the environment, health and safety, importation of labour, demolition of houses, protection of environment and procurement, transportation, storage and use of explosives, etc.

Protection of Environment

- The contractor will take all necessary measures and precautions and ensure that the execution of the works and all associated operations on site or offsite are carried out in conformity with statutory and regulatory environmental requirements including those prescribed in EMP.
- The contractor will take all measures and precautions to avoid any nuisance or disturbance to inhabitants arising from the execution of works.
- All liquid waste products arising on the sites will be collected and disposed of at a location on or off the sites and in a manner that will not cause either nuisance or pollution.
- The contractor will at all times ensure that all existing water courses and drains within and adjacent to the site are kept safe and free from any contamination.
- The contractor will submit details of his temporary drainage work system (including all surface channels, sediment traps, washing basins and discharge pits) to the Project Implementation Unit / Supervising Engineer for approval prior to commencing work on its construction.
- The contractor will arrange all the equipment in good condition to minimize dust, gaseous or other air-borne emissions and carry out the works in such a manner as to minimize adverse impact on air.
- Any vehicle with an open load-carrying area used for transporting potentially dust-producing material will have properly fitted side and tailboards. Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a clean tarpaulin in good condition.
- The contractor will take all necessary measures to ensure that the operation of all mechanical equipment and condition processes on and off the site will not cause any unnecessary or excessive noise, taking into account applicable environmental requirements.
- The contractor will take necessary measures to maintain all plant and equipment in good condition.
- Where the execution of the works requires temporary closure of road to traffic, the contractor will provide and maintain temporary traffic diversions subject to the approval of the CSE.

- Where the execution of the works requires single-lane operation on public road the contractor will provide and maintain all necessary barriers, warning signs and traffic control signals to the satisfaction of the CSE.
- Wherever traffic diversions, warning signs, traffic control signals, barriers and the like are required, the contractor will install them to the satisfaction of CSE prior to commencing the work, in that area.
- Contractor will install asphalt plants and other machineries away from the populated areas as per laid down regulations.
- Permit for felling of trees will be obtained from the forest department before the execution of any work.
- Trees and plants going to be uprooted by Contractor's own requirement will be duly compensated and maintained up to 3 years.
- Mist sprays should be provided at appropriate places for preventing dust pollution during handling and stockpiling of stones and loose earth.
- Over Burden (OB) waste dumps shall be sprayed with water, as they are the major source of air borne particulate matter.
- OB waste dumps shall be reclaimed / afforested to bind the loose soil and to prevent soil erosion. The frequency of sprinkling should be fixed as per the seasonal requirement and in consultation with engineer.
- Regular water spraying on haulage roads during transportation of construction material by water sprinklers. The frequency of sprinkling should be fixed as per the seasonal requirements in consultation with engineer.
- Transfer point for transporting construction material shall be provided with appropriate hoods/ chutes to prevent dust emissions.
- Dumping of construction material should be from an optimum height (preferably not too high), so as to reduce the dust blow.
- Innovative approaches of using improvised machinery designs, with in-built mechanism to reduce sound emission.
- Procurement of drill loaders, dumbers and other equipment with noise proof system in operator's cabin.
- Confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas.
- Regular and proper maintenance of noise generating machinery including the transport vehicles to maintain noise levels.
- Provisions should be made for noise absorbing pads at foundations of vibrating equipments to reduce noise emissions.

Quarry Operations

The Contractor shall obtain materials from quarries only after the consent of the Forest Department or other concerned authorities and in consultation with the supervision Engineer. The quarry operations shall be undertaken within the purview of the rules and regulations in force.

Prevention of Water Courses from Soil Erosion and Sedimentation / Siltation

The Contractor shall apply following mitigation measures to prevent sedimentation and pollution of watercourses.

- To prevent increased siltation, if need be existing bridges maybe widened downstream side of the water body;
- Cement and coal ash should be stacked together, fenced by bricks or earth wall, and kept away from water, to prevent leachate formation and contamination of surface and ground water;
- If need be, slope of the embankments leading to water bodies should be modified and rechannelised to prevent entry of contaminants into the water body;
- During construction silt fencing could be used along the road at all canals and rivers to prevent sediments from the construction site to enter into the watercourses.

Pollution from Hot-Mix Plants and Batching Plants

Bituminous hot-mix plants and concrete batching plants shall be located sufficiently away from habitation, agricultural operations. The Contractor shall take every precaution to reduce the levels of noise, vibration, dust and emissions from his plants and shall be fully responsible for any claims for damages caused to the owners of property, fields and residents in the vicinity.

Arrangement for Traffic During Construction

The Contractor shall at all times carry out work on the road in a manner creating least interference to the flow of traffic with the satisfactory execution. For all works involving improvements to the existing state highway, the Contractor shall, in accordance with the directives of the SE, provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement, or along a temporary diversion constructed close to the state highway. The Contractor shall take prior approval of the SE regarding traffic arrangements during construction.

Traffic Safety and Control

- Where subject to the approval of the Engineer the execution of the works requires temporary closure of road to traffic use, the Contractor shall provide and maintain temporary traffic diversions. The diversion shall generally consist of 200 mm thickness of gravel 4.5 meters wide laid directly upon natural ground and where any additional earthworks are required for this purpose that will be provided under the appropriate payment items.
- Where the execution of the works requires single-lane operation on public road, the Contractor shall provide and maintain all necessary barriers, warning signs and traffic control signals to the approval of the Engineer.

- With the exception of temporary traffic arrangements or diversions required within the first 4 weeks of the Contract, the Contractor shall submit details of his proposals to the Engineer for approval not less than 4 weeks prior to the temporary arrangement or diversion being required. Details of temporary arrangements or diversions for approval as soon as possible after the date of the Letter of Acceptance.
- The color, configuration, size and location of all traffic signs shall be in accordance with the code of practice for road sign. In the absence of any detail or for any missing details, the signs shall be provided as directed by the CSE.
- The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking, flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the road under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic or closer of traffic on the road shall be drawn up in consultation with the CSE.
- At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the carriageway) the lane width path for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the SE. At night, the passage shall be delineated with lanterns or other suitable light source.
- One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns / lights.
- On both sides, suitable regulatory / warnings signs as approved by the SE shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of design and of reflectory type, if so directed by the SE.
- Upon completion of the works for which the temporary traffic arrangements or diversions have been made, the Contractor shall remove all temporary installations and signs and reinstate all affected roads and other structures or installations to the conditions that existed before the work started, as directed by the Engineer.

Health and Safety

The contractor shall take all measures and precautions necessary to ensure the health, safety and welfare of all persons entitled to be on the site. Such precautions shall include those that, in the opinion of the Engineer, are reasonable to prevent unauthorized entry upon the site and to protect members of the public from any activities under the control of the contractor. The contractor's responsibilities shall include but not be limited to:

- The provision and maintenance of the Contractor's Equipment in a safe working condition and the adoption of methods of work that are safe and without risks to the health of any person entitled to be on the site.
- The execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances,
- The provision of lighting, including standby facilities in the event of failure, that, in the opinion of the Engineer, is adequate to ensure the safe execution of any works that are to be carried out at right.
- The provision of protective clothing and safety equipment, with such personnel and equipment and such information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on or entering on the site in connection with the works, including the Engineer's supervisory staff, all in accordance with the laws.
- Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced provided with proper caution signs and marked with lights at night to avoid accidents. Contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.
- The contractor shall not use or generate any materials in the works, which are hazardous to the health of persons, animals or vegetation. Where it is necessary to use some substances, which can cause injury to the health of workers, the Contractor shall provide protective clothing or appliances to his workers.
- The contractor will take all measures necessary to safeguard the health; safety and welfare of all persons entitled to be on site and will ensure that works are carried out in a safe and efficient manner.
- The contractor will provide, and ensure the utilization of appropriate safety equipment for all workmen and staff employed directly or indirectly by the contractor. Such safety equipment will include but not be limited to the safety helmets, goggles and other eye protectors, hearing protectors, safety harnesses, safety equipment for working over water, rescue equipment, fire extinguishers and first-aid equipment. The personnel working at vulnerable locations at site will wear safety helmets and strong footwear.
- The contractor will provide an adequate number of latrines and other sanitary arrangements at areas of the site where work is in progress and ensure that they are regularly cleaned and maintained in a hygienic condition.
- Provision should be made to provide OHS orientation training9 to all new employees to ensure they are apprised of basic site rules or work at / on site and of personal protection and preventing injury to fellow employees.

[9]IFC's EHS Guidelines 2007

- OHS training should consist of basic hard awareness, site specific hazards, safe work practices and emergency procedures for file, evacuation and natural disaster as appropriate.

First Aid

- The provision and maintenance of suitably equipped and staffed first aid stations throughout the extent of the works to the satisfaction of the Engineer. The contractor shall allow in his prices and the responsible for the costs of all such site welfare arrangements and requirements.
- Injuries might occur during the construction period. It is therefore pertinent to provide first aid facilities for all the construction workers. At construction camps and at all workplaces first aid equipment and nursing staff must be provided. Since many of the workplaces may be far away from regular hospitals, an indoor health unit having one bed facility every 250 workers needs to be provided.
- Adequate transport facilities for moving the injured persons to the nearest hospital must also be provided in ready to move condition.
- The first-aid units apart from an adequate supply of sterilized dressing material should contain other necessary appliances as per the factory rules.

Maintenance

- All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition and be protected from rubbish accumulation.
- Each structure made available for occupancy shall be of sound construction, shall assure adequate protection against weather, and shall include essential facilities to permit maintenance in a clean and operable condition. Comfort and safety of occupants shall be provided for by adequate heating, lighting, ventilation or insulation when necessary to reduce excessive heat.
- Each structure made available for occupancy shall comply with the requirements of the Uniform Building Code. This shall not apply to tent camps.

Maintenance of Diversions and Traffic Control Devices

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversion shall be maintained in a satisfactory condition till such time they are required as directed by the SE. The temporary traveled way shall be kept free of dust by frequent applications of water, if necessary.

Community Health and Safety

Hazards posed to the public while accessing project facilities may include:

- Physical trauma associated with failure of building structures
- Burns and smoke inhalation from fires
- Injuries suffered as a consequence of falls or contact with heavy equipment

- Respiratory distress from dust, fumes, or noxious odors
- Exposure to hazardous materials

Reduction of potential hazards should be accomplished by:

- Inclusion of buffer strips or other methods of physical separation around project sites to protect the public from major hazards associated with hazardous materials incidents or process failure, as well as nuisance issues related to noise, odors, or other emissions
- Incorporation of siting and safety engineering criteria to prevent failures due to natural risks posed by earthquakes, tsunamis, wind, flooding, landslides and fire. To this end, all project structures should be designed in accordance with engineering and design criteria mandated by site-specific risks, including but not limited to seismic activity, slope stability, wind loading, and other dynamic loads

Arrangement for transportation of hazardous material

The procedures for transportation of hazardous materials (Hazmats) should include:

- Proper labelling of containers, including the identify and quantity of the contents, hazards, and shipper contact information
- Providing a shipping document (e.g. shipping manifest) that describes the contents of the load and its associated hazards in addition to the labeling of the containers. The shipping document should establish a chain-of-custody using multiple signed copies to show that the waste was properly shipped, transported and received by the recycling or treatment/disposal facility
- Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures

Community Notification

If a local community may be at risk from a potential emergency arising at the facility, the company should implement communication measures to alert the community, such as:

- Audible alarms, such as fire bells or sirens
- Fan out telephone call lists
- Vehicle mounted speakers
- Communicating details of the nature of the emergency
- Communicating protection options (evacuation, quarantine)
- Providing advice on selecting an appropriate protection option

Annexure 16: Guidelines for Stripping, Stocking, Preservation of Top Soil[10]

When so directed by the Engineer, the topsoil from all areas of cutting and from all areas to be covered by embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2 m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily subjected to traffic either before stripping or when in a stockpile. At least 10% of the temporary acquired area shall be earmarked for storing top soil. The stockpile shall be designated such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the stockpile is restricted to 2 m. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

Prior to stripping the topsoil, all trees, shrubs etc. shall be removed along with their roots, with approval of the Engineer. Where directed, the topsoil removed and conserved shall be spread over cut slopes, shoulders and other disturbed areas. Slopes may be roughened and moistened slightly, prior to the application of topsoil, in order to provide satisfactory bond. The depth of topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 100 mm.

Topsoil generated during excavation of the borrow area shall be stockpiled at a certain location within the borrow area and the same shall be used for rehabilitation/reinstatement of the borrow area, when operation of the borrow area is over.

[10]Clauses 301.3.2 and 305.3.3 of MoRTH Specifications for Roads and Bridges Works (Fifth Edition) 2013

Annexure 17: Baseline Monitoring Result

Air Quality Monitoring

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/AA/2110010001**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	18/10/2021
	Analysis Date	:	18/10/2021 to 21/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010001** & 18/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-1)
Type of Sample	:	Air Sample
Date of Sample Collection	:	14/10/2021 to 15/10/2021
Location / Source of Sample	:	**Nakachari, Inside Public Health Center** Latitude- 26°41'39.75" N, Longitude- 94°24'48.99" E Chainage - 00+100 Km, Distance from alignment – 050 m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	75	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	41	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	9.2	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	13.6	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/AA/2110010002**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	18/10/2021
	Analysis Date	:	18/10/2021 to 21/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010002** & 18/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-2)
Type of Sample	:	Air Sample
Date of Sample Collection	:	14/10/2021 to 15/10/2021
Location / Source of Sample	:	**Chamguri, Inside School** Latitude- 26°50'43.842"N,Longitude- 94°34'3.686"E Chainage - 24+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	68	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	40	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	7.8	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	12.4	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/2110010003**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	19/10/2021
	Analysis Date	:	19/10/2021 to 22/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010003** & 19/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-3)
Type of Sample	:	Air Sample
Date of Sample Collection	:	15/10/2021 to 16/10/2021
Location / Source of Sample	:	**Balighat, Near Termination Point** Latitude- 26.926340 N, Longitude- 94.742767 E Chainage - 44+931 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	82	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	46	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	9.4	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	15.2	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/AA/2110010004**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	24/10/2021
	Analysis Date	:	24/10/2021 to 27/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010004** & 24/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-1)
Type of Sample	:	Air Sample
Date of Sample Collection	:	20/10/2021 to 21/10/2021
Location / Source of Sample	:	**Nakachari, Inside Public Health Center** Latitude- 26°41'39.75" N, Longitude- 94°24'48.99" E Chainage - 00+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	79	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	45	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	9.9	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	14.2	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:			
	Test Report No.	:	**ITL/ENV/PR/AA/2110010005**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	24/10/2021
	Analysis Date	:	24/10/2021 to 27/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010005** & 24/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-2)
Type of Sample	:	Air Sample
Date of Sample Collection	:	20/10/2021 to 21/10/2021
Location / Source of Sample	:	**Chamguri, Inside School** Latitude- 26°50'43.842"N,Longitude- 94°34'3.686"E Chainage - 24+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	70	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	42	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	8.4	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	13.2	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/2110010006**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	25/10/2021
	Analysis Date	:	25/10/2021 to 28/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010007** & 25/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-3)
Type of Sample	:	Air Sample
Date of Sample Collection	:	21/10/2021 to 22/10/2021
Location / Source of Sample	:	**Balighat, Near Termination Point** Latitude- 26.926340 N, Longitude- 94.742767 E Chainage - 44+931 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	89	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	49	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	10.2	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	16.2	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/AA/2110010007**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	30/10/2021
	Analysis Date	:	30/10/2021 to 03/11/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010007** & 30/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-1)
Type of Sample	:	Air Sample
Date of Sample Collection	:	26/10/2021 to 27/10/2021
Location / Source of Sample	:	**Nakachari, Inside Public Health Center** Latitude- 26°41'39.75" N, Longitude- 94°24'48.99" E Chainage - 00+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	78	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	44	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	8.5	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	12.4	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:			
	Test Report No.	:	**ITL/ENV/PR/AA/2110010008**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	30/10/2021
	Analysis Date	:	30/10/2021 to 03/11/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010008** & 30/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-2)
Type of Sample	:	Air Sample
Date of Sample Collection	:	26/10/2021 to 27/10/2021
Location / Source of Sample	:	**Chamguri, Inside School** Latitude- 26°50'43.842"N,Longitude- 94°34'3.686"E Chainage - 24+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	64	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	39	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	7.4	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	11.2	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/2110010009**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	31/10/2021
	Analysis Date	:	31/10/2021 to 03/11/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010009** & 31/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-3)
Type of Sample	:	Air Sample
Date of Sample Collection	:	27/10/2021 to 28/10/2021
Location / Source of Sample	:	**Balighat, Near Termination Point** Latitude- 26.926340 N, Longitude- 94.742767 E Chainage - 44+931 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	78	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	43	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	8.8	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	14.4	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/AA/2110010010**
	Report Issue Date	:	12/11/2021
	Sample Receipt Date	:	08/11/2021
	Analysis Date	:	08/11/2021 to 11/11/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010010** & 08/11/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-1)
Type of Sample	:	Air Sample
Date of Sample Collection	:	05/11/2021 to 06/11/2021
Location / Source of Sample	:	**Nakachari, Inside Public Health Center** Latitude- 26°41'39.75" N, Longitude- 94°24'48.99" E Chainage - 00+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	71	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	42	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	8.4	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	11.5	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:	**Test Report No.**	:	**ITL/ENV/PR/AA/2110010011**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	08/11/2021
	Analysis Date	:	08/11/2021 to 11/11/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010011** & 08/11/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-2)
Type of Sample	:	Air Sample
Date of Sample Collection	:	05/11/2021 to 06/11/2021
Location / Source of Sample	:	**Chamguri, Inside School** Latitude- 26°50'43.842"N,Longitude- 94°34'3.686"E Chainage - 24+100 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	66	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	42	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	8.2	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	13.2	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Issued to:			
	Test Report No.	:	**ITL/ENV/PR/2110010012**
	Report Issue Date	:	12/11/2021
	Sample Receipt Date	:	09/11/2021
	Analysis Date	:	09/11/2021 to 12/11/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/AA/2110010012** & 09/11/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	1010/2021

Nature and Description of Sample	:	Ambient Air Quality Monitoring (AAQM-3)
Type of Sample	:	Air Sample
Date of Sample Collection	:	06/11/2021 to 07/11/2021
Location / Source of Sample	:	**Balighat, Near Termination Point** Latitude- 26.926340 N, Longitude- 94.742767 E Chainage - 44+931 Km, Distance from alignment - 050m
Sample Quantity	:	NA
Sample Condition	:	OK
Sampling Method	:	CPCB Method Volume-1, 2011
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S No.	Parameter (s)	Method of Test	Result	Limit As Per NAAQS Dated 18 Nov 2009
1	Particulate Matter (PM_{10}), µg/m³	IS 5182 Part 23:2006	87	100
2	Particulate Matter ($PM_{2.5}$), µg/m³	CPCB Method Volume-1, 2011	48	60
3	Sulphur dioxide (SO_2), µg/m³	IS 5182 Part 2:2001	9.2	80
4	Oxide of nitrogen (NO_2), µg/m³	IS 5182 Part 6:2006	14.8	80
5	Carbon monoxide (CO), mg/m³	USEPA Method 13	BDL	2
6	Hydrocarbon (HC), µg/m³	CPCB Method Volume-1, 2011	BDL	-
7	Lead (Pb), µg/m³	CPCB Method Volume-1, 2011	BDL	1

* BDL – Below Detection Limit

Noise Monitoring

Issued to:	Test Report No.	:	ITL/ENV/PR/NM/21100110001
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	NA
	Analysis Date	:	NA
	Lab Sample No. & Date	:	ITL/ENV/PR/NM/211001100018 14/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	10/10/2021

Nature and Description of Sample	:	Noise Level Monitoring (NM-1)
Type of Sample	:	Noise Level
Date of Sample Collection	:	Mentioned below in results table
Location / Source of Sample	:	Nakachari Near Public Health Center Latitude- 26°41'39.75" N, Longitude- 94°24'48.99" E Chainage - 00+100 Km
Sample Quantity	:	NA
Sample Condition	:	NA
Sampling Method	:	NA
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali

Test Results

Time	Results as per noise monitoring date	
	14/10/2021	15/10/2021
Day 6.00	42.1	41.9
7.00	43.7	43.7
8.00	44.5	45.3
9.00	46.2	46.8
10.00	47.8	47.4
11.00	49.3	48.9
12.00	50.6	50.3
13.00	50.9	51.8
14.00	51.2	52.6
15.00	**52.6**	**53.7**
16.00	52.0	52.2
17.00	51.3	51.1
18.00	50.4	49.3
19.00	49.1	47.8
20.00	48.3	46.2
21.00	46.6	45.9
Night 22.00	44.5	44.5
23.00	44.1	43.8
24.00	42.3	42.7
1.00	41.9	42.1
2.00	41.4	41.3
3.00	40.7	40.2
4.00	**40.2**	39.9
5.00	41.8	40.7
Maximum	**52.6**	**53.7**
Minimum	**40.2**	**39.9**
Ld	**49.3**	**49.5**
Ln	**41.4**	**41.2**
Ldn	**50.1**	**50.1**

-----End of the report-----

Issued to:	Test Report No.	:	ITL/ENV/PR/NM/21100110002
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	NA
	Analysis Date	:	NA
	Lab Sample No. & Date	:	ITL/ENV/PR/NM/21100110002& 14/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	10/10/2021

Nature and Description of Sample	:	Noise Level Monitoring (NM-2)
Type of Sample	:	Noise Level
Date of Sample Collection	:	Mentioned below in results table
Location / Source of Sample	:	Chamguri, Inside School Latitude- 26°50'43.842"N,Longitude- 94°34'3.686"E Chainage - 24+100 Km
Sample Quantity	:	NA
Sample Condition	:	NA
Sampling Method	:	NA
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali

Test Results

Time	Results as per noise monitoring date	
	14/10/2021	15/10/2021
Day 6.00	40.1	41.1
7.00	41.8	42.3
8.00	43.5	43.6
9.00	44.7	45.2
10.00	46.0	46.9
11.00	47.7	47.7
12.00	48.5	49.5
13.00	49.1	50.1
14.00	49.8	51.4
15.00	50.0	51.9
16.00	50.4	52.0
17.00	**51.6**	**52.5**
18.00	50.1	51.1
19.00	48.8	50.0
20.00	46.3	49.3
21.00	44.2	45.2
Night 22.00	43.9	44.5
23.00	42.5	46.1
24.00	42.0	47.0
1.00	41.8	45.3
2.00	41.3	44.2
3.00	40.9	43.6
4.00	**39.3**	41.6
5.00	39.6	**40.9**
Maximum	**51.6**	**52.5**
Minimum	**39.3**	**40.9**
Ld	**48.0**	**49.2**
Ln	**40.6**	**44.5**
Ldn	**49.0**	**51.7**

----End of the report----

Issued to:			
	Test Report No.	:	ITL/ENV/PR/NM/21100110003
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	NA
	Analysis Date	:	NA
	Lab Sample No. & Date	:	ITL/ENV/PR/NM/21100110003& 14/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	10/10/2021

Nature and Description of Sample	:	Noise Level Monitoring (NM-3)
Type of Sample	:	Noise Level
Date of Sample Collection	:	Mentioned below in results table
Location / Source of Sample	:	**Balighat, Near Termination Point** Latitude- 26.926340 N, Longitude- 94.742767 E Chainage - 44+931 Km
Sample Quantity	:	NA
Sample Condition	:	NA
Sampling Method	:	NA
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

Time	Results as per noise monitoring date	
	16/10/2021	17/10/2021
Day 6.00	41.1	40.1
7.00	42.6	41.6
8.00	43.2	43.5
9.00	45.7	44.7
10.00	46.3	46.0
11.00	49.7	47.7
12.00	50.5	48.5
13.00	51.1	49.1
14.00	52.6	49.6
15.00	53.2	50.0
16.00	53.7	50.4
17.00	**54.0**	**51.6**
18.00	52.1	50.1
19.00	49.8	48.8
20.00	47.3	46.3
21.00	45.2	44.2
Night 22.00	44.0	43.9
23.00	43.5	42.5
24.00	42.7	42.0
1.00	41.3	41.8
2.00	40.2	41.3
3.00	39.8	40.9
4.00	**39.0**	**39.3**
5.00	41.4	39.6
Maximum	**54.0**	**51.6**
Minimum	**39.0**	**39.3**
Ld	**50.2**	**48.0**
Ln	**40.8**	**40.6**
Ldn	**50.4**	**49.0**

-------End of the report-------

Groundwater Monitoring

Issued to:	***Test Report No.***	:	**ITL/ENV/PR/GW/2110010001**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	18/10/2021
	Analysis Date	:	18/10/2021 to 21/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/GW/2110010001**& 09/03/2020
	Reference No.	:	PI/CTKI21-24/WO/GEMPU/1
	Date	:	10/10/2021

Nature and Description of Sample	:	Ground Water
Type of Sample	:	Water Sample
Date of Sample Collection	:	14/10/2021
Location / Source of Sample	:	Nakachari (Ground Water sample from Tubewell) Latitude- 26.694302 N, longitude- 94.413154 E Chainage - 00+100 Km, Distance from alignment - 100m
Sample Quantity	:	2.5 liter
Sample Condition	:	Sealed properly
Sampling Method	:	IS 3025 Part I, ITL/Micro/SOP/03
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S. No.	Parameter(s)	Test Method	Test Result	Acceptable Limit	Permissible Limit
1	Colour, Hazen units	IS 3025 Part 4	< 1	5 Max	15 Max
2	Odour	IS 3025 Part 5	Agreeable	Agreeable	Agreeable
3	Temperature, °C	IS 3025 Part 9	24	-	-
4	pH Value at 25°C	IS 3025 Part 11	6.37	6.5 – 8.5	No Relaxation
5	Conductivity at 25°C, µS/cm	IS 3025 Part 14	267	-	-
6	Total Dissolve Solids, mg/l	IS 3025 Part 16	112	500 Max	2000 Max
7	Calcium (as Ca),mg/l	IS 3025 Part 40	14	75 Max	200 Max
8	Magnesium (as Mg) , mg/l	IS 3025 Part 46	13.6	30 Max	100 Max
9	Sodium (as Na),mg/l	IS 3025 Part 45	18	-	-
10	Potassium (as K) ,mg/l	IS 3025 Part 45	9	-	-
11	Alkalinity (as HCO_3), mg/L	IS 3025 Part 23	88	-	-
12	Sulphate (as SO4) ,mg/l	IS 3025 Part 24	26	200 Max	400 Max
13	Chloride (as Cl),mg/l	IS 3025 Part 32	59.9	250 Max	1000 Max
14	Nitrate (as NO3) ,mg/l	IS 3025 Part 34	1.5	45 Max	No Relaxation
15	Boron (as B), mg/L	IS 3025 Part 57	BDL	0.5 Max	1.0 Max
16	Nitrite (as NO_2), mg/L	IS 3025 Part 34	0.03	-	-
17	Fluoride (as F), mg/L	IS 3025 Part 60	BDL	1 Max	1.5 Max
18	Dissolve Phosphate (as PO_4), mg/L	IS 3025 Part 31	BDL	-	-
19	Total Hardness (as $CaCO_3$), mg/L	IS 3025 Part 21	72	200 Max	600 Max
20	E. Coli, (MPN/100ml)	IS 1622: 1981	Absent	Shall not be detected in 100ml sample	
21	Total Coliform, (MPN/100ml)	IS 1622: 1981	Absent	Shall not be detected in 100ml sample	

--------End of the report-------

Issued to:			
	Test Report No.	:	**ITL/ENV/PR/GW/2110010002**
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	18/10/2021
	Analysis Date	:	18/10/2021 to 21/10/2021
	Lab Sample No. & Date	:	**ITL/ENV/PR/GW/2110010002** & 18/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	10/10/2020

Nature and Description of Sample	:	Ground Water
Type of Sample	:	Water Sample
Date of Sample Collection	:	14/10/2021
Location / Source of Sample	:	Nazira (Ground Water sample from Hand pump) Latitude- 26.916191 N, longitude- 94.735280 E Chainage - 43+400 Km, Distance from alignment - 100m
Sample Quantity	:	2.5 liter
Sample Condition	:	Sealed properly
Sampling Method	:	IS 3025 Part I, ITL/Micro/SOP/03
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S. No.	Parameter(s)	Test Method	Test Result	Acceptable Limit	Permissible Limit
1	Colour, Hazen units	IS 3025 Part 4	< 1	5 Max	15 Max
2	Odour	IS 3025 Part 5	Agreeable	Agreeable	Agreeable
3	Temperature, °C	IS 3025 Part 9	24.4	-	-
4	pH Value at 25°C	IS 3025 Part 11	6.78	6.5 – 8.5	No Relaxation
5	Conductivity at 25°C, µS/cm	IS 3025 Part 14	288	-	-
6	Total Dissolve Solids, mg/l	IS 3025 Part 16	180	500 Max	2000 Max
7	Calcium (as Ca),mg/l	IS 3025 Part 40	30.4	75 Max	200 Max
8	Magnesium (as Mg) , mg/l	IS 3025 Part 46	32.4	30 Max	100 Max
9	Sodium (as Na) ,mg/l	IS 3025 Part 45	12.4	-	-
10	Potassium (as K) ,mg/l	IS 3025 Part 45	4.9	-	-
11	Alkalinity (as HCO_3), mg/L	IS 3025 Part 23	60	-	-
12	Sulphate (as SO4) ,mg/l	IS 3025 Part 24	31	200 Max	400 Max
13	Chloride (as Cl),mg/l	IS 3025 Part 32	43.9	250 Max	1000 Max
14	Nitrate (as NO3) ,mg/l	IS 3025 Part 34	1.1	45 Max	No Relaxation
15	Boron (as B), mg/L	IS 3025 Part 57	BDL	0.5 Max	1.0 Max
16	Nitrite (as NO_2), mg/L	IS 3025 Part 34	0.02	-	-
17	Fluoride (as F), mg/L	IS 3025 Part 60	BDL	1 Max	1.5 Max
18	Dissolve Phosphate (as PO_4), mg/L	IS 3025 Part 31	0.1	-	-
19	Total Hardness (as $CaCO_3$), mg/L	IS 3025 Part 21	164	200 Max	600 Max
20	E. Coli, (MPN/100ml)	IS 1622: 1981	Absent	Shall not be detected in 100ml sample	
21	Total Coliform, (MPN/100ml)	IS 1622: 1981	Absent	Shall not be detected in 100ml sample	

-------End of the report------

Surface Water Monitoring

Issued to:			
	Test Report No.	:	ITL/ENV/PR/SW/21100110001
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	18/10/2021
	Analysis Date	:	18/10/2021 to 21/10/2021
	Lab Sample No. & Date	:	ITL/ENV/PR/SW/21100110001 & 18/10/2021
	Reference No.	:	PI/CTKI/21-24/WO/GEMPU/1
	Date	:	10/10/2021

Nature and Description of Sample	:	Surface Water
Type of Sample	:	Water Sample
Date of Sample Collection	:	14/10/2021
Location / Source of Sample	:	Gharphalia Maibela (Road side Pond) Latitude- 26.700120 N longitude- 94.437104 E Chainage - 05+550 Km, Distance from alignment - 100m
Sample Quantity	:	2.5 Liter
Sample Condition	:	OK
Sampling Method	:	IS 3025 Part-I, ITL/Micro/SOP/03
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (If any)	:	Environmental Baseline Monitoring For Road Project At Assam, Nakachari To Balighat Tiniali

TestResults

S. No.	Parameter(s)	Test Method	Test Result	Acceptable Limit	Permissible Limit
1	Colour, Hazen units	IS 3025 Part 4	< 1	5 Max	15 Max
2	Odour	IS 3025 Part 5	Agreeable	Agreeable	Agreeable
3	pH Value at 25°C	IS 3025 Part 11	6.18	6.5 – 8.5	No Relaxation
4	Temperature, °C	IS 3025 Part 9	24.3	-	-
5	Conductivity at 25°C, µS/cm	IS 3025 Part 14	197	-	-
6	Total Dissolve Solids, mg/l	IS 3025 Part 16	112	500 Max	2000 Max
7	Total Suspended Solids, mg/l	IS 3025 Part 17	20	-	-
8	Total Solids, mg/l	IS 3025 Part 15	132	-	-
9	Calcium (as Ca),mg/l	IS 3025 Part 40	20.8	75 Max	200 Max
10	Magnesium (as Mg) , mg/l	IS 3025 Part 46	20.9	30 Max	100 Max
11	Sodium (as Na) ,mg/l	IS 3025 Part 45	26	-	-
12	Potassium (as K) ,mg/l	IS 3025 Part 45	18.2	-	-
13	Total Alkalinity (as CaCO3) ,mg/l	IS 3025 Part 23	30	200 Max	600 Max
14	Sulphate (as SO4) ,mg/l	IS 3025 Part 24	56	200 Max	400 Max
15	Chloride (as Cl),mg/l	IS 3025 Part 32	89.9	250 Max	1000 Max
16	Nitrate (as NO3) ,mg/l	IS 3025 Part 34	3.3	45 Max	No Relaxation
17	Ammonia (as NH3),mg/l	IS 3025 Part 34	0.32	0.5 Max	No Relaxation
18	Iron (as Fe),mg/l	IS 3025 Part 53	0.05	0.3 Max	No Relaxation
19	Dissolve Phosphate (as PO4) ,mg/l	IS 3025 Part 31	0.8	-	-
20	Total Hardness (as CaCO3) ,mg/l	IS 3025 Part 21	108	200 Max	600 Max
21	Biochemical Oxygen Demand, mg/l	IS 3025 Part 44	02	-	-
22	Chemical Oxygen Demand, mg/l	IS 3025 Part 58	15	-	-
23	Dissolve Oxygen, mg/l	IS 3025 Part 38	6.0	-	-
24	Lead as Pb, mg/l	IS 3025 Part 47	BDL	0.01	No Relaxation
25	Nickel as Ni, mg/l	IS 3025 Part 54	BDL	0.02	No Relaxation
26	Copper as Cu, mg/l	IS 3025 Part 42	BDL	0.05	1.5
27	Zinc as Zn, mg/l	IS 3025 Part 49	0.9	5	15
28	Cadmium as Cd, mg/l	IS 3025 Part 41	BDL	0.003	No Relaxation
29	Arsenic as As, mg/l	IS 3025 Part 37	BDL	0.01	0.05
30	Total Chromium	IS 3025 Part 52	BDL	0.05	No Relaxation

Issued to:		
	Test Report No.	: ITL/ENV/PR/SW/21100110002
	Report Issue Date	: 11/11/2021
	Sample Receipt Date	: 18/10/2021
	Analysis Date	: 18/10/2021 to 21/10/2021
	Lab Sample No. & Date	: ITL/ENV/PR/SW/21100110002 & 18/10/2021
	Reference No.	: PI/CTKI21-24/WO/GEMPL/1
	Date	: 10/10/2021

Nature and Description of Sample	:	Surface Water
Type of Sample	:	Water Sample
Date of Sample Collection	:	14/10/2021
Location / Source of Sample	:	Location – Parbatia (Road side Pond) Latitude- 26.878510 N longitude- 94.635248 E Chainage - 32+100 Km, Distance from alignment - 100m
Sample Quantity	:	2.5 Liter
Sample Condition	:	OK
Sampling Method	:	IS 3025 Part-I, ITL/Micro/SOP/03
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (If any)	:	**Environmental Baseline Monitoring for Road Project at Assam.**

TestResults

S. No.	Parameter(s)	Test Method	Test Result	Acceptable Limit	Permissible Limit
1	Colour, Hazen units	IS 3025 Part 4	< 1	5 Max	15 Max
2	Odour	IS 3025 Part 5	Agreeable	Agreeable	Agreeable
3	pH Value at 25°C	IS 3025 Part 11	7.22	6.5 – 8.5	No Relaxation
4	Temperature, °C	IS 3025 Part 9	24.5	-	-
5	Conductivity at 25°C, µS/cm	IS 3025 Part 14	210	-	-
6	Total Dissolve Solids, mg/l	IS 3025 Part 16	126	500 Max	2000 Max
7	Total Suspended Solids, mg/l	IS 3025 Part 17	18	-	-
8	Total Solids, mg/l	IS 3025 Part 15	144	-	-
9	Calcium (as Ca),mg/l	IS 3025 Part 40	19.2	75 Max	200 Max
10	Magnesium (as Mg) , mg/l	IS 3025 Part 46	16.5	30 Max	100 Max
11	Sodium (as Na) ,mg/l	IS 3025 Part 45	22.5	-	-
12	Potassium (as K) ,mg/l	IS 3025 Part 45	16	-	-
13	Total Alkalinity (as CaCO3) ,mg/l	IS 3025 Part 23	50	200 Max	600 Max
14	Sulphate (as SO4) ,mg/l	IS 3025 Part 24	58	200 Max	400 Max
15	Chloride (as Cl),mg/l	IS 3025 Part 32	85	250 Max	1000 Max
16	Nitrate (as NO3) ,mg/l	IS 3025 Part 34	3.6	45 Max	No Relaxation
17	Ammonia (as NH3),mg/l	IS 3025 Part 34	0.20	0.5 Max	No Relaxation
18	Iron (as Fe),mg/l	IS 3025 Part 53	0.06	0.3 Max	No Relaxation
19	Dissolve Phosphate (as PO4) ,mg/l	IS 3025 Part 31	0.54	-	-
20	Total Hardness (as CaCO3) ,mg/l	IS 3025 Part 21	90	200 Max	600 Max
21	Biochemical Oxygen Demand, mg/l	IS 3025 Part 44	02	-	-
22	Chemical Oxygen Demand, mg/l	IS 3025 Part 58	10	-	-
23	Dissolve Oxygen, mg/l	IS 3025 Part 38	6.3	-	-
24	Lead as Pb, mg/l	IS 3025 Part 47	BDL	0.01	No Relaxation
25	Nickel as Ni, mg/l	IS 3025 Part 54	BDL	0.02	No Relaxation
26	Copper as Cu, mg/l	IS 3025 Part 42	BDL	0.05	1.5
27	Zinc as Zn, mg/l	IS 3025 Part 49	0.7	5	15
28	Cadmium as Cd, mg/l	IS 3025 Part 41	BDL	0.003	No Relaxation
29	Arsenic as As, mg/l	IS 3025 Part 37	BDL	0.01	0.05
30	Total Chromium	IS 3025 Part 52	BDL	0.05	No Relaxation

----------End of the report----------

Soil Monitoring

Issued to:	*Test Report No.*	:	ITL/ENV/PR/SW/211001 10001
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	17/10/2021
	Analysis Date	:	17/10/2021 to 22/10/2021
	Lab Sample No. & Date	:	ITL/ENV/PR/SW/211001 10001& 17/10/2021
	Reference No.	:	PI/CTKI21-24/WO/GEMPL/1
	Date	:	10/10/2021

Nature and Description of Sample	:	Soil Sample
Type of Sample	:	Soil Sample
Date of Sample Collection	:	14/10/2021
Location / Source of Sample	:	**Gharphalia Maibela Patia Gaon** Latitude- 26.704350 N Longitude- 94.440923 E Chainage - 03+150 Km, Distance from alignment - 150m
Sample Quantity	:	5 kg
Sample Condition	:	Sealed, Ok
Sampling Method	:	ITL/SOP/Soil/01
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S. No.	Parameter(S)	Test Method	Unit	Test Result
1	Soil Texture	ITL/SOP/ENV/Soil/07	-	Sandy Loam
2	Soil Colour	ITL/SOP/ENV/Soil/08		Dark Brown
3	pH Value at 25°C	ITL/SOP/ENV/Soil/01	-	7.68
4	Conductivity at 25°C	ITL/SOP/ENV/Soil/02	µS/cm	8.5
5	Moisture	ITL/SOP/ENV/Soil/03	% by mass	10.6
6	Bulk Density	ITL/SOP/ENV/Soil/04	gm/cc	1.32
7	Water Holding Capacity	ITL/SOP/ENV/Soil/05	Inches/foot	1.21
8	Nitrogen as N	ITL/SOP/ENV/Soil/09	mg/Kg	21.4
9	Phosphorus	ITL/SOP/ENV/Soil/10	mg/Kg	3.11
10	Potassium (as K)	ITL/SOP/ENV/Soil/11	mg/Kg	60.4
11	Calcium as Ca	ITL/SOP/ENV/Soil/13	mg/Kg	43
12	Nitrate as NO3	ITL/SOP/ENV/Soil/12	mg/Kg	81
13	Sulphate as SO4	ITL/SOP/ENV/Soil/14	mg/Kg	9.2
14	Chloride	ITL/SOP/ENV/Soil/15	mg/Kg	3.1
15	Organic Carbon	ITL/SOP/ENV/Soil/18	% by mass	4.4
16	Organic Matter	ITL/SOP/ENV/Soil/17	% by mass	3.5
17	Total Soluble Solids	ITL/SOP/ENV/Soil/16	mg/Kg	12.4
18	Particle size distribution			
a	Sand	ITL/SOP/ENV/Soil/06	% by mass	40.1
b	Silt	ITL/SOP/ENV/Soil/06	% by mass	21.6
c	Clay	ITL/SOP/ENV/Soil/06	% by mass	38.2

----------End of the report----------

Issued to:			
	Test Report No.	:	ITL/ENV/PR/SW/21100110002
	Report Issue Date	:	11/11/2021
	Sample Receipt Date	:	17/10/2021
	Analysis Date	:	17/10/2021 to 22/10/2021
	Lab Sample No. & Date	:	ITL/ENV/PR/SW/21100110002 & 17/10/2021
	Reference No.	:	PI/CTKI18-10/WO/GEMPL/1/R1
	Date	:	10/02/2020

Nature and Description of Sample	:	Soil Sample
Type of Sample	:	Soil Sample
Date of Sample Collection	:	14/10/2021
Location / Source of Sample	:	**Nazira Gaon** Latitude- 26.908015 N, Longitude- 94.72541 E Chainage - 42+100 Km, Distance from alignment - 150m
Sample Quantity	:	5 kg
Sample Condition	:	Sealed, Ok
Sampling Method	:	ITL/SOP/Soil/01
Name of the Sample Collecting Officer	:	By ITL Sampling Executive
Any Other Information (if any)	:	**Environmental Baseline Monitoring for Road Project at Assam. Nakachari to Balighat Tinali**

Test Results

S. No.	Parameter(S)	Test Method	Unit	Test Result
1	Soil Texture	ITL/SOP/ENV/Soil/07	-	Sandy Loam
2	Soil Colour	ITL/SOP/ENV/Soil/08		Brown
3	pH Value at 25°C	ITL/SOP/ENV/Soil/01	-	7.92
4	Conductivity at 25°C	ITL/SOP/ENV/Soil/02	µS/cm	845
5	Moisture	ITL/SOP/ENV/Soil/03	% by mass	12.4
6	Bulk Density	ITL/SOP/ENV/Soil/04	gm/cc	1.29
7	Water Holding Capacity	ITL/SOP/ENV/Soil/05	Inches/foot	1.14
8	Nitrogen as N	ITL/SOP/ENV/Soil/09	mg/Kg	22.4
9	Phosphorus	ITL/SOP/ENV/Soil/10	mg/Kg	3.41
10	Potassium (as K)	ITL/SOP/ENV/Soil/11	mg/Kg	58.4
11	Calcium as Ca	ITL/SOP/ENV/Soil/13	mg/Kg	44
12	Nitrate as NO3	ITL/SOP/ENV/Soil/12	mg/Kg	81
13	Sulphate as SO4	ITL/SOP/ENV/Soil/14	mg/Kg	11.4
14	Chloride	ITL/SOP/ENV/Soil/15	mg/Kg	2.5
15	Organic Carbon	ITL/SOP/ENV/Soil/18	% by mass	4.4
16	Organic Matter	ITL/SOP/ENV/Soil/17	% by mass	3.1
17	Total Soluble Solids	ITL/SOP/ENV/Soil/16	mg/Kg	12.1
18	Particle size distribution			
a	Sand	ITL/SOP/ENV/Soil/06	% by mass	42.4
b	Silt	ITL/SOP/ENV/Soil/06	% by mass	21.2
c	Clay	ITL/SOP/ENV/Soil/06	% by mass	36.4

----------End of the report----------

Annexure 18: Air Modelling Report

Introduction

The impacts in the operation stage for air would be less severe as compared to that in construction phase. After completion of road improvement works, smoothened new pavement and widened roads reduce fugitive dust emissions. This reduced vehicular emission is due to uniform speed and less frequent acceleration and deceleration of vehicles. With reduction in the levels of CO_2, NO_x, CO and HC emissions from the operating vehicles, there will be extensive saving on fuel consumption. Air pollution can be an important concern due to increase in number of vehicles on the improved roads and poor maintenance of vehicles. To assess the likely concentrations at the critical location along the project road corridors, the prediction of the pollutant concentrations has been carried out for project using e AERMOD View™ model based on Gaussian Equation. The current and projected traffic volume of **A20_2 (Balighat Tiniali to Nakachari)** road has been used for the prediction. The modeling was carried out using AERMOD developed by USEPA. The AERMOD air dispersion model is USEPAs official "Appendix A" air dispersion model for regulatory use and was developed by the AERMIC (The American Meteorological Society/EPA Regulatory Model Improvement Committee) work group (Cimorelli et al., 2004). AERMOD aims at modeling short-range (up to 50 km) dispersion from a variety of polluting sources (e.g., point, area, and volume sources) using a number of model configurations. These configurations include different sets of urban or rural dispersion coefficients as well as simple and complex topography. The model has the capacity to employ hourly sequential pre-processed meteorological data to estimate concentrations of pollutants at receptor locations at different time scales ranging from 1 h to 12 months. AERMOD is an advanced plume model that incorporates updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions.

Objectives of the Study

- To estimate the emission inventory of the various sources around the project.
- To estimate the emission inventory with the project development
- To assess regulatory requirements
- To recommend the prevention and mitigation measures to reduce the impacts

Tools and Methods

The major source of pollutants from the proposed project road is vehicular exhaust i.e. line source during the operational phase. Source dispersion analysis is assumed based on the AERMOD ViewTM model. This model enables analysis with respect to PM, and NOx, and gives results in easy-to-understand graphical format.

The following steps are involved in the analysis:

- Inputs are entered into the software as per the general modeling parameters.

- Information on the roadway network, traffic volume, and receptors are added to the software.
- The analysis process is done by the model.

Input(s) and assumptions

Sl. no	Input Required		Availability for project
1.	Traffic Parameters	Traffic Volume	Yes
		Traffic Composition	Yes
		Type of Fuel used by each category	Yes
		Average Speed of the Vehicles	Yes
2.	Meteorological Parameters	Wind Speed, Wind Direction, Cloud Cover, Temperature, Humidity, Station Pressure, etc	IMD Weather data
3.	Emission Parameters	Expressed in grams/distance travelled	CPCB 2011
		Expressed in grams/m2/second emitted	US-EPA, AP42
		Expressed in grams/second emitted	US-EPA, AP42
4.	Road Geometry	Road Width	Actual
		Median Width	Actual
5.	Receptor	Uniform grid	Uniform grid

Model Inputs

AERMOD View™ was used for evaluating the emission scenarios for the proposed project. The inputs to the model are defined in 5 functional pathways as represented in the following sections. Each of these functional parameters includes several options that may be user-defined or set as default, the details of some of these essential elements of AERMOD View™ runs were explained in the discussions.

Control pathway inputs

- Default option
- Calculate the concentration
- Averaging period of 24hr and 1hr depending on the NAAQS and pollutant type

Source pathway inputs

- Includes definition of source, its locations
- Vehicle source parameter include emissions ($g/m^2/s$)
- Construction and haul road within; area source parameter include emissions (g/m^2 /s)

Receptors pathway inputs

- Cartesian grid starting at the SE corner of the ward with 400m increment over X & Y coordinates, thus forming a receptor output grid radius of 1km
- Uniform grid is selected with 10x10 cell size

Meteorology pathways inputs

- One hourly regional data was used as an input in the meteorology processor to generate model ready input surface & profile meteorology files.
- Roughness length of 1m of measurement height, displacement height of 0.2m, Albedo of 0.2 & measurement height of 14m i.e. the height at which measurements of meteorology have been done
- The minimum wind speed (0.5 m/s lower than 1m/s considered as calm by IMD), minimum mixed layer height (50m), and minimum heat flux 20 W/M2/s).
- The potential temperature gradient above the mixed layer
- The weather data for Thane base station provided by the Indian Meteorological Department (IMD) have been used for the present project. The data was compiled in the AERMET module of A ERMOD View™ and the results of this final analysis were used as input meteorological data.

Output Pathway

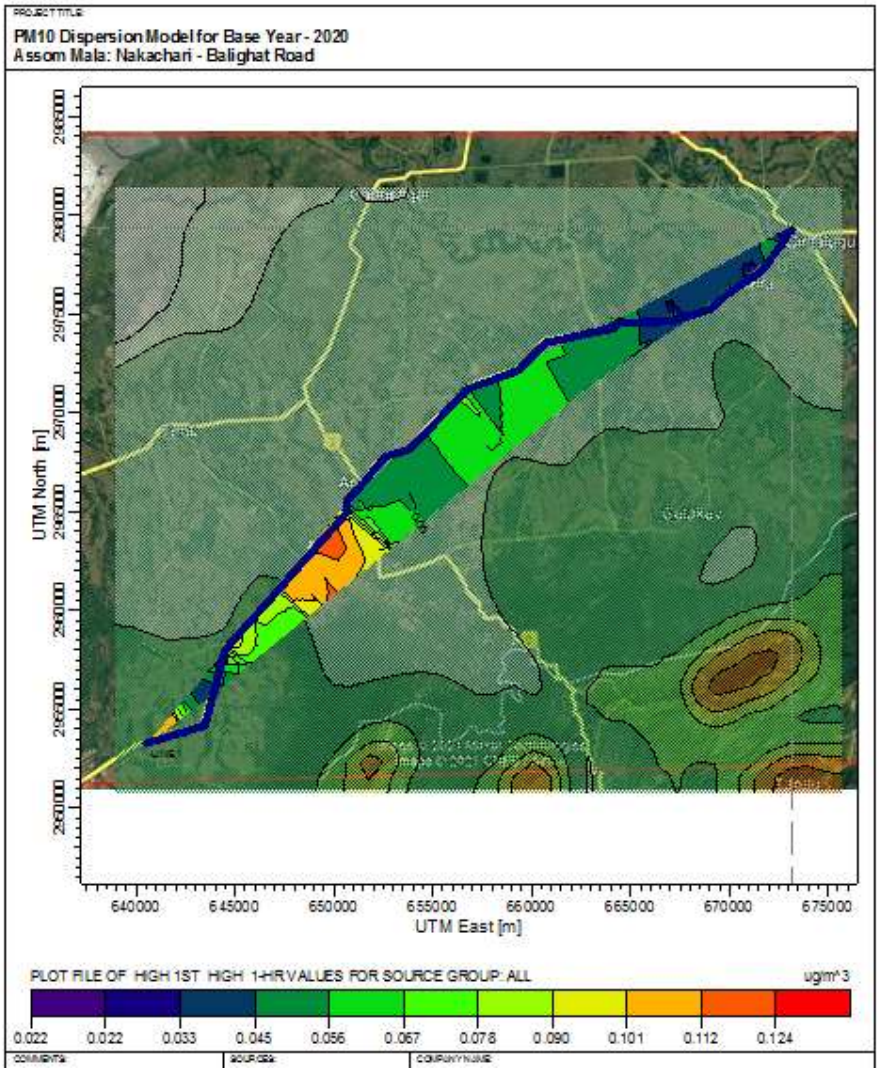
The model ran for 1 hr average as per the pollutant type and the NAAQS standards criteria. The contour for 1st highest reading is shown for each pollutant based on construction and operational scenarios.

Model outputs were obtained for emissions of each of the pollutants in each of the 500m x 500m receptor grid spread across the gridded impact zone. A contour map is plotted for each of the study pollutants and the impact by the line source i.e. operational scenario including additional vehicle assumed to be added due to project. This map is superimposed on the road tile map of the proposed location. The maximum ground level concentration of criterion pollutants modeled by AERMOD ViewTM for the construction and operational scenarios are added to the average value of observed value of criterion pollutant from Ambient Air Quality Monitoring Report at project site to assess the impact of project on air quality.

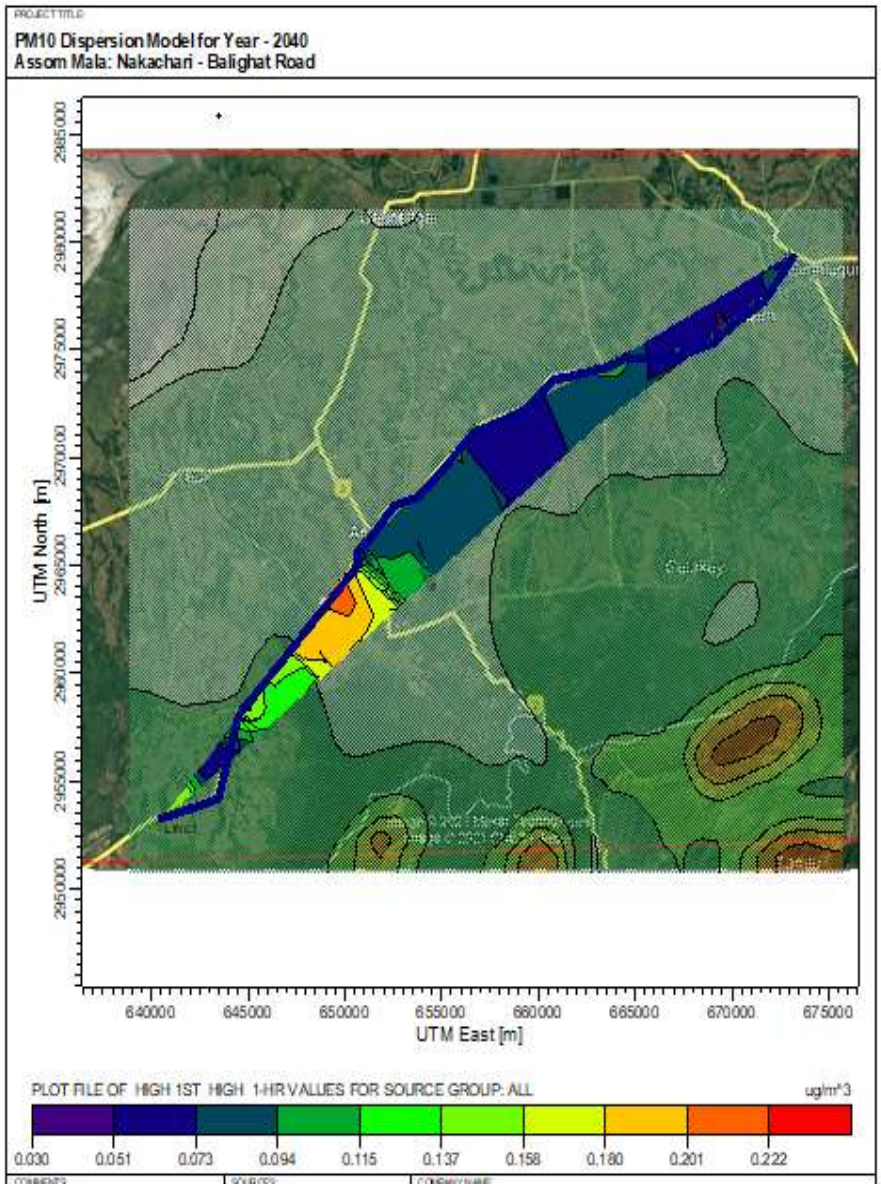
The results of modeled maximum ground level concentrations of pollutants for both construction and operation phase were presented in the below table.

Description of the component	Chainage	Easting	Northing	PM10 Base	PM10 2040	Nox base	Nox 2040
Public Health Centre	0+100	640597.02	2953336.89	0.11156	0.14532	3.80594	2.71824
School	0+200	640694	2953367	0.111	0.1751	4.58468	2.70461
School	4+430	643695.48	2955620.57	0.0396	0.0491	1.28907	0.96496
School	7+600	644907.41	2958451.35	0.0981	0.16661	4.51816	2.39034
School	9+700	644277.97	2957632.67	0.0383	0.06881	1.80404	0.9332
School	14+750	649637.8	2963811.27	0.1236	0.22218	5.78094	3.01174
School	16+050	650476.07	2964801.84	0.10277	0.17761	4.64583	2.50403
School	17+100	650824.27	2965662.41	0.04407	0.06682	1.74824	1.07387
School	17+530	651108.18	2965970.31	0.05005	0.0877	2.29362	1.21956
School	20+500	653159.41	2967798.03	0.04579	0.08061	2.10447	1.11561
college	24+100	655731.22	2970268.79	0.05715	0.09755	2.5835	1.39255
school	24+300	656685.87	2971285.26	0.04391	0.06462	1.69153	1.06997
school	25+100	656387.68	2971024.27	0.0729	0.05	1.33329	1.77622

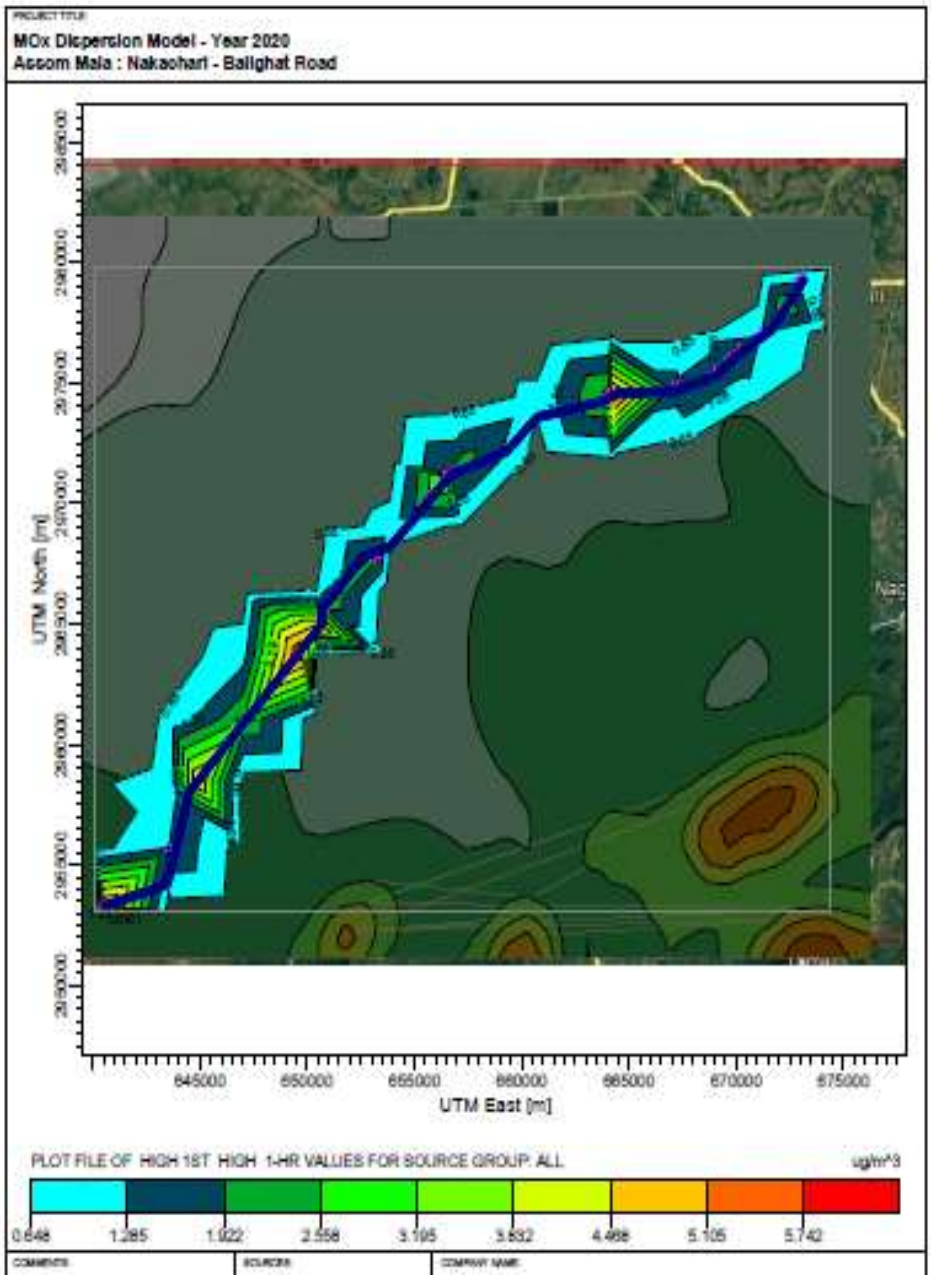
Description of the component	Chainage	Easting	Northing	PM10 Base	PM10 2040	Nox base	Nox 2040
Madrassa	25+500	664020.31	2974542	0.05837	0.10161	2.65826	1.42235
School	33+850	667090.78	2974788.2	0.03581	0.06102	1.59253	0.87258
School	36+950	667232.6	2974846.97	0.03129	0.05193	1.35671	0.76236
School	37+100	668961.23	2975440.16	0.0369	0.06469	1.66332	0.89912
School	38+950	669640.98	2975958.23	0.03926	0.04398	1.15418	0.95665
School	39+800	670123.91	2976311.19	0.04544	0.06344	1.65716	1.10731
School	40+400	671122.56	2977072.03	0.02808	0.04996	1.29311	0.68412
School	41+650	672299.54	2978196.33	0.05528	0.09031	2.55243	1.3469
College	44+700	672982.77	2979366.95	0.02195	0.03014	0.80069	0.53491



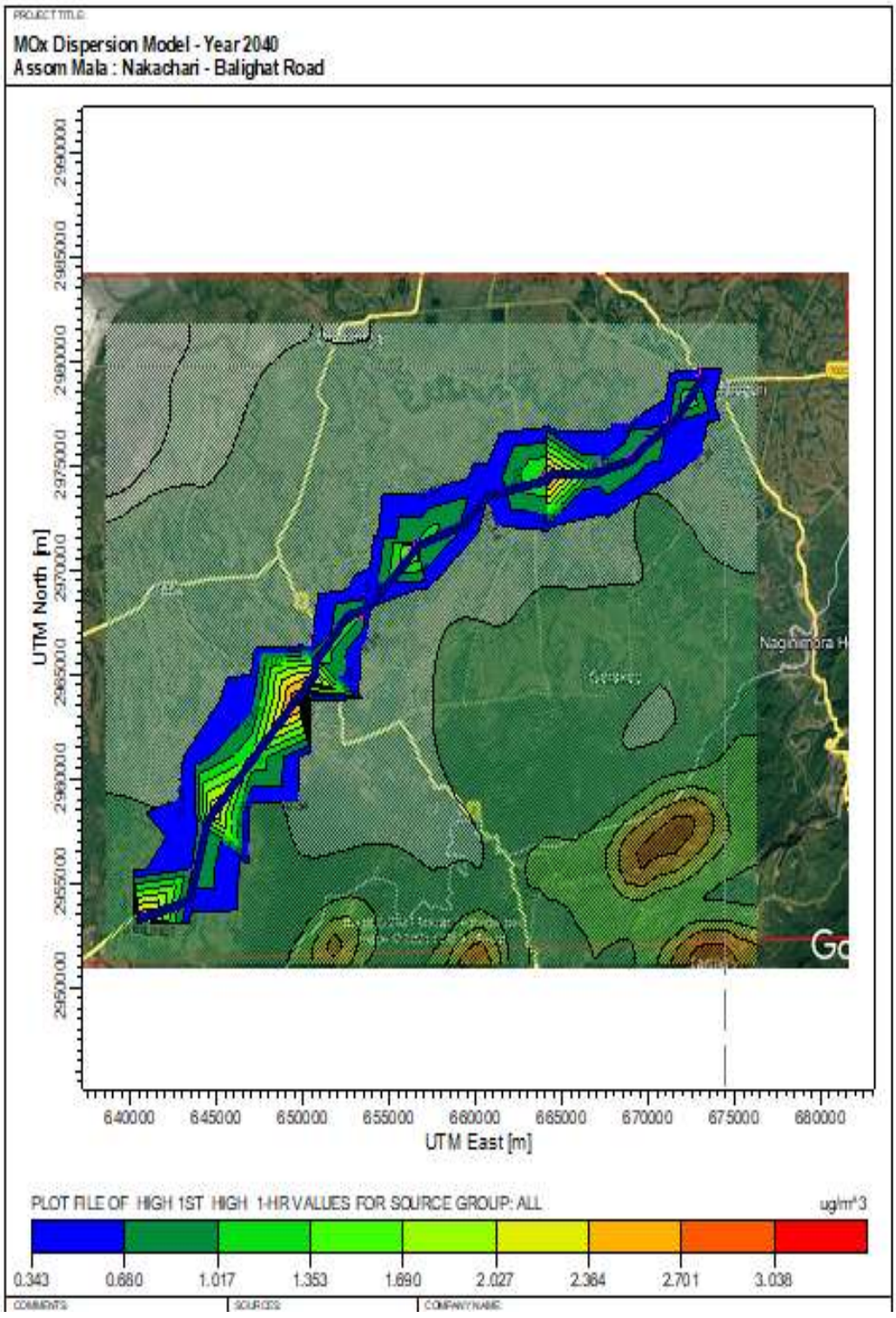
Predicted 1-hr Average PM10 Concentration due vehicular emission during Year 2020



Predicted 1-hr Average PM10 Concentration due vehicular emission during Year 2040



Predicted 1-hr Average NOx Concentration due vehicular emission during Year 2020



Predicted 1-hr Average NOx Concentration due vehicular emission during Year 2040

*** AERMOD - VERSION 09292 *** *** D:\1 PRAYUKTI INTERNATIONAL\2 Projects\2020 PRISM - Hingolganj Actio *** 12/03/21
*** *** 19:36:27
PAGE 53
**MODELOPTs: RegDFAULT CONC ELEV
WARNCHKD NODRYDPLT NOWETDPLT

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): L0000001, L0000002, L0000003, L0000004, L0000005, L0000006, L0000007, L0000008, L0000009, L0000010, L0000011, L0000012, L0000013, L0000014, L0000015, L0000016, L0000017, L0000018, L0000019, L0000020, L0000021, L0000022, L0000023, L0000024, L0000025, L0000026, L0000027, L0000028, L0000029, L0000030, . . . ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM_10 IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
640597.02	2953336.89	0.14532	(18082420)	640694.00	2953367.00	0.17510	(18082420)
643695.48	2955620.57	0.04910	(18022324)	644277.97	2957632.67	0.06881	(18041523)
644907.41	2958451.35	0.16661	(18030424)	649637.80	2963811.27	0.22218	(18020421)
650476.07	2964801.84	0.17761	(18112722)	650824.27	2965662.41	0.06682	(18022201)
651108.18	2965970.31	0.08770	(18121123)	653159.41	2967798.03	0.08061	(18122922)
655731.22	2970268.79	0.09755	(18031018)	656387.68	2971024.27	0.05000	(18081119)
656685.87	2971285.26	0.06462	(18031818)	664020.31	2974542.00	0.10161	(18031818)
667090.78	2974788.20	0.06102	(18022201)	667232.60	2974846.97	0.05193	(18031818)
668961.23	2975440.16	0.06469	(18112722)	669640.98	2975958.23	0.04398	(18031818)
670123.91	2976311.19	0.06344	(18020421)	671122.56	2977072.03	0.04996	(18110403)
672299.54	2978196.33	0.09031	(18122923)	672982.77	2979366.95	0.03014	(18032819)

*** AERMOD - VERSION 09292 *** *** D:\1 PRAYUKTI INTERNATIONAL\2 Projects\2020 PRISM - Hingolganj Actio *** 12/03/21
*** *** 19:36:27
PAGE 54
**MODELOPTs: RegDFAULT CONC ELEV
WARNCHKD NODRYDPLT NOWETDPLT

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF PM_10 IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	NETWORK OF TYPE	GRID-ID
ALL	HIGH 1ST HIGH VALUE IS	0.22218	ON 18020421:	AT (649637.80, 2963811.27, 150.93, 150.93, 0.00)	DC	

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR

*** AERMOD - VERSION 09292 *** *** D:\1 PRAYUKTI INTERNATIONAL\2 Projects\2020 PRISM - Hingolganj Actio *** 12/03/21
*** *** 19:36:27
PAGE 55
**MODELOPTs: RegDFAULT CONC ELEV
WARNCHKD NODRYDPLT NOWETDPLT

*** Message Summary : AERMOD Model Execution ***

**MODELOPTs: RegDFAULT CONC ELEV
WARNCHKD NODRYDPLT NOWETDPLT

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): L0072738, L0072739, L0072740, L0072741, L0072742, L0072743, L0072744, L0072745, L0072746, L0072747, L0072748, L0072749, L0072750, L0072751, L0072752, L0072753, L0072754, L0072755, L0072756, L0072757, L0072758, L0072759, L0072760, L0072761, L0072762, L0072763, L0072764, L0072765, L0072766, L0072767, . . . ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
640597.02	2953336.89	2.71824	(20022502)	640694.00	2953367.00	2.70461	(20022502)
643695.48	2955620.57	0.96496	(20020405)	644277.97	2957632.67	0.93320	(20041718)
644907.41	2958451.35	2.39034	(20010803)	649637.80	2963811.27	3.01174	(20101103)
650476.07	2964801.84	2.50403	(20011903)	650824.27	2965662.41	1.07387	(20020404)
651108.18	2965970.31	1.21956	(20020404)	653159.41	2967798.03	1.11561	(20031702)
655731.22	2970268.79	1.39255	(20011903)	656387.68	2971024.27	1.77622	(20022504)
656685.87	2971285.26	1.06997	(20022502)	664020.31	2974542.00	1.42235	(20012603)
667090.78	2974788.20	0.87258	(20081802)	667232.60	2974846.97	0.76236	(20081802)
668961.23	2975440.16	0.89912	(20021016)	669640.98	2975958.23	0.95665	(20011316)
670123.91	2976311.19	1.10731	(20011316)	671122.56	2977072.03	0.68412	(20010803)
672299.54	2978196.33	1.34690	(20011904)	672982.77	2979366.95	0.53491	(20012903)

**MODELOPTs: RegDFAULT CONC ELEV
WARNCHKD NODRYDPLT NOWETDPLT

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

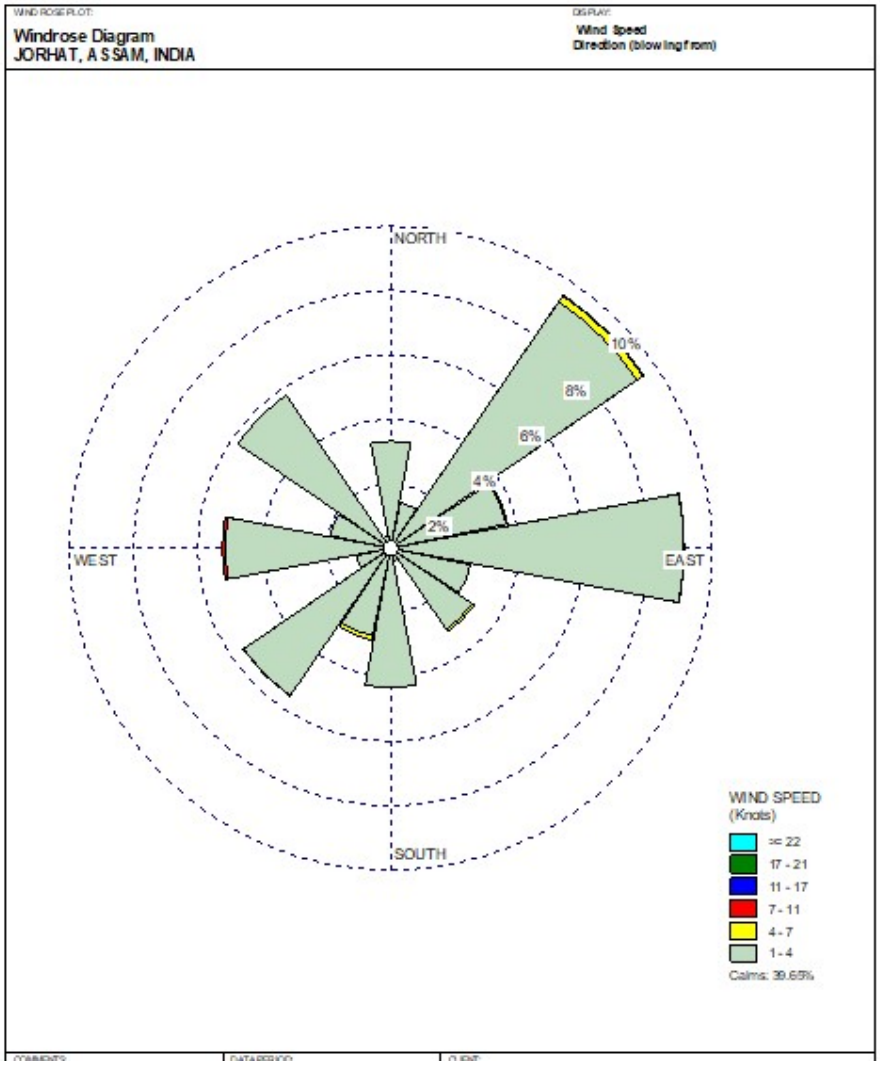
** CONC OF NOX IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	NETWORK RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	GRID-ID
ALL	HIGH 1ST HIGH VALUE IS	3.03758	ON 20011316: AT (664142.72, 2974415.92, 171.00, 171.00, 0.00)	GC	UCART1

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR

**MODELOPTs: RegDFAULT CONC ELEV
WARNCHKD NODRYDPLT NOWETDPLT

*** Message Summary : AERMOD Model Execution ***



Conclusion

Baseline monitoring results were complying with prescribed national standards. Modeled operations scenarios illustrate that they are well within the prescribed standards. Hence, the project has no implication in overall air quality.

Annexure 19: Noise Modelling Report

During operation noise generating sources will be traffic noise and road-side commercial activities at some places. Noise generated due to traffic on this road will have impact on the nearby villages. Cumulative noise levels of these traffic sources were computed using Federal Highway Administration (FHWA's) Traffic Noise Model (TNM). TNM computes incremental highway traffic noise at nearby receivers. As sources of noise, it includes noise emission levels for the following vehicle types:

- Automobiles: all vehicles with two axles and four tyres primarily designed to carry nine or fewer people (passenger camp, vans) or cargo (vans, light trucks), generally with gross vehicle weight less than 4500 kg.
- Medium trucks: all cargo vehicles with two axles and six tires – generally with gross vehicle weight between 4500 kg and 12000 kg.
- Heavy trucks: All cargo vehicles with three or more axles, generally with gross vehicle weight more than 12000 kg.
- Buses: all vehicles designed to carry more than nine passengers
- Motorcycles: all vehicles with two or three tires and an open-air driver/passenger compartment.

The procedure for prediction of noise levels involved the following steps:

- Identification of various receivers,
- Determination of land uses and activities which may be affected by the noise generated
- Assemble input parameters
- Application of the model
- Traffic volume for the projected period is obtained from the traffic projections. The total number of vehicles passing per hour by type- light, medium and heavy along with their average speed is used for predictions. The average speeds for vehicles in our project road around build-up area are considered as 30 kmph for this model.

Table A: Traffic Volume/Day: (Base Year 2019-2020)

Vehicle Type	2021	
	Ch. 12.300 Km at Amguri	
	In Number	In PCU
Two-Wheeler	2616	1308
Car/Jeep/Van/Taxi/Auto	1229	1229
Mini Bus	8	12
Standard Bus	25	75
LCV	388	583
2-Axle Truck	154	462
3-Axle Truck	9	28
Multi-Axle	2	10
Tractor With Trailer	1	3
Tractor Without Trailer	1	1

Vehicle Type	2021	
	Ch. 12.300 Km at Amguri	
	In Number	In PCU
Cycle	747	374
Cycle Rickshaw	4	7
Hand Cart	7	20
Bullock Cart	0	0
Horse Cart	0	0
Total Motorized Vehicles (Number)	**4434**	-
Total Non-Motorized Vehicles (Number)	**757**	-
Total Vehicles (Number)	**5191**	-
Total Motorized Vehicles (PCU)	-	**3711**
Total Non-Motorized Vehicles (PCU)	-	**401**
Total PCU per day	-	**4112**
Total Commercial Vehicle per day	**588**	

Table B: Present and Projected Traffic in the road section

Year	Total in Numbers	Total in PCU
2021	5191	4112
2022	5470	4344
2023	5767	4590
2024	6082	4852
2025	6418	5131
2026	6752	5410
2027	7107	5707
2028	7482	6020
2029	7880	6353
2030	8302	6706
2031	8726	7061
2032	9173	7437
2033	9646	7833
2034	10145	8253
2035	10673	8696
2036	11201	9142
2037	11757	9611
2038	12343	10107
2039	12960	10629
2040	13611	11179
2041	14296	11759
2042	15018	12371

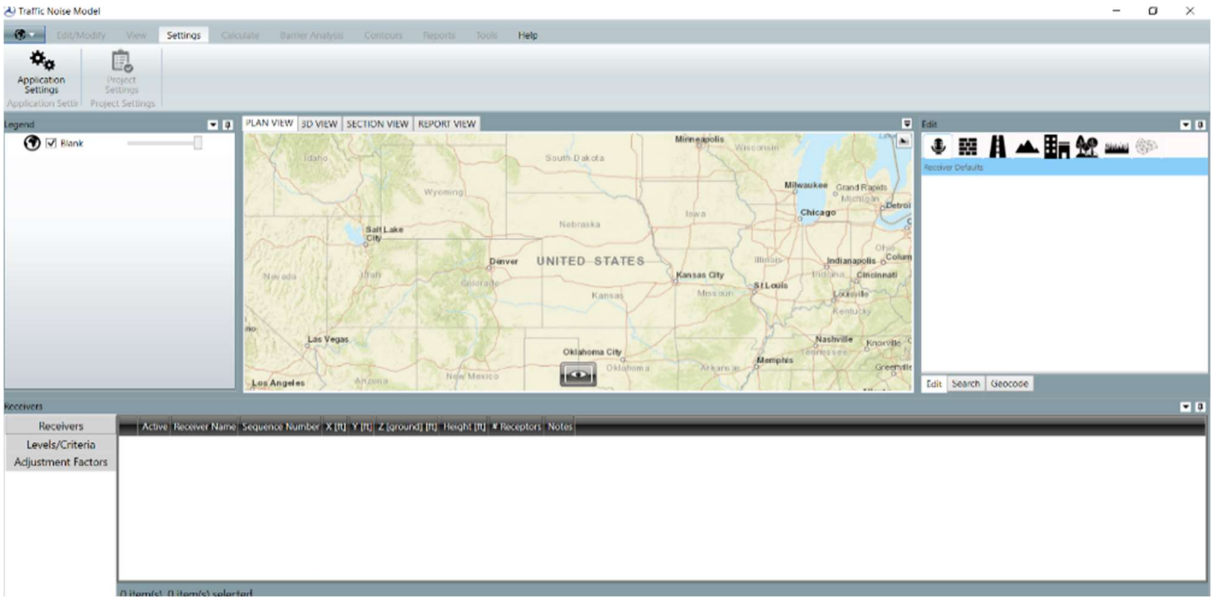


Figure 10-1:Layout of FHWA's Traffic Noise Model (3.0)

Output of Noise Prediction:
(Sensitive Receptors)

REPORT:	Results: Sound Levels - Input Heights		
TNM VERSION:	3.0.7.60002	REPORT DATE:	16 November 2021
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	16-11-2021 15:45:00
CASE:	A20_2(N-B)	ORGANIZATION:	Bongs Prayukti International
ANALYSIS BY:	user	PROJECT/CONTRACT:	Demo
DEFAULT GROUND TYPE:	HardSoil		
ATMOSPHERICS:	24°C, 50%	Average pavement type shall be used unless a state highway agency	
PAVEMENT TYPE(S) USED:	Average	substantiates the use of a different type with approval of FHWA.	

			Noise Reduction			Barrier Cost			
			Min	Avg	Max	Area / Volume	Lineal	Total	Total/DUs
Results for:		DUs	dB	dB	dB	$	$	$	$
Receivers in the Barrier Design:	All	47	0.0	0.0	0.0	0	0	0	0
	All Impacted	44	0.0	0.0	0.0	0	0	0	0
Meeting Noise Reduction Goal:	All	0	---	---	---	0	0	0	---
	All Impacted	0	---	---	---	0	0	0	---

Receiver				Modeled Traffic Noise Levels								
				All Abatement Barriers at Zero Height					With Abatement Barriers			
				LAeq		Increase over Existing				Noise Reduction		Calc.
			Existing	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of	Calc.	Calc.	Goal	Minus Goal
Name	No.	DUs	LAeq dBA	dBA	dBA	dBA	dBA	Impact	LAeq dBA	dBA	dBA	dBA
PHC 0.100-1	1	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 0.200-1	2	1	---	51.9	50.0	---	---	Sound Level	51.9	0.0	8.0	-8.0
Sch 2.150-2	3	1	---	51.4	50.0	---	---	Sound Level	51.4	0.0	8.0	-8.0
Sch 2.550-3	4	1	---	51.6	50.0	---	---	Sound Level	51.6	0.0	8.0	-8.0
Sch 4.430-4	5	1	---	51.6	50.0	---	---	Sound Level	51.6	0.0	8.0	-8.0
Sch 4.700-5	6	1	---	53.0	50.0	---	---	Sound Level	53.0	0.0	8.0	-8.0
Sch 5.950-6	7	1	---	52.7	50.0	---	---	Sound Level	52.7	0.0	8.0	-8.0
Sch 6.500-7	8	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 7.600-8	9	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 8.250-9	10	1	---	52.0	50.0	---	---	Sound Level	52.0	0.0	8.0	-8.0
Sch 8.900-10	11	1	---	52.9	50.0	---	---	Sound Level	52.9	0.0	8.0	-8.0
Sch 9.450-11	12	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 10.100-13	13	1	---	51.6	50.0	---	---	Sound Level	51.6	0.0	8.0	-8.0
Sch 13.250-14	14	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0

Sch 14.750-15	15	1	---	52.2	50.0	---	---	Sound Level	52.2	0.0	8.0	-8.0
Sch 16.050-16	16	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 17.100-17	17	1	---	52.4	50.0	---	---	Sound Level	52.4	0.0	8.0	-8.0
Sch 17.530-18	18	1	---	51.5	50.0	---	---	Sound Level	51.5	0.0	8.0	-8.0
Sch 19.800-19	19	1	---	51.9	50.0	---	---	Sound Level	51.9	0.0	8.0	-8.0
Sch 20.500-20	20	1	---	52.7	50.0	---	---	Sound Level	52.7	0.0	8.0	-8.0
Sch 22.800-21	21	1	---	52.2	50.0	---	---	Sound Level	52.2	0.0	8.0	-8.0
Sch 22.800-22	22	1	---	53.3	50.0	---	---	Sound Level	53.3	0.0	8.0	-8.0
Sch 23.950-23	23	1	---	52.0	50.0	---	---	Sound Level	52.0	0.0	8.0	-8.0
Clg 24.100-1	24	1	---	50.9	50.0	---	---	Sound Level	50.9	0.0	8.0	-8.0
Receiver-25	25	1	---	25.1	50.0	---	---	None	25.1	0.0	8.0	-8.0
Sch 24.300-24	26	1	---	51.2	50.0	---	---	Sound Level	51.2	0.0	8.0	-8.0
Sch 24.450-25	27	1	---	-202.4	50.0	---	---	None	-202.4	0.0	8.0	-8.0
Sch 25.100-26	28	1	---	49.9	50.0	---	---	None	49.9	0.0	8.0	-8.0
Sch 25.500-27	29	1	---	51.3	50.0	---	---	Sound Level	51.3	0.0	8.0	-8.0
Sch 29.450-28	30	1	---	53.0	50.0	---	---	Sound Level	53.0	0.0	8.0	-8.0
Sch 30.450-29	31	1	---	52.3	50.0	---	---	Sound Level	52.3	0.0	8.0	-8.0
Sch 31.100-30	32	1	---	52.4	50.0	---	---	Sound Level	52.4	0.0	8.0	-8.0
Sch 32.100-31	33	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 33.700-32	34	1	---	52.4	50.0	---	---	Sound Level	52.4	0.0	8.0	-8.0
Mds 33.850-1	35	1	---	51.4	50.0	---	---	Sound Level	51.4	0.0	8.0	-8.0
Sch 35.050-33	36	1	---	54.1	50.0	---	---	Sound Level	54.1	0.0	8.0	-8.0
Sch 36.950-34	37	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 37.100-35	38	1	---	51.7	50.0	---	---	Sound Level	51.7	0.0	8.0	-8.0
Sch 38.950-37	39	1	---	52.6	50.0	---	---	Sound Level	52.6	0.0	8.0	-8.0
Sch 39.400-38	40	1	---	53.1	50.0	---	---	Sound Level	53.1	0.0	8.0	-8.0
Sch 39.800-39	41	1	---	52.1	50.0	---	---	Sound Level	52.1	0.0	8.0	-8.0
Sch 40.400-40	42	1	---	51.3	50.0	---	---	Sound Level	51.3	0.0	8.0	-8.0
Sch 41.350-41	43	1	---	53.3	50.0	---	---	Sound Level	53.3	0.0	8.0	-8.0
Sch 41.650-42	44	1	---	51.7	50.0	---	---	Sound Level	51.7	0.0	8.0	-8.0
Hsp 43.150-1	45	1	---	53.3	50.0	---	---	Sound Level	53.3	0.0	8.0	-8.0
Sch 43.300-43	46	1	---	51.2	50.0	---	---	Sound Level	51.2	0.0	8.0	-8.0
Clg 44.700-2	47	1	---	51.2	50.0	---	---	Sound Level	51.2	0.0	8.0	-8.0

For year 2030:

REPORT:	Results: Sound Levels - Input Heights		
TNM VERSION:	3.0.7.60002	REPORT DATE:	16 November 2021
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	16-11-2021 16:21:53
CASE:	Nakachari to Balighat	ORGANIZATION:	Bongs Prayukti International
ANALYSIS BY:	Prasenjit Ghosh	PROJECT/CONTRACT:	Demo
DEFAULT GROUND TYPE:	HardSoil		
ATMOSPHERICS:	20°C, 50%	Average pavement type shall be used unless a state highway agency	
PAVEMENT TYPE(S) USED:	Average	substantiates the use of a different type with approval of FHWA.	

			Noise Reduction			Barrier Cost			
			Min	Avg	Max	Area / Volume	Lineal	Total	Total/DUs
Results for:		DUs	dB	dB	dB	$	$	$	$
Receivers in the Barrier Design:	All	47	0.0	0.0	0.0	0	0	0	0
	All Impacted	45	0.0	0.0	0.0	0	0	0	0
Meeting Noise Reduction Goal:	All	0	---	---	---	0	0	0	---
	All Impacted	0	---	---	---	0	0	0	---

Receiver				Modeled Traffic Noise Levels								
				All Abatement Barriers at Zero Height					With Abatement Barriers			
				LAeq		Increase over Existing				Noise Reduction		Calc.
			Existing	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of	Calc. LAeq	Calc.	Goal	Minus Goal
Name	No.	DUs	LAeq dBA	dBA	dBA	dBA	dBA	Impact	dBA	dBA	dBA	dBA
PHC 0.100-1	1	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 0.200-1	2	1	---	54.4	50.0	---	---	Sound Level	54.4	0.0	8.0	-8.0
Sch 2.150-2	3	1	---	53.9	50.0	---	---	Sound Level	53.9	0.0	8.0	-8.0
Sch 2.550-3	4	1	---	54.1	50.0	---	---	Sound Level	54.1	0.0	8.0	-8.0
Sch 4.430-4	5	1	---	54.2	50.0	---	---	Sound Level	54.2	0.0	8.0	-8.0
Sch 4.700-5	6	1	---	55.6	50.0	---	---	Sound Level	55.6	0.0	8.0	-8.0
Sch 5.950-6	7	1	---	55.3	50.0	---	---	Sound Level	55.3	0.0	8.0	-8.0
Sch 6.500-7	8	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 7.600-8	9	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 8.250-9	10	1	---	54.5	50.0	---	---	Sound Level	54.5	0.0	8.0	-8.0
Sch 8.900-10	11	1	---	55.4	50.0	---	---	Sound Level	55.4	0.0	8.0	-8.0
Sch 9.450-11	12	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 10.100-13	13	1	---	54.1	50.0	---	---	Sound Level	54.1	0.0	8.0	-8.0
Sch 13.250-14	14	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0

Sch 14.750-15	15	1	---	54.7	50.0	---	---	Sound Level	54.7	0.0	8.0	-8.0
Sch 16.050-16	16	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 17.100-17	17	1	---	54.9	50.0	---	---	Sound Level	54.9	0.0	8.0	-8.0
Sch 17.530-18	18	1	---	54.1	50.0	---	---	Sound Level	54.1	0.0	8.0	-8.0
Sch 19.800-19	19	1	---	54.4	50.0	---	---	Sound Level	54.4	0.0	8.0	-8.0
Sch 20.500-20	20	1	---	55.2	50.0	---	---	Sound Level	55.2	0.0	8.0	-8.0
Sch 22.800-21	21	1	---	54.7	50.0	---	---	Sound Level	54.7	0.0	8.0	-8.0
Sch 22.800-22	22	1	---	55.8	50.0	---	---	Sound Level	55.8	0.0	8.0	-8.0
Sch 23.950-23	23	1	---	54.5	50.0	---	---	Sound Level	54.5	0.0	8.0	-8.0
Clg 24.100-1	24	1	---	53.4	50.0	---	---	Sound Level	53.4	0.0	8.0	-8.0
Receiver-25	25	1	---	27.3	50.0	---	---	None	27.3	0.0	8.0	-8.0
Sch 24.300-24	26	1	---	53.7	50.0	---	---	Sound Level	53.7	0.0	8.0	-8.0
Sch 24.450-25	27	1	---	-221.1	50.0	---	---	None	-221.1	0.0	8.0	-8.0
Sch 25.100-26	28	1	---	52.4	50.0	---	---	Sound Level	52.4	0.0	8.0	-8.0
Sch 25.500-27	29	1	---	53.8	50.0	---	---	Sound Level	53.8	0.0	8.0	-8.0
Sch 29.450-28	30	1	---	55.5	50.0	---	---	Sound Level	55.5	0.0	8.0	-8.0
Sch 30.450-29	31	1	---	54.8	50.0	---	---	Sound Level	54.8	0.0	8.0	-8.0
Sch 31.100-30	32	1	---	54.9	50.0	---	---	Sound Level	54.9	0.0	8.0	-8.0
Sch 32.100-31	33	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 33.700-32	34	1	---	54.9	50.0	---	---	Sound Level	54.9	0.0	8.0	-8.0
Mds 33.850-1	35	1	---	53.9	50.0	---	---	Sound Level	53.9	0.0	8.0	-8.0
Sch 35.050-33	36	1	---	56.6	50.0	---	---	Sound Level	56.6	0.0	8.0	-8.0
Sch 36.950-34	37	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 37.100-35	38	1	---	54.2	50.0	---	---	Sound Level	54.2	0.0	8.0	-8.0
Sch 38.950-37	39	1	---	55.1	50.0	---	---	Sound Level	55.1	0.0	8.0	-8.0
Sch 39.400-38	40	1	---	55.6	50.0	---	---	Sound Level	55.6	0.0	8.0	-8.0
Sch 39.800-39	41	1	---	54.6	50.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Sch 40.400-40	42	1	---	53.9	50.0	---	---	Sound Level	53.9	0.0	8.0	-8.0
Sch 41.350-41	43	1	---	55.8	50.0	---	---	Sound Level	55.8	0.0	8.0	-8.0
Sch 41.650-42	44	1	---	54.2	50.0	---	---	Sound Level	54.2	0.0	8.0	-8.0
Hsp 43.150-1	45	1	---	55.8	50.0	---	---	Sound Level	55.8	0.0	8.0	-8.0
Sch 43.300-43	46	1	---	53.7	50.0	---	---	Sound Level	53.7	0.0	8.0	-8.0
Clg 44.700-2	47	1	---	53.7	50.0	---	---	Sound Level	53.7	0.0	8.0	-8.0

For year 2041:

REPORT:	Results: Sound Levels - No Barrier Objects			
TNM VERSION	3.0.7.60002		REPORT DATE:	16 November 2021
CALCULATED WITH:	3.0.7.60002		CALCULATION DATE:	16-11-2021 16:42:56
CASE:	Nakachari-Balighat		ORGANIZATION:	Bongs Prayukti International
UNITS:	Metric		ANALYSIS BY:	Prasenjit.Ghosh
DEFAULT GROUND TYPE:	HardSoil		PROJECT/CONTRACT	Demo
ATMOSPHERICS:	20°C, 50%		Average pavement type shall be used unless a state	
PAVEMENT TYPE(S) USED:	Average		highway agency substantiates the use of a different	
			type with approval FHWA.	

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq dBA	Calc. dBA	Absolute Criterion dBA	Calc. dBA	Relative Criterion dBA	Type of Impact
PHC 0.100-1	1	1	---	56.9	50.0	---	---	Sound Level
Sch 0.200-1	2	1	---	56.7	50.0	---	---	Sound Level
Sch 2.150-2	3	1	---	56.2	50.0	---	---	Sound Level
Sch 2.550-3	4	1	---	56.4	50.0	---	---	Sound Level
Sch 4.430-4	5	1	---	56.4	50.0	---	---	Sound Level
Sch 4.700-5	6	1	---	57.8	50.0	---	---	Sound Level
Sch 5.950-6	7	1	---	57.5	50.0	---	---	Sound Level
Sch 6.500-7	8	1	---	56.9	50.0	---	---	Sound Level
Sch 7.600-8	9	1	---	56.9	50.0	---	---	Sound Level
Sch 8.250-9	10	1	---	56.8	50.0	---	---	Sound Level
Sch 8.900-10	11	1	---	57.7	50.0	---	---	Sound Level
Sch 9.450-11	12	1	---	56.8	50.0	---	---	Sound Level
Sch 10.100-13	13	1	---	56.4	50.0	---	---	Sound Level
Sch 13.250-14	14	1	---	56.9	50.0	---	---	Sound Level
Sch 14.750-15	15	1	---	57.0	50.0	---	---	Sound Level

Sch 16.050-16	16	1	---	56.9	50.0	---	---	Sound Level
Sch 17.100-17	17	1	---	57.2	50.0	---	---	Sound Level
Sch 17.530-18	18	1	---	56.3	50.0	---	---	Sound Level
Sch 19.800-19	19	1	---	56.7	50.0	---	---	Sound Level
Sch 20.500-20	20	1	---	57.5	50.0	---	---	Sound Level
Sch 22.800-21	21	1	---	57.0	50.0	---	---	Sound Level
Sch 22.800-22	22	1	---	58.1	50.0	---	---	Sound Level
Sch 23.950-23	23	1	---	56.8	50.0	---	---	Sound Level
Clg 24.100-1	24	1	---	55.7	50.0	---	---	Sound Level
Receiver-25	25	1	---	29.6	50.0	---	---	None
Sch 24.300-24	26	1	---	55.9	50.0	---	---	Sound Level
Sch 24.450-25	27	1	---	-218.8	50.0	---	---	None
Sch 25.100-26	28	1	---	54.7	50.0	---	---	Sound Level
Sch 25.500-27	29	1	---	56.1	50.0	---	---	Sound Level
Sch 29.450-28	30	1	---	57.7	50.0	---	---	Sound Level
Sch 30.450-29	31	1	---	57.0	50.0	---	---	Sound Level
Sch 31.100-30	32	1	---	57.2	50.0	---	---	Sound Level
Sch 32.100-31	33	1	---	56.9	50.0	---	---	Sound Level
Sch 33.700-32	34	1	---	57.2	50.0	---	---	Sound Level
Mds 33.850-1	35	1	---	56.2	50.0	---	---	Sound Level
Sch 35.050-33	36	1	---	58.9	50.0	---	---	Sound Level
Sch 36.950-34	37	1	---	56.9	50.0	---	---	Sound Level
Sch 37.100-35	38	1	---	56.4	50.0	---	---	Sound Level
Sch 38.950-37	39	1	---	57.4	50.0	---	---	Sound Level
Sch 39.400-38	40	1	---	57.9	50.0	---	---	Sound Level
Sch 39.800-39	41	1	---	56.9	50.0	---	---	Sound Level
Sch 40.400-40	42	1	---	56.1	50.0	---	---	Sound Level
Sch 41.350-41	43	1	---	58.1	50.0	---	---	Sound Level

(Religious Structure)

For year 2020:

REPORT:	Results: Sound Levels - Input Heights		
TNM VERSION:	3.0.7.60002	REPORT DATE:	16 November 2021
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	16-11-2021 12:20:48
CASE:	A20_2	ORGANIZATION:	Bongs Prayukti International
ANALYSIS BY:	user	PROJECT/CONTRACT:	Demo
DEFAULT GROUND TYPE:	HardSoil		
ATMOSPHERICS:	24°C, 50%	Average pavement type shall be used unless a state highway agency	
PAVEMENT TYPE(S) USED:	Average	substantiates the use of a different type with approval of FHWA.	

			Noise Reduction			Barrier Cost			
			Min	Avg	Max	Area / Volume	Lineal	Total	Total/DUs
Results for:		DUs	dB	dB	dB	$	$	$	$
Receivers in the Barrier Design:	All	31	0.0	0.0	0.0	0	0	0	0
	All Impacted	31	0.0	0.0	0.0	0	0	0	0
Meeting Noise Reduction Goal:	All	0	---	---	---	0	0	0	---
	All Impacted	0	---	---	---	0	0	0	---

Receiver				Modeled Traffic Noise Levels								
				All Abatement Barriers at Zero Height					With Abatement Barriers			
				LAeq		Increase over Existing				Noise Reduction		Calc.
Name	No.	DUs	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact	Calc. LAeq	Calc.	Goal	Minus Goal
			dBA	dBA	dBA	dBA	dBA		dBA	dBA	dBA	dBA
Tem 1.800-1	1	1	---	62.2	0.0	---	---	Sound Level	62.2	0.0	8.0	-8.0
Tem 3.900-2	2	1	---	64.0	0.0	---	---	Sound Level	64.0	0.0	8.0	-8.0
Tem 7.000-3	3	1	---	62.4	0.0	---	---	Sound Level	62.4	0.0	8.0	-8.0
Tem 10.100-5	4	1	---	53.7	0.0	---	---	Sound Level	53.7	0.0	8.0	-8.0
Tem 12.300-6	5	1	---	54.1	0.0	---	---	Sound Level	54.1	0.0	8.0	-8.0
Tem 13.100-8	6	1	---	54.6	0.0	---	---	Sound Level	54.6	0.0	8.0	-8.0
Tem 14.800-10	7	1	---	57.4	0.0	---	---	Sound Level	57.4	0.0	8.0	-8.0
Tem 17.300-12	8	1	---	57.9	0.0	---	---	Sound Level	57.9	0.0	8.0	-8.0
Tem 17.700-14	9	1	---	55.6	0.0	---	---	Sound Level	55.6	0.0	8.0	-8.0
Tem 17.850-15	10	1	---	58.0	0.0	---	---	Sound Level	58.0	0.0	8.0	-8.0
Tem 19.500-16	11	1	---	64.2	0.0	---	---	Sound Level	64.2	0.0	8.0	-8.0
Tem 20.500-17	12	1	---	65.4	0.0	---	---	Sound Level	65.4	0.0	8.0	-8.0
Msq 25.800-1	13	1	---	58.6	0.0	---	---	Sound Level	58.6	0.0	8.0	-8.0
Tem 30.750-20	14	1	---	59.3	0.0	---	---	Sound Level	59.3	0.0	8.0	-8.0

Tem 31.400-21	15	1	---	58.9	0.0	---	---	SoundLevel	58.9	0.0	8.0	-8.0
Msq 32.100-3	16	1	---	59.4	0.0	---	---	SoundLevel	59.4	0.0	8.0	-8.0
Msq 32.800-4	17	1	---	58.8	0.0	---	---	SoundLevel	58.8	0.0	8.0	-8.0
Eid 34.000-1	18	1	---	58.6	0.0	---	---	SoundLevel	58.6	0.0	8.0	-8.0
Msq 34.500-5	19	1	---	58.9	0.0	---	---	SoundLevel	58.9	0.0	8.0	-8.0
Tem 36.350-23	20	1	---	59.8	0.0	---	---	SoundLevel	59.8	0.0	8.0	-8.0
Tem 36.550-24	21	1	---	61.2	0.0	---	---	SoundLevel	61.2	0.0	8.0	-8.0
Tem 38.600-25	22	1	---	59.1	0.0	---	---	SoundLevel	59.1	0.0	8.0	-8.0
Tem 38.900-26	23	1	---	59.9	0.0	---	---	SoundLevel	59.9	0.0	8.0	-8.0
Msq 40.700-6	24	1	---	60.9	0.0	---	---	SoundLevel	60.9	0.0	8.0	-8.0
Tem 43.100-27	25	1	---	61.9	0.0	---	---	SoundLevel	61.9	0.0	8.0	-8.0
Tem 43.230-29	26	1	---	59.8	0.0	---	---	SoundLevel	59.8	0.0	8.0	-8.0
Tem 43.400-30	27	1	---	55.8	0.0	---	---	SoundLevel	55.8	0.0	8.0	-8.0
Msq 43.600-7	28	1	---	64.0	0.0	---	---	SoundLevel	64.0	0.0	8.0	-8.0
Tem 43.700-31	29	1	---	64.4	0.0	---	---	SoundLevel	64.4	0.0	8.0	-8.0
Eid 43.850-2	30	1	---	65.1	0.0	---	---	SoundLevel	65.1	0.0	8.0	-8.0
Tem 44.500-32	31	1	---	64.2	0.0	---	---	SoundLevel	64.2	0.0	8.0	-8.0

For Year 2030:

REPORT:	Results: Sound Levels - No Barrier Objects		
TNM VERSION	3.0.7.60002	REPORT DATE:	16 November 2021
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	16-11-2021 17:30:33
CASE:	Nakachari to Balighat	ORGANIZATION:	Bongs Prayukti International
UNITS:	Metric	ANALYSIS BY:	Prasenjit Ghosh
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	Demo
ATMOSPHERICS:	20°C, 50%	Average pavement type shall be used unless a state	
PAVEMENT TYPE(S) USED:	Average	highway agency substantistes the use of a different	
		type with approval FHWA.	

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
Tem 1.800-1	1	1	---	69.4	50.0	---	---	Sound Level
Tem 3.900-2	2	1	---	67.8	50.0	---	---	Sound Level
Tem 7.000-3	3	1	---	69.7	50.0	---	---	Sound Level
Tem 9.450-4	4	1	---	68.0	50.0	---	---	Sound Level
Tem 10.100-5	5	1	---	66.9	50.0	---	---	Sound Level
Tem 12.300-6	6	1	---	67.9	50.0	---	---	Sound Level
Tem 13.050-7	7	1	---	67.7	50.0	---	---	Sound Level
Tem 13.100-8	8	1	---	68.8	50.0	---	---	Sound Level
Tem 14.550-9	9	1	---	68.7	50.0	---	---	Sound Level
Tem 14.800-10	10	1	---	68.4	50.0	---	---	Sound Level
Tem 16.100-11	11	1	---	70.6	50.0	---	---	Sound Level
Tem 17.300-12	12	1	---	71.2	50.0	---	---	Sound Level
Tem 17.350-13	13	1	---	68.9	50.0	---	---	Sound Level
Tem 17.700-14	14	1	---	70.7	50.0	---	---	Sound Level
Tem 17.850-15	15	1	---	67.5	50.0	---	---	Sound Level

Tem 19.500-16	16	1	---	70.6	50.0	---	---	SoundLevel
Tem 20.500-17	17	1	---	72.3	50.0	---	---	SoundLevel
Tem 22.800-18	18	1	---	65.9	50.0	---	---	SoundLevel
Msq 25.800-1	19	1	---	68.9	50.0	---	---	SoundLevel
Msq 27.000-2	20	1	---	67.6	50.0	---	---	SoundLevel
Tem 27.650-19	21	1	---	69.8	50.0	---	---	SoundLevel
Tem 30.750-20	22	1	---	68.2	50.0	---	---	SoundLevel
Tem 31.400-21	23	1	---	70.0	50.0	---	---	SoundLevel
Msq 32.100-3	24	1	---	70.1	50.0	---	---	SoundLevel
Msq 32.800-4	25	1	---	70.8	50.0	---	---	SoundLevel
Eid 34.000-1	26	1	---	69.5	50.0	---	---	SoundLevel
Msq 34.500-5	27	1	---	65.1	50.0	---	---	SoundLevel
Tem 34.930-22	28	1	---	70.8	50.0	---	---	SoundLevel
Tem 36.350-23	29	1	---	66.6	50.0	---	---	SoundLevel
Tem 36.550-24	30	1	---	66.3	50.0	---	---	SoundLevel
Tem 38.600-25	31	1	---	74.8	50.0	---	---	SoundLevel
Tem 38.900-26	32	1	---	69.7	50.0	---	---	SoundLevel
Msq 40.700-6	33	1	---	69.6	50.0	---	---	SoundLevel
Tem 43.100-27	34	1	---	67.4	50.0	---	---	SoundLevel
Tem 43.100-28	35	1	---	67.0	50.0	---	---	SoundLevel
Tem 43.230-29	36	1	---	66.8	50.0	---	---	SoundLevel
Tem 43.400-30	37	1	---	68.4	50.0	---	---	SoundLevel
Msq 43.600-7	38	1	---	72.0	50.0	---	---	SoundLevel
Tem 43.700-31	39	1	---	70.8	50.0	---	---	SoundLevel
Eid 43.850-2	40	1	---	69.1	50.0	---	---	SoundLevel
Tem 44.500-32	41	1	---	72.2	50.0	---	---	SoundLevel

For Year 2041:

REPORT:	Results: Sound Levels - No Barrier Objects		
TNM VERSION	3.0.7.60002	REPORT DATE:	16 November 2021
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	16-11-2021 18:05:22
CASE:	Nakachari to balighat	ORGANIZATION:	Bongs Prayukti International
UNITS:	Metric	ANALYSIS BY:	Prasenjit.Ghosh
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	Demo
ATMOSPHERICS:	20°C, 50%	Average pavement type shall be used unless a state	
PAVEMENT TYPE(S) USED:	Average	highway agency substantiates the use of a different	
		type with approval FHWA.	

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
Tem 1.800-1	1	1	---	71.7	50.0	---	---	Sound Level
Tem 3.900-2	2	1	---	70.1	50.0	---	---	Sound Level
Tem 7.000-3	3	1	---	70.4	50.0	---	---	Sound Level
Tem 9.450-4	4	1	---	70.3	50.0	---	---	Sound Level
Tem 10.100-5	5	1	---	69.6	50.0	---	---	Sound Level
Tem 12.300-6	6	1	---	70.5	50.0	---	---	Sound Level
Tem 13.050-7	7	1	---	70.5	50.0	---	---	Sound Level
Tem 13.100-8	8	1	---	71.0	50.0	---	---	Sound Level
Tem 14.550-9	9	1	---	71.0	50.0	---	---	Sound Level
Tem 14.800-10	10	1	---	72.6	50.0	---	---	Sound Level
Tem 16.100-11	11	1	---	71.2	50.0	---	---	Sound Level
Tem 17.300-12	12	1	---	72.6	50.0	---	---	Sound Level
Tem 17.350-13	13	1	---	72.6	50.0	---	---	Sound Level
Tem 17.700-14	14	1	---	72.8	50.0	---	---	Sound Level
Tem 17.850-15	15	1	---	70.7	50.0	---	---	Sound Level

Tem 19.500-16	16	1	---	72.9	50.0	---	---	Sound Level
Tem 20.500-17	17	1	---	71.7	50.0	---	---	Sound Level
Tem 22.800-18	18	1	---	68.2	50.0	---	---	Sound Level
Msq 25.800-1	19	1	---	71.1	50.0	---	---	Sound Level
Msq 27.000-2	20	1	---	69.9	50.0	---	---	Sound Level
Tem 27.650-19	21	1	---	72.1	50.0	---	---	Sound Level
Tem 30.750-20	22	1	---	70.9	50.0	---	---	Sound Level
Tem 31.400-21	23	1	---	72.2	50.0	---	---	Sound Level
Msq 32.100-3	24	1	---	72.8	50.0	---	---	Sound Level
Msq 32.800-4	25	1	---	73.1	50.0	---	---	Sound Level
Eid 34.000-1	26	1	---	70.7	50.0	---	---	Sound Level
Msq 34.500-5	27	1	---	67.0	50.0	---	---	Sound Level
Tem 34.930-22	28	1	---	67.6	50.0	---	---	Sound Level
Tem 36.350-23	29	1	---	68.2	50.0	---	---	Sound Level
Tem 36.550-24	30	1	---	68.6	50.0	---	---	Sound Level
Tem 38.600-25	31	1	---	74.2	50.0	---	---	Sound Level
Tem 38.900-26	32	1	---	71.9	50.0	---	---	Sound Level
Msq 40.700-6	33	1	---	72.1	50.0	---	---	Sound Level
Tem 43.100-27	34	1	---	70.6	50.0	---	---	Sound Level
Tem 43.100-28	35	1	---	69.5	50.0	---	---	Sound Level
Tem 43.230-29	36	1	---	70.1	50.0	---	---	Sound Level
Tem 43.400-30	37	1	---	70.4	50.0	---	---	Sound Level
Msq 43.600-7	38	1	---	73.4	50.0	---	---	Sound Level
Tem 43.700-31	39	1	---	74.0	50.0	---	---	Sound Level
Eid 43.850-2	40	1	---	71.6	50.0	---	---	Sound Level
Tem 44.500-32	41	1	---	74.3	50.0	---	---	Sound Level

Annexure 20: Biodiversity Assessment Report

ASSAM SECONDARY ROAD NETWORK IMPROVEMENT PROJECT

Biodiversity Assessment Report (Draft)

(Revision 1)

Prepared for Public Works Roads Department Assam

September, 2021

About the Authors of this Report

THE TEAM

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Mr. Satish Kumar Damodara
Environmental & Biodiversity Expert

Mr. Satish Kumar Damodara is a graduate in civil engineering with postgraduate qualification in Environmental Planning, with an experience of 23 years. He is trained in Environmental Impact Assessments, Environmental Management and implementation, and in GIS maping and remote sensing. His areas of expertise include, interpretation and impact assessments for environmental and social attributes, prediction modeling of air, noise and water quality, conducting land suitability analysis towards finalizing the strategic plan for the project towns and spatial analysis using SQL. He has been leading complex spatial and environmental assessment projects as Project Manager/Team Leader/Subject Lead covering master planning and infrastructure design components of large infrastructure development projects. He is a permanent employee of LASA and has International experience of working in South East Asia, South Asia, Sub Saharan Africa and Middle East.

Mr. Satish has been instrumental in preparing the Environmental Codes of Practice for PMGSY Roads in India, way back in 2004. The codes have been subsequently adopted in several rural road projects across India and have been followed in several state road projects. He has made his mark in environmental and social management plan not only in India but also in countries such as Ethiopia and Uganda where an ESMP for one of the World Bank project has been prepared way back in 2009. The ESMP has been subsequently adopted as a template in several projects across Uganda and Sub-Saharan Africa.

Many of the projects undertaken by Mr. Satish are funded by international funding agencies such as The World Bank, Asian Development Bank (ADB), AIIB, KfW, USAID and NORAD apart from national agencies and local bodies, like NHAI, State PWRDs, Urban Development Authorities, and Industrial Development Agencies.

Reviewed by
Dr. P. C. Bhattacharjee
Renowned Biodiversity Expert

Dr. P.C. Bhattacharjee, a retired Professor & Head, Department of Zoology, Gauhati University, Assam, India is a renowned **Biodiversity Expert** with 41 years of teaching experience. He is instrumental in wildlife studies in North East India and he has published 100+ scientific papers, article and co-authored 3 books. He has guided a number of Ph.D students). He has attended a number of conferences, national and international seminars, workshops and delivered lectures, on topics related to Environment, Ecology and Biodiversity. He is a Biodiversity and Ecology Specialist for many important projects funded by ADB, World Bank etc.

Dr. P.C. Bhattacharjee is a **Trustee and Vice chairman** of **Wildlife Trust of India** and was a Member of National Biodiversity Authority, Member of Assam State Biodiversity Board, Assam State wildlife Board and Wetland Authority of Assam. He was also Vice-President, Primate Research Center (PRC). At present he is the President of North East Science Movement (NESM)- Affiliated to Vigyan Bharati.

Dr. P.C. Bhattacharjee is a member of **International Ornithological Congress** (Senior Fellow), **IUCN-SIS-Primate specialist Group**; He was Coordinator, North East, Mid-Winter water fowl census, under Wetland International (2004 to 2016). He is recipient of a number of life time achievement awards which includes Government of Assam, by Chief Minister of Assam, 2020 (Wildlife Conservation); Balipara Foundation, 2020.

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CONTENTS

List of Tables

List of Figures

List of Annexures

ABBREVIATIONS

AIIB	:	Asian Infrastructure Investment Bank
ASRIP	:	Assam Secondary Road Network Improvement Project
EAP	:	Externally Aided Project
GoA	:	Government of Assam
GoI	:	Government of India
IUCN	:	International Union for Conservation of Nature
MDR	:	Major District Roads
MDB	:	Multilateral Development Banks
PPP	:	Public Private Partnerships
SH	:	State Highways

1. Introduction

Biodiversity encompasses all levels of biological diversity including natural ecosystems, wild species (flora, fauna), Aquatic ecosystem, agricultural ecosystems, domesticated species and varieties. This is an outcome of ecological and evolutionary processes taking place gradually in any ecosystem. The term biodiversity is usually defined as the total variety and variability among living organisms and the ecological complexes they inhabit. Biodiversity is vital to the fulfillment of human needs; a biodiversity rich region offers wide possibilities and opportunities for sustaining human welfare including adoption to changes.

2. Biodiversity of the State

India is one of the 17 Mega biodiverse countries in the world and accounts for 7 to 8 % of the recorded species. The State of **Assam is an integral unit of the Eastern Himalayan Biodiversity Region; one of the two biodiversity "Hot Spots" in the country.** Being the core component of Northeast India, Assam has the important feature of Indo Malayan, Indo Chinese characteristics contributing to its biodiversity. The climatic variations and wide variety in physical features have resulted in diversity of ecological habitats such as forests, grasslands, wetlands, which harbor and sustain wide ranging floral and faunal species placing.

The state of Assam possesses largely tropical type of vegetation containing areas of evergreen, semi-evergreen, deciduous forests and grasslands besides patches of riparian forest found along the river banks. As per Revised Survey of Forest Types in India, Champion and Seth categorized as many as fifty one different forest types/ sub types for this region. Broadly, these are Tropical Wet Evergreen Forests, Tropical Semi Evergreen Forests, Tropical Moist Deciduous Forests, Sub-tropical Broadleaf Hill Forests, Sub-tropical Pine Forests, Littoral and Swamp Forests, Grassland and Savannah.

With respect to Flora, Assam has rich biodiversity of bamboo, Cane, Medicinal Plant and many endemic plant species. Assam is home to a good number of plants having medicinal uses, altogether, 952 plants species have been identified which have uses in medical practices in some form or other. Endemic species are found in very limited areas of the state. Altogether about 165 species of plants have been reported, which are restricted in distribution to certain pockets in Assam and N.E. Region. However, around 100 such species have distribution restricted to Assam only. Some of these (Plants & trees) are e.g. Accacia gageana, Adiantum assamicum, Alseodaphne andersonii, Alseodaphane khasyana, Angiopteris assamica, Cedrela fabrifuga, Cinnamomum cacharensis, Coelogyne assamica, Combretum wallichii, Dinochloa indica, Diospyros cacharensis, Dipterocarpus mannii, Eugenia cyanophylla, bamboos e.g. Bambusa cacharensis, Bambusa mastersii, Chimnobambusa griffitheana, orchids e.g. Bulbophyllum elassonotum, Bulbophyllum vireus, Dendrobium assamicum etc.

With reference to **Rare and Endangered Floral** Species under IUCN red List, about 9 wild species are reported as extinct while around 284 species of plants are observed to be critically endangered, 149 species as endangered, 58 species as vulnerable, 13 species as near threatened.

Assam is a geographical part of the transitional zone between the Indian, Indo Malayan and Indo Chinese Biographical regions. Assam is endowed with favourable climate, topographic and edaphic factors support luxuriant growth of diverse ecosystem and wild fauna (mammals, primates, reptiles, amphibians, fishes, mollusks, birds, butterflies, moths etc.) as inhabitants.

Mammalian diversity of Assam is represented by 193 species, which are widely distributed in this region. But some of the species like one horned rhinoceros, water buffalo, pigmy hog, swamp deer, golden langur, hoolock gibbon have their distribution limited to isolated pockets and protected areas. In case of Primate Diversity, out of 15 Indian primate species 9 are found in Assam. Hoolock gibbon is the

only ape found in India. The other major primate species are capped monkey, golden langur, rhesus macaque, stump tailed macaque, pigtail macaque, Assamese macaque, and slow Lorries.

With respect to Reptilian Diversity, Assam's varied physiographic conditions support a rich variety of reptilian population like Gangetic gharial, 19 species of tortoises, 77 species of lizards and snakes. In Amphibian, Assam and other parts of the N.E. region have 70 species of Amphibions, Gangenophis fulleri and Ichthyphis garoensis are endemic to Assam.

Assam is one of the "**endemic bird areas**" of the world. Assam has **950 bird species**; this is home to 53.5% of the bird species of Indian Sub-Continent, where 17 species of birds are endemic to Assam. **45 species** of birds from Assam has been recognized as **threatened** under the Indian Red Data Book.

Due to having Brahmaputra and Barak River basin, Assam region is recognized as one of the hot spots of fresh water fish biodiversity. Amongst 197 species; food, sports and ornamental fish species are reported from the North East region, of which 185 species are reported from Assam. Commercially main fish species include, **Rohu, Katla, Pabha, Pabda Chital, Magur, Singi, Sol**, etc.

Butterflies play an important role in pollination of plants and biodiversity conservation. Around total 1500 species of butterflies from India, half are reported from Assam and Northeast India.

Protected Area Network: The protected area network of Assam includes 5 National Parks and 18 wildlife sanctuaries covering an area of 0.40 million ha constituting 4.98% of the geographical area. The state has three Tiger Reserves, namely Kaziranga NP, Manas NP, and Nameri NP. Kaziranga National Park and Manas National Park are in the list of Natural World Heritage sites. **Majuli** Island is **Biodiversity heritage site;** this is spread over an 875 sq. km. area. In addition to this, few of the Protected Area and its buffer zone have also been identified as **Elephant reserve** like Sonitpur ER, **Dihing-Patkai ER**, Kaziranga-Karbi Anglong ER, Dhansiri-Lungding ER, Chirang-Ripu ER.

Eco-Sensitive Zone: Ministry of Environment, Forest & Climate Change has notified 0-10 km ranges of Buffer area from the boundary of National Park and Wild Life sanctuary as Eco Sensitive Zone (under Wild Life conservation strategy 2002). In this context, many of the protected area's buffer zone (0 - 10 km periphery) has been notified as eco sensitive zone by its default definition. In the state of Assam, recently a few of the Protected Areas (PA) have their notified Eco sensitive zone viz. **Nameri NP, Sonai Rupai WLS, Amchang WLS, Dibru Saikhowa NP, Hollongapar Gibbon WLS & Chakrashila WLS**. The process of demarcation of Buffer area as eco-sensitive zone is still under process in Assam for remaining PAs. Therefore, PAs, which has not demarcated its Eco sensitive zones, the buffer area of 10 km from the protected area boundary has been considered as eco sensitive zone.

3. Project Corridors

The GoA has embarked upon the Asom Mala to objectively develop the secondary network of the State in the next 15 years. The Asom Mala is an umbrella program with several transport related projects under it and funded from various sources, including those funded from the State Budget (SOPD), Externally Aided Project (EAP) funded by Multilateral Development Banks (MDB) like AIIB, ADB, World Bank, JICA, etc. The Assam Secondary Road Network Improvement Project (ASRIP) has been taken up as an EAP aided by AIIB. The Project corridors included under ASRIP are presented in table below:

Table 1: Project Corridors

Sl. No.	Corridor	Road improvement and upgradation works	District Name	Length (km)
1	A31	Balichapori, Majuli to Bhogalmara, Lakhimpur, including 2 RCC bridges over Subansiri and Luit river	Lakhimpur & Majuli	19.3
2	A15	Dhodar Ali (Kamargaon to Kamarbandha)	Golaghat	42.1
3	A07	Sarthebari Rampur Pathsala Raipur Road	Barpeta & Bajali	20.8

Sl. No.	Corridor	Road improvement and upgradation works	District Name	Length (km)
4	A22	Dhakuakhana Butikur Tiniali Telijan	Lakhimpur & Dhemaji	32.8
5	A30	Moran Naharkatia Duliajan	Dibrugarh	70.6
6	A20	Sivasagar to Nakachari	Sivasagar & Jorhat	63.4
			Total =	**250**

Biodiversity is assessed by mapping the study area with respect to (I) IUCN Red List (II) Protected areas, important species and biodiversity area, forest and other potentially sensitive areas. The present report describes briefly the biodiversity around the project corridors, sensitive hotspots in terms of significant flora & Fauna.

4. Objective

The Biodiversity Assessment Report is a safeguard document that sets out the mitigation and management requirements and responsibilities to be implemented on site to fulfill the Project's biodiversity conservation intentions.

5. Screening of the Project Corridors for Biodiversity

Ecological set-up, favourable geographical location and diversified topographical and climatic conditions were major factors driving the high biodiversity in the state of Assam. Different types of terrestrial and aquatic ecosystem are the ideal conditions for functioning of different types of natural seen in the state with rich biodiversity. Topographically, Assam may conveniently be divided into two major divisions, i.e., the plains and the hills. Assam falls under the regime of sub-tropical monsoon climate. The climate of Assam is characterized by moderate to heavy rainfall accompanied by high percentage of relative humidity and tolerably high temperature in summer and drought with considerably low temperature in winter.

Table below entails about the project corridors and their sensitive analysis with respect to biodiversity impact (please refer below **Table 2**, **Figure 1**).

Table 2: Project corridors & its ecological sensitivity

	Project Corridors					
	A31	A15	A07	A22	A30	A20
Name of the corridor	Balichapori, Majuli to Bhogalmara, Lakhimpur, including 2 RCC bridges over Subansiri and Luit river	Dhodar Ali (Kamargaon to Kamarbandha	Sarthebari Pathsala Raipur Road	Dhakuakhana Butikur Tiniali Telijan	Moran Naharkatia Duliajan	Sivasagar to Nakachari
District	Lakhimpur & Majuli	Golaghat	Barpeta & Bajali	Lakhimpur & Dhemaji	Dibrugarh	Sivasagar & Jorhat
Proximity to PAs or other sensitive areas	• The Project corridor is located at a distance of around 1.5km from Pabho Reserve Forest and it crosses Luit River and Subansiri River near Majuli Island. The area is endowed with rare & threatened Bird Species. • Majuli is a major Island of India and Asia, **it is notified as Biodiversity Heritage site under Government of Assam Gazette Notification dated 29 March 2017 under Section 37 of Biological Diversity Act, 2000.** • The sensitive area around the road stretch may have good biodiversity of fishes, bird and Dolphins. Project involves bridge construction at Subansiri and Luit River. Construction specific Fish and dolphin management plan shall be incorporated in the EMP and PIU/PMU will ensure its effectively implementation by	• **Nambor Doigrung WLS is located at an aerial distance of around 5 km from the project road (Golaghat Town)** • Dhansiri River is flowing at a distance of around 50m from the project road from Ch 2+600 to Ch 3+400. • Occasional Elephant Movement has been reported as per DFO Golaghat and Community consultation • The Protected area has significant number of threatened and endangered wild life fauna and birds.	• Manas NP is located at 23km towards north • No major threatened flora and fauna reported along the corridor and in its indirect influential Zone.	• No Protected Areas/ WLS falls within 10 km Boundary of Project Road. • No major threatened flora and fauna reported along the corridor and in its indirect influential Zone.	• **Dehing Patkai Wildlife Sanctuary is around 4 km from the project road (Bhadoi Panchali).** • **Dehing Patkai WLS has good habitat for elephant, the WLS is an Elephant Reserve.** • Elephant & other wildlife movement is not reported as per DFO Digboi and community consultation.	• **Hollongapar Gibbon Wild Life Sanctuary is located around 6km from the project road.** • The sanctuary has good number of primates and rich habitat of other wild fauna and avi fauna. • The corridor is not within the ESZ and wildlife movement has not been reported as per community consultation.

Project Corridors						
	A31	A15	A07	A22	A30	A20
Name of the corridor	Balichapori, Majuli to Bhogalmara, Lakhimpur, including 2 RCC bridges over Subansiri and Luit river	Dhodar Ali (Kamargaon to Kamarbandha	Sarthebari Pathsala Raipur Road	Dhakuakhana Butikur Tiniali Telijan	Moran Naharkatia Duliajan	Sivasagar to Nakachari
	contractor.					
Flora	Tropical Wet Evergreen Forest (No rare endangered species reported from Project area)	Tropical Semi Evergreen type (No rare endangered species reported from Project area)	Tropical Semi Evergreen type. (No rare endangered species reported from Project area)	Tropical Wet Evergreen Forest (No rare endangered species reported from Project area)	Tropical Rainforest (No rare endangered species reported from Project area)	Tropical Rainforest (No rare endangered species reported from Project area)
Other	Bamboo, Gamari, Jutuli, Chapa, Sissu, Silkha, Chom, Sualu, Neem, Hollock, Urium, Nahar, Ajhar, Simul, Silikha, etc. are the tree species observed.	Bamboo, Gamari, Jutuli, Chapa, Sissu, Silkha, Chom, Sualu, Neem, Hollock, Urium, Nahar, Ajhar, Simul, Silikha, etc. are the tree species observed.	Aegle marmelos, Anonas comosus, Areca catechu,Artocarpus heterophyllus, Azadirachta indica, Dalbergia sisoo, Bombax ceiba, Carica papaya, Citrus limon,Gmelina arborea, Gynocardia odorata, Lagerstomia parviflora, Litsea cubeba, Mangifera indica, Melia	Bamboo, Gamari, Jutuli, Chapa, Sissu, Silkha, Chom, Sualu, Neem, Hollock, Urium, Nahar, Ajhar, Simul, Silikha, etc. are the tree species observed.	Hollang, Mekai, Dhuna, Udiyam, Nahar, Samkothal, Bheer, Hollock, Nahor, Elephant apple, different species of Dimoru were observed	Hollang, Mekai, Dhuna, Udiyam, Nahar, Samkothal, Bheer, Hollock, Nahor, Elephant apple, different species of Dimoru were observed.
	Threatened Flora of Assam: Cycas pectinate, Vatica lanceaefolia, Paphiopedilum spicerianum, Mesua assamica, Magnolia mannii, Magnolia griffithii, Magnolia cathcartii					

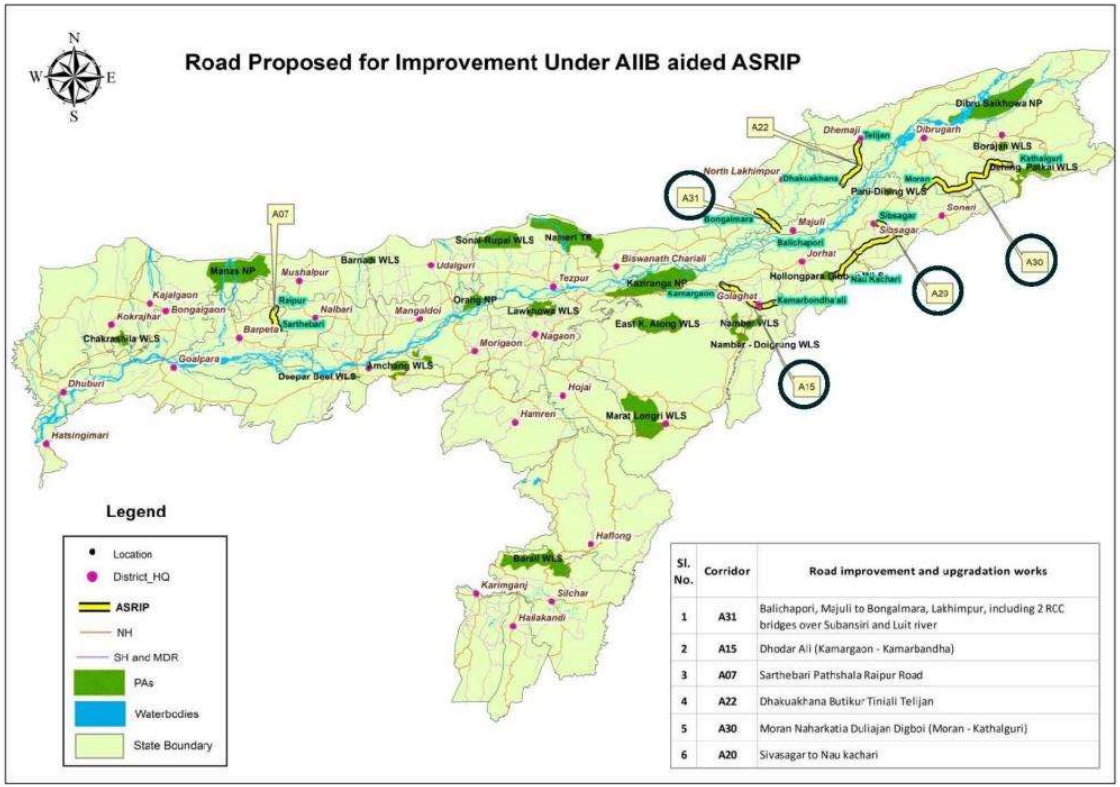


Figure 1: Project Corridor and Eco Sensitive area

6. Clearances

All the project corridors were pre-existing long before notification of any protected area. None of the project roads pass through any Wildlife Sanctuary or National Parks or Protected Areas. Moreover, none of the project roads are legally notified State Highways, hence clearance for environmental and wildlife from Ministry of Environment, Forest and Climate Change is not required.

7. Applicable Rules and Regulations

The following act & regulation of Government of India and State are enacted to ensure the protection of significant Flora and Fauna along with overall environmental security. Though project does not pass through any Wildlife Sanctuary / National Park, however, the security and protection of rare and endangered species is important because few PAs are noticed within 10 km periphery of the project corridors and further it shall need to ensure its compliance and protections by implementing the corridor specific Biodiversity Management Plan (**Table 6 to Table 8**) under strict supervision and monitoring by CSC/ AE/ PIU. The following acts shall be required to be ensured by contractor and construction worker should be aware of these act and penalties thereof.

Sl. No.	Regulations	Relevance	Purpose	Salient Feature
1	The Biological Diversity Act, 2002	▪ A31 - a portion of the project road is located within Majuli Island which is notified as Biodiversity Heritage Site by Govt of Assam in March 2017 under the Act.	It aims at the conservation of biological resources, managing its sustainable use and enabling fair and equitable sharing benefits arising out of the use and knowledge of biological resources with the local communities.	▪ This act prohibits, any person or organization (either based in India or not) obtaining any biological resource occurring in India for its research or commercial utilization. ▪ The act stipulates all offences under it as cognizable and non-bailable.
2	The Wild Life (Protection) Act, 1972	▪ A31-presence of Ganges River Dolphin in Subansiri River ▪ Applicable for A15 as there were incidences of occasional elephant crossing	This Act provides Order, rules and regulations for protection of the country's wild animals, birds, and plant species, in order to ensure environmental and ecological security.	▪ The Act prohibited the hunting of endangered species animal specified in Schedule I & II
3	Forest Conservation Act 1980 and Amendments	▪ Applicable for all Corridors as roadside tree cutting is required.	This Act governs Rules and Regulation for protection and security of Forest.	▪ Section 2 of this Act deals with a restriction on the de-reservation of forests or the use of forest land for non-forest purposes.

8. Biodiversity Screening

A. Corridor A15, A30, A20 - Applicable for Wild Fauna

In the indirect influence area i.e. 10 km periphery of the project corridors, the sensitivity and risk with respect to Wild life, natural habitat has been studied. Based on the details of protected area network of Assam, the corridors of A15, A30 & A20 have some sensitivity towards its natural habitats.

Though above mentioned corridors (A15, A30, A20 & A31) have land use of majorly agricultural and built-up areas, protected areas such as Dhing Patkai WLS, Biodiversity Heritage site i.e. Majuli Island, and River Dhansiri (river tributaries of Brahmaputra), Nambor Doigrung WLS & Hollongapar Gibbon WLS are observed within 10 km periphery of project corridors. In order to protect the critical wildlife habitats, the road upgradation work shall incorporate the requisite management measures for protection of significant wild life habitats.

The Project Corridor A15 Dhodar Ali (Kamargaon to Kamarbandha) is an existing intermediate lane road, originally constructed in around the year 1687, much before the notified protected areas. The Dhodar Ali is a 212-km-long road starting from Kamargaon (NH 715) in Golaghat to Jeypur in Dibrugarh touching Mariani and Jorhat. It runs through five districts of Upper Assam viz. Golaghat, Jorhat, Sivasagar, Charaideo and Dibrugarh, holding significance for several neighbouring states. This road connects mainly small scale and large-scale tea industries, oil refineries, Gas plants, and places of historic importance as well. The project road is located in Golaghat district of Assam, which is famous for its numerous small scale tea gardens and Numaligarh Oil Refinery, this corridor passes parallel to NH 129 and connects Golaghat town directly to NH 715 at Kamargaon. Moreover, it provides the inter-lineage between rural roads and NH which further provides connectivity to major growth centres in the Upper Assam region such as Jorhat (education hub), Sivasagar (historic importance), Dibrugarh, Tinsukia, Digboi (Industrial hub) and further connects to Nagaland, Arunachal Pradesh and Myanmar.

The Dhansiri River is flowing at a distance of around 50m from the road from Ch 2+600 to Ch 3+400. As per stakeholder consultations and confirmation with Forest Office, elephants used to cross the project road on and off at 1st Km, 4th Km and 6th Km. Elephant Underpass has been proposed at 2 locations i.e., 3+630 & 6+450 and approved by the Chief Wildlife Warden, Assam (Annexure 7). Nambor Doigrung WLS is located at an aerial distance of around 5 km from the project road (Golaghat Town). The protected area has good number of rare and endangered mammals, birds and reptiles. The major fauna of the Sanctuary includes Asiatic elephant (Elephus maximus), Hoolock Gibbon (*Hoolock hoolock*), Stumped Tailed Macaque (*Macaca arctoides)*, Pig Tailed Macaque (*Macaca leonina*), Slow Loris (*Nycticebus bengalensis*), Assamese Macaque *(Macaca assamensis),* Rhesus Macaque *(Macaca mulatta),* Tiger *(Panthera tigris),* Leopard *(Panthera pardus),* Fishing Cat *(Prionailurus viverrinus)*, Barking Deer *(M untiacus muntjak),* Sambar *(Rusa unicolor),* Wild Boar (*Sus scrofa*), Gaur (*Bos gaurus) etc.* Some of the important bird species found are White Winged Wood Duck (*Asarcornis scutulata*), Great Pied Hornbill *(Buceros bicornis)*, Wreathed Hornbill *(Rhyticeros undulatus),* Adjutant Stork *(Leptoptilos dubius)* etc. Tortoise *(Testudinidae),* Monitor Lizard *(Varanus),* Python *(Pythonidae)* are also found.

The Project Corridor A30 Moran Naharkatia Road is an existing intermediate lane road, originally constructed in around the year prior to 20th century, much before the notified protected areas. The project road is located in Dibrugarh District, it connects four important industrial towns of Upper Assam viz. Moran, Naharkatia, Duliajan and further to Digboi. Naharkatia is one of the commercial towns of Dibrugarh district. There are many small- and large-scale tea gardens and factories located throughout the corridor from Moran to Naharkatia. Duliajan is an industrial town of Dibrugarh District and it is particularly known for its oil industry. The Head Office of Oil India Limited, Shiv-Vani Oil & Gas Exploration Services Ltd and Assam Gas Company Limited are located in Duliajan. Digboi is known as the Oil City of Assam where the first oil well in Asia was drilled in 1866. The first refinery was started in Digboi as early as 1901. Digboi has the oldest oil well in operation. Apart from National highway 15

connecting Dibrugarh and Tinsukia, the project corridor is the only alternative to connect these 4 important places. This road will play a major role in movement of commercial traffic related to oil, gas, coal and tea between upper Assam and all other parts of India. This corridor is also be a shorter one as compared to national highway 15 to travel between Dulijan, Naharkatia and Moran.

Dhing Patkai Wild life sanctuary is located at 4 km east from the road. The Dhing Patkai WLS has significant numbers of IUCN listed and WL Scheduled fauna; it is also an elephant reserve. As per ENVIS record MOEF&CC, the total numbers of Elephant population was 295 recorded in year 2005. The Biodiversity of the WLS has good numbers of rare and endemic fauna. The major fauna of the Sanctuary includes Tiger (stray) (*Panthera tigris*), Asiatic elephant (*Elephus maximus*), leopard (*Panthera pardus*), pangolin (*Manis crassicaudata*), jungle Cat (*Felis chaus*), Indian civet (*Viverridae spp.*), giant squirrel (*Retufa bicolor*), barking deer (*Muntiacus muntjak*), sambar deer (*Cervus unicolour*), wild pig etc. Some of the important tree species found in this forest area are Hollang, Mekai, Dhuna, Udiyam, Nahar, Samkothal, Bheer, Hollock, Nahor, Elephant apple, different species of Dimoru etc.

The Project Corridor A20 Dhodar Ali (Sivasagar to Nakachari) is also an existing intermediate lane road, originally constructed in around the year 1687, much before the notified protected areas. The road section from Nakachari to Simaluguri is a part of Dhodar Ali, an arterial road of great economic importance and traverse major cities and towns such as Golaghat, Titabor, Mariani, Amguri, Nazira, Simaluguri and Sonari. It starts at NH 715 in Golaghat district and ends at Jeypore in Dibrugarh district after passing through three other districts - Jorhat, Sivasagar and Charaideo. It provides commercial route for the major tea gardens, oil and gas fields, refineries, etc. It provides the inter-lineage between rural roads and NH which further provides connectivity to major growth centres in the Upper Assam region such as Jorhat (education hub), Sivasagar (historic importance), Dibrugarh, Tinsukia, Digboi (Industrial hub) and further connects to Nagaland, Arunachal Pradesh and on to Myanmar.

The project corridor is located around 6 km from Hollongapar Gibbon Wildlife Sanctuary and it is around 1.3 km from the ESZ. The WLS is falling under Jorhat District having total area of 20 sq.km. As per the Champion & Seth (1968) classification scheme, the major forest type in the WLS is Assam Plains Alluvial Semi Evergreen Forests /2/2B/C sparsely interspersed with wet evergreen forest patches. The vegetation is composed of several canopy layers, mostly are evergreen in nature. Major trees are Hollong (*Dipterocarpus macrocarpas*) and other associated top canopy with Hollong are Sam (*Artocarps chaplasha*), Amari (*Amoora wallichi*), Sopas (*Mcheliai spp.*), Bhelu (*Tetramels mudiflora*), Udal (*Sterculia villosa*) and Hingori (*Castanopsis spp.*), these are suitable habitat for primates **capped langur (*Trachypithecus pileatus*) and pig tailed macaque (*Macaca nemestrina*), Hoolock Gibbon (*Hoolock hoolock*).** The Sanctuary supports 11 species mammals, 5 species of reptiles and amphibians and 31 avifaunal species.

The following section entails of sensitive wild life animal occupying in the sanctuary.

Table 3: Threatened Wild Fauna of Protected Area

IUCN Red List	WLPA Schedule	Types of Animal
Endangered	Sch I	Wild Elephant (*Elephase Maximus*), Tigers (*Panthera tigris*), Otter (*Lutra lutra*), Hoolock gibbon (*Hoolock hoolock*), Capped Langur (*Trachypiyhecus pileatus*)
Vulnerable	Sch I	Clouded Leopard (*Neofelis nebulosa*), Marbled Cat (*Pardofelis marmorata*), Assamese macaque (*Macaca assamensis*), Himalayan black bear (*Salena rotos thibetanus*), common Leopard (*panther Pardus*), Sloth Bear (*Melursus urisinus*)
NA	Sch I	Slow loris (*Nycticebus bengalensis*), Golden Cat (*Catopuma temminckii*)
NA	Sch II	Jungle Cat and Wild Cat (*Felis chaus*), Rhesus macaque (*Macaca mulatta*), Pigtailed macaque (*Macaca leonina*), Stump tailed macaque (*Macaca arctoides*)
LC	SchII	Flying fox (*Pteropus*), Wild pig (*Sus scrofa*), Sambar (*Rusa unicolor*), Barking deer

IUCN Red List	WLPA Schedule	Types of Animal
		(Muntiacus muntjak), Gaur (Bes gaurus), Serow *(Capricornis)*, Malayan giant squirrels (*Ratufa bicolor)*, Porcupine *(Hystrix brachyura)* etc.
Reptile	Sch I	Rock python *(python molurus)*, Water Monitor (*varanus*), Asian leaf turtle *(Cyclemys dentata)*, Monitor Lizard *(Varanus)*, etc.
	SchII	King cobra *(Ophiophagus Hannah)*, crab eating mongoose *(Herpestes urva)*
Important Birds		Presented in Table 4

In view of above, the significant management measures to protect the biodiversity were incorporated into the designing, construction and operation phases of the Project.

B. Corridor A31-Applicable for Birds

The Project Corridor A31 Majuli to Bhogalmara via Dhunaguri is an existing road located in the Island District of Majuli and Lakhimpur district. At present the Majuli Island[1] is not connected by road and the island is accessible by ferries from the mainland. It is proposed to connect the island to the mainland on the northern bank of the Brahmaputra River by construction of bridges over Subansiri River and Luit River. Majuli is a lush green environment-friendly, a pristine and pollution-free freshwater island in the river Brahmaputra Mostly inhabited by Tribes, the culture of Majuli is unique and quite interesting which is one of the key reasons for tourism. Majuli is also called the cultural capital of Assam, it is famous for its Satras[2]. In 15th century the first Satra was founded in Majuli. These Satras attracts tourism from all around the globe throughout the year.

The project corridor is about 1.5 km from Pabho Reserve Forest & traversing Luit and Subansiri River. Both locations are Bird Hotspot Area. Majuli is a major Island of India and Asia, the surrounding area has Threatened Bird Species. The indirect influence area i.e. 10 km periphery of the project road are noted to have significant species of Avifauna. Majuli Island is a notified Biodiversity Heritage site by Government of Assam dated 29 March 2017.

It traverse two perennial rivers i.e. Subansiri River and Luit River. It encompasses a large riverine island with innumerable small islets, locally called chapories. The topography of the region is flat floodplain with lakes (beels) and marshes. Majuli, with its fertile floodplains and highly productive wetlands, forms ideal habitats for a variety of birds. This area not only supports diverse resident birds, but also attracts a large number of migratory birds, including some uncommon species. The area has evergreen and deciduous trees, grasses, a wide variety of marsh vegetation, bamboos and canes. As per secondary reference and stakeholder consultation Majuli Island is the habitat for the following threatened bird species:

Habitat:

The majorly bird species are found in colonies in trees close to large waterbody / lakes with other extensive wetlands, preferably at height of 10–40 feet (3.0–12.2 m).

Table 4: Threatened Avifauna of Protected areas / WLS

IUCN Red list	WPA 1972	Type of Avifauna
Critical Endangered	Sch I	Oriental White-backed Vulture (*Gyps bengalensis*), Slender-billed Vulture (*Gyps tenuirostris*), Bengal Florican (*Houbaropsis bengalensis*)
Endangered	Sch I	Greater Adjutant (*Leptoptilos dubius*), White-winged Duck (*Cairina scutulata*)
Vulnerable	Sch I	Pallas's Fish-Eagle (*Haliaeetus leucoryphus*), Lesser Adjutant (*Leptoptilos*

[1] Majuli District is the largest river island of Asia, situated on the Brahmaputra River in Northeastern Assam.
[2] Institutional centers associated with the tradition of Vaishnavism

IUCN Red list	WPA 1972	Type of Avifauna
		javanicus), Spot-billed Pelican (*Pelecanus philippensis)*, Swamp Francolin (*Francolinus gularis)*
NT	Sch I	Great Pied Hornbill (*Buceros bicornis*) (NT),
--	Sch I	Grey peacock Pheasant (*polyplectron bicalcaratum*), Wreathed Hornbill (*Aceros undulates*),
Other Species (NA)	Sch IV	Lesser Whistling-Duck *(Dendrocygna javanica),* Ruddy Shelduck (*Tadorna ferruginea*), Alexandrine Parakeet (*Psittacula eupatria*), Purple crimson sunbird (*Leptocoma zeylonica*), Scarlet backed Flower pecker (*Dicaeum cruentatum*), Steaked weaver *(Ploceus manyar*), Black Kite (*Milvus migrans*)
		Rock Pigeon *(Columba livia)*, Oriental turtle dove *(Streptopelia orientalis)*, Spotted Dove *(Spilopelia chinensis)*, Black Myna *(Gracula religiosa)*, Red collared Dove *(Streptopelia tranquebarica)*, Indian Spot billed Duck *(Anas poecilorhyncha)*, Partridge *(Francolinus gularis)*, Asian koel *(Eudynamys scolopaceus)*, Grey Headed Sandpiper *(Actitis hypoleucos)*, Asian Open Bill *(Anastomus oscitans)*, Great Egret *(Ardea alba)*, Indian Pond heron *(Ardeola grayii)*, Great cormorant (*Phalacrocorax carbo*), Darter*(Anhingidae)*, Kaleej Pheasant (*Lophura leucomelanos)*, Pied Falconet (*Mictohierax melanoleucos*)

C. Corridor A31-Applicable for Fisheries and Dolphin

The Project Corridor A31 Majuli to Bhogalmara via Dhunaguri traverses two rivers i.e. Subansiri River & Luit River. Majuli is the largest river island of Asia, situated on the River Brahmaputra in northeastern Assam. It embraces a large riverine island with innumerable small islets, locally termed as chapories. The major fishes of River Subansiri and aquatic mammal is presented in below table:

Habitat:

All the mentioned fish's species are freshwater fishes, basically found in drainage of Subansiri & Brahmaputra River Basin.

Table 5: Significant Fishes diversity of River Subansiri

IUCN status	WPA 1972	Name of Fish & Family
(NT)	NA	Chitala chitala Notopterus notopterus (Pallas) (Family-Notopteridae)
(LC)	NA	Anguilla bengalensis (Anguillidae)
(LC)	NA	Amblypharyngodon mola, Danio dangila, Devario devario, Puntius rasbora, Cirrhinus mrigala,Labeo bata, Labeo pangusi, Labeo rohita (Family Cyprinidae)
(LC)	NA	Gagata gagata,Rita rita, Ailia coila (family- Sisoridae)
(LC)	NA	Rhinomugil corsula (Family- Mugilidae)
(LC)	NA	Xenentodon cancilla (Family- Belonidae)
Other species	NA	Psilorhynchus sucatio (psilorhynchidae), Aborichthys rosammai (Nemachelidae)
	NA	Other species of families Engraulidae, Psilorhynchidae, Balitoridae, Cobitidae, Bagridae, Siluridae, Schilbeidae, Pangasidae, Amblycipitidae, Erethistidae, Claridae, Channidae etc.

Aquatic Mammal

With regard to threatened aquatic mammal, only aquatic mammal 'Gangetic River Dolphin' is reported in the river (as per secondary records[3]). Locally this animal is known as Sisu. The Ganges River Dolphin belongs to the family Plantanistidae and inhabits Fresh water area. This species is reported in basins of River Ganga-Brahmaputra Basin, Meghana, Karnaphuli-Sangu River system. The subspecies is "endangered" under International Union for Conservation of Nature (IUCN) Red List. In the monsoon season, Ganges River Dolphin locally migrate to tributaries and then back to large River channels in dry, winter season. They also move along the coast of West Bengal. It is a national Aquatic Animal of India. The number of inhabitants in the world was estimated to be 2000 in 1990s. The main reason of declining the population trend is poaching, over catching, loss/division of habitats, River pollution, of modification of the river through inflow, or extraction sediments.

The Gangetic dolphins are found in the River Subansiri in sectors of Katori Chapori to Bodhakora, Bodhakora to Solmari, Solmari to Boroliya and Boroloiya to Silikhaguri (Source: Protection of Endangered Ganges River Dolphin in Brahmaputra River, Assam, India 2009), **Bodoti area is falling near the project corridor.**

Sectors	Area name	Location	Best estimate
I	Katoi sapori - Badhakora	N27°25', E94°15'- N27°18', E94°11'	2
II	Badhakora-Solmari	N27°17', E94°11'- N27°09', E94°10'	3
III	Solmari-Borolia	N27°09', E94°10'- N27°01', E94°06'	9
IV	Boroliya-Bodoti	N27°01', E94°06'- N26°56', E93°58"	7
V	Bodoti-Hilikhaguri	N26°55', E93°57'- N26°51', E93°52'	2
	Total		**23**

Multiple site visits along with local people were carried out at different timings for dolphin sighting but none was sighted in the project area (upstream and download of proposed bridge over Subansiri River). During community consultations, it was informed that sometimes one/two dolphins are usually sighted during monsoon season.

Although during winter season, the number of Dolphin could be less, construction activity may alter the habitat factors like availability of food fishes, browsing areas; alter water quality and other factors which may have adverse impact on the small population. The impact during preconstruction, construction stage may affect the aquatic habitat of the river body. Ganges river dolphin population will not suffer from habitat fragmentation as the Dolphins and other aquatic species can pass under the bridge and no habitat fragmentation will occur.

9. Anticipated Impact due to the project

Project activities which may cause negative impact on biodiversity are clearing of native vegetation (including habitat); works around watercourses; noise; disturbance of soils, consequential erosion and the mobilisation of sediment; and use of chemicals / fuels (potential for spills).

Direct Impact: Removal of native vegetation; loss of terrestrial and wetland fauna habitat; and loss of aquatic fauna habitat

Indirect Impact: Habitat fragmentation; Potential fauna displacement, altered surface water hydrology; Erosion, sedimentation and contamination; Dust; Light, noise and vibration; Mobilisation of contaminated soils; Spread of pests and pathogens; and Fire.

[3] IUCN published: Protection of Endangered Ganges River Dolphin in Brahmaputra River, Assam

Other activities of impact:

- Emanating some amount of debris during construction, that may affect the Soil & water quality
- Impact on aquatic life, dolphin due to underwater noise, drilling and blasting activity
- Noise from different equipment, construction vehicle may disturb the migratory birds & Wild Fauna
- Several small species amphibians, reptiles, fishes may suffer from habitat change due to construction activities, bridges, culverts, embankments.
- Spillage of oil and other hazardous chemicals
- Worker camps, spillage from parking areas etc.
- Pollution of surface and sub surface water
- Temporary construction and labour camps for workers can be a source of significant temporary and even permanent impact on wildlife and other resources within high-biodiversity areas. Consequently, poaching of wildlife, illegal fishing, harvest of trees for fuelwood, and other illegal activities may take place in these areas.

For any road improvement and upgradation works there would be effects on biodiversity due to road improvement works. The proposed project corridors are existing roads with single to intermediate lane which are proposed for improvement and upgradation to two lane, consisting of 7m carriageway with 1.5m paved shoulder on either side, along with 1m earthen shoulder on each side.

Mostly construction specific activities are confined and temporary in nature, these are physical construction specific impacts where the extent of effect is moderate which can be reversed once the construction completes and further minimized by having an effective construction and operation specific management measures.

10. Biodiversity Management Plan (Corridor A15, A30 & A20)

To ensure that damage to biodiversity (or other environmental concerns) is avoided or properly mitigated in the field, proper environmental management and supervision of road works is required. Additional to Environmental management measures as suggested in EIA report, Biodiversity Management Plan are required to be incorporated in project management during pre-construction, construction and operation phases. This is especially important for projects close to natural habitats and other environmentally sensitive areas, riverine ecosystem etc. **Table 6 to Table 8** below presents the necessary Biodiversity Management Plan applicable to minimize the species wise risk for Mammals, Reptile, Amphibian Birds & fishes.

Table 6: Biodiversity Management Plan (A15 Dhodar Ali)

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
Pre-construction Stage						
1.	Disturbance to Natural Vegetative community	• Prior to clearing and grubbing work, the Biodiversity Specialists will conduct pre-construction checks, to avoid accidental injury or death to sensitive species. • The Biodiversity Specialists will prepare a monitoring report and sensitive map/ area showing sensitive locations. This will be shared with workers through toolbox talks, regular awareness campaigns so that sensitive areas can be avoided or bespoke mitigation implemented	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
2.		• Pre-construction checks will include bird nesting within hollow trees and other places of shelter on trees in corridor of impacts. • Identification of sites and peak visiting period for migratory birds in the project area of influence.	Avifauna (Birds)	Throughout the project stretch	Contractor	CSC/ PIU
3.		• Prior to construction, it is important to determine the area, locations which are preferentially used by Wild animal (large mammals & Amphibians, reptiles, Arboreal) during feeding time possibly Morning and evening near the buffer area of PAs, close to Project areas, so that conservation effort can be focused on these locations. • As per stakeholder consultations and confirmation with Forest Office, elephants used to cross the project road on and off at 1st Km, 4th Km and 6th Km. • Elephant Underpass has been proposed at 2 locations i.e., 3+630 & 6+450 and approved by the Chief Wildlife Warden, Assam, (Annexure 7).	Overall Sensitive Fauna	Throughout the project stretch	Contractor	CSC/ PIU
4.	Debris Management	• Debris management plan as suggested in EIA should be followed strictly at site	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
5.	Location of Labour camp	• Labour camps should be prohibited in protected and high-biodiversity areas / Buffer areas/Reserve Forest	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
Construction Stage						
6.	Sensitivity among worker and project staff	• Workers will be made aware of the ecological sensitivities of the areas and will be trained in mitigation for any unforeseen events, including the presence of uncommon habitats and species. • Hunting and gathering by Project staff will be prohibited, Hunting by Project staff should be viewed as a serious violation	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
7.	Disturbance due to excess light in eco sensitive areas	• Work during night time will be kept to a minimum where possible. Wherever lighting required, lights will be kept away from areas of woodland and hedges and lighting will be directed to where it is needed with marginal light spillage.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
8.	Waste Management Issue	• A waste management plan will be implemented. Waste disposal facilities will be operated in a manner that includes the regular covering of exposed refuse with soil or gravel. This will reduce risk of exposure of birds such as Vulture, kites that regularly forage in waste dumps to potentially damaging waste products.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
9.	Dust Issues	• Vehicle speeds on access and haul roads will be controlled to minimise dust emissions and the risk of mortality of animals. • Water sprinkling shall be practised at construction sites, earthen access and haul roads.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
10.	Labour sensitivity	• Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Waste water from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
11.	Construction Activity	• Temporary construction material sites, quarries, borrow pits, and storage areas can also have an effect on habitat loss and degradation. Such sites shall be rehabilitated as appropriate, following their use but before construction is	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		completed.				
12.	Overall Safety Measure	• To minimize harm to biodiversity during road construction (or improvement, rehabilitation, or maintenance), it is important to regulate the behaviour of workers in the field. Specifically, workers under the projects should be prohibited from hunting, fishing, wildlife capture (including for pets), plant collection, or burning of vegetation, anywhere in or near the project area. • Construction of road with proper slope for elephant crossing at the location of identified passage along with marking of wildlife crossing and speed limit.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
Post Construction Phases						
13.	Monitoring of sensitive species (reported during detailed survey along the corridor)	• Monitoring must take place under the direction of an appropriately qualified person and the results of the monitoring must be kept in a written record	Overall	Throughout the project stretch	Contractor	PIU
14.	Landscaping & compensatory afforestation	• Landscaping and green belt along the corridor will utilize predominantly native vegetation endemic to the region, sourced and consulted from local area. This will attenuate the negative impact originated from construction activities. • All re-vegetation carried out for the Project will be carefully reviewed and monitored to avoid accidental introduction of invasive alien species	Overall	Throughout the project stretch	Contractor	PIU
15.	Accidental discharge in water	• To avoid Accidental discharge; leakage from oil receptors, refuelling of vehicle, washing of vehicles should follow the approach of routine and periodical maintenance • Oil interceptor shall be installed at plant and vehicle workshop	Fishes	At bridge construction locations	Contractor	PIU
16.	Overall Management oil contamination	• Automotive workshop establishment shall be avoided and discouraged along the corridor especially which is undergoing commercial activities without maintaining	Overall species	At bridge construction locations	Contractor	PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		preventive measure of oil contamination/spillage.				
17.	Sensitivity among project people, locals etc.,	• Awareness programme as training, workshop shall be organized to spread the awareness for protection of endangered species and provisions of punishment against poaching or disturbing as per WPA 1972 under GOI.	Overall species	Throughout the project stretch	Contractor	PIU
18.	Road safety Treatment	• Wildlife warning signages with flashing lights and variable message boards have the potential to be more effective than static warning signs (As per World Bank Report). Such signs are most effective if employed during peak wildlife crossing periods (e.g., migration, morning, evening) or are associated with animal-activated detection systems that trigger flashing and/or message signs only when animals are present.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
19.		• Solar-powered flashing lights (with batteries for night-time operation) can be attached to static signs for operation during key periods such as elephant migration. • Period maintenance of signages installed.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
20.		• To effectively reduce wildlife-vehicle collision incidence, lower design speed considerations will be integrated into road design and construction. Specific design speeds are used to engineer various geometric design features into a roadway, with minimum standards applied for different design speeds.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
21.		• Traffic calming managements, such as curb extensions, raised medians, rumble strips in the pavement, speed bumps, Reduced speed warning shall be undertaken by contractor for stretch close to sensitive areas	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
22.		• The Endangered species as listed in table will be monitored throughout the Project and additional mitigation implemented if necessary.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
23.		• To prevent animal casualty during operation phase, care has to be taken by the APWRD in consultation with the wildlife official and DFO. One forest check post has to be	Overall Wild fauna	Throughout the project stretch	Contractor	PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		erected on both the end of roads falling close to protected area - **Nambor Doirung WLS**. Forest guards or CCTV cameras has to be installed at both the end and in between to keep eye on the plying vehicles. Sign Board 500 meters ahead of Wildlife Area has to be placed for traveller's information. • No honk zone & speed limits of 20-30km/hr sign board has to be erected at every 500 meters on the roads falling near ecological-sensitive area • Sign board of animal's movement zone and CCTV Surveillance zone has to be installed before the check posts and in between the road. • The death of animals if happening has to be reported along with locations. If repetitive deaths are happening at the same location or area, then PWRD has to take some preventive measures like adding animal's underpass or animal's accident zone sign board with speeds breakers.				

Table 7: Biodiversity Management Plan (A30 Moran Naharkatia Duliajan)

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
Pre-construction Stage						
1.	Disturbance to Natural Vegetative community	• Prior to clearing and grubbing work, the Biodiversity Specialists will conduct pre-construction checks, to avoid accidental injury or death to sensitive species. • The Biodiversity Specialists will prepare a monitoring report and sensitive map/ area showing sensitive locations. This will be shared with workers through toolbox talks, regular awareness campaigns so that sensitive areas can be avoided or bespoke mitigation implemented	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
2.		• Pre-construction checks will include bird nesting within hollow trees and other places of shelter on trees in	Avifauna (Birds)	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		corridor of impacts. • Identification of sites and peak visiting period for migratory birds in the project area of influence.				
3.		• Prior to construction, it is important to determine the area, locations which are preferentially used by Wild animal (large mammals & Amphibians, reptiles, Arboreal) during feeding time possibly Morning and evening near the buffer area of PAs, close to Project areas, so that conservation effort can be focused on these locations.	Overall Sensitive Fauna	Throughout the project stretch	Contractor	CSC/ PIU
4.	Debris Management	• Debris management plan as suggested in EIA should be followed strictly at site	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
5.	Location of Labour camp	• Labour camps should be prohibited in protected and high-biodiversity areas / Buffer areas/Reserve Forest	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
Construction Stage						
6.	Sensitivity among worker and project staff	• Workers will be made aware of the ecological sensitivities of the areas and will be trained in mitigation for any unforeseen events, including the presence of uncommon habitats and species. • Hunting and gathering by Project staff will be prohibited, Hunting by Project staff should be viewed as a serious violation	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
7.	Disturbance due to excess light in eco sensitive areas	• Work during night time will be kept to a minimum where possible. Wherever lighting required, lights will be kept away from areas of woodland and hedges and lighting will be directed to where it is needed with marginal light spillage.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
8.	Waste Management Issue	• A waste management plan will be implemented. Waste disposal facilities will be operated in a manner that includes the regular covering of exposed refuse with soil or gravel. This will reduce risk of exposure of birds such as Vulture, kites that regularly forage in waste dumps to potentially damaging waste products.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
9.	Dust Issues	• Vehicle speeds on access and haul roads will be controlled to minimise dust emissions and the risk of mortality of animals. • Water sprinkling shall be practised at construction sites, earthen access and haul roads.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
10.	Labour sensitivity	• Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Waste water from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
11.	Construction Activity	• Temporary construction material sites, quarries, borrow pits, and storage areas can also have an effect on habitat loss and degradation. Such sites shall be rehabilitated as appropriate, following their use but before construction is completed.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
12.	Overall Safety Measure	• To minimize harm to biodiversity during road construction (or improvement, rehabilitation, or maintenance), it is important to regulate the behaviour of workers in the field. Specifically, workers under the projects should be prohibited from hunting, fishing, wildlife capture (including for pets), plant collection, or burning of vegetation, anywhere in or near the project area.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
Post Construction Phases						
13.	Monitoring of sensitive species (reported during detailed survey along the corridor)	• Monitoring must take place under the direction of an appropriately qualified person and the results of the monitoring must be kept in a written record	Overall	Throughout the project stretch	Contractor	PIU
14.	Landscaping & compensatory afforestation	• Landscaping and green belt along the corridor will utilize predominantly native vegetation endemic to the region, sourced and consulted from local area. This will attenuate the negative impact originated from construction activities.	Overall	Throughout the project stretch	Contractor	PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		• All re-vegetation carried out for the Project will be carefully reviewed and monitored to avoid accidental introduction of invasive alien species				
15.	Accidental discharge in water	• To avoid Accidental discharge; leakage from oil receptors, refuelling of vehicle, washing of vehicles should follow the approach of routine and periodical maintenance • Oil interceptor shall be installed at plant and vehicle workshop	Fishes	At bridge construction locations	Contractor	PIU
16.	Overall Management oil contamination	• Automotive workshop establishment shall be avoided and discouraged along the corridor especially which is undergoing commercial activities without maintaining preventive measure of oil contamination/spillage.	Overall species	At bridge construction locations	Contractor	PIU
17.	Sensitivity among project people, locals etc.,	• Awareness programme as training, workshop shall be organized to spread the awareness for protection of endangered species and provisions of punishment against poaching or disturbing as per WPA 1972 under GOI.	Overall species	Throughout the project stretch	Contractor	PIU
18.	Road safety Treatment	• Wildlife warning signages with flashing lights and variable message boards have the potential to be more effective than static warning signs (As per World Bank Report). Such signs are most effective if employed during peak wildlife crossing periods (e.g., migration, morning, evening) or are associated with animal-activated detection systems that trigger flashing and/or message signs only when animals are present.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
19.		• Solar-powered flashing lights (with batteries for night-time operation) can be attached to static signs for operation during key periods such as elephant migration.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
20.		• To effectively reduce wildlife-vehicle collision incidence, lower design speed considerations will be integrated into road design and construction. Specific design speeds are used to engineer various geometric design features into a roadway, with minimum standards applied for different design speeds.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
21.		• Traffic calming managements, such as curb extensions, raised medians, rumble strips in the pavement, speed bumps, Reduced speed warning shall be undertaken by contractor for stretch close to sensitive areas	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
22.		• The Endangered species as listed in table will be monitored throughout the Project and additional mitigation implemented if necessary.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
23.		• To prevent animal casualty during operation phase, care has to be taken by the APWRD in consultation with the wildlife official and DFO. One forest check post has to be erected on both the end of roads falling close to protected area – **Dihing Patkai WLS**. Forest guards or CCTV cameras has to be installed at both the end and in between to keep eye on the plying vehicles. Sign Board 500 meters ahead of Wildlife Area has to be placed for traveller's information. • No honk zone & speed limits of 20-30km/hr sign board has to be erected at every 500 meters on the roads falling near ecological-sensitive area • Sign board of animal's movement zone and CCTV Surveillance zone has to be installed before the check posts and in between the road. • The death of animals if happening has to be reported along with locations. If repetitive deaths are happening at the same location or area, then PWRD has to take some preventive measures like adding animal's underpass or animal's accident zone sign board with speeds breakers.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU

Table 8: Biodiversity Management Plan (A20 Sivasagar to Nakachari)

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
Pre-construction Stage						
1.	Disturbance to Natural Vegetative community	• Prior to clearing and grubbing work, the Biodiversity Specialists will conduct pre-construction checks, to avoid accidental injury or death to sensitive species. • The Biodiversity Specialists will prepare a monitoring report and sensitive map/ area showing sensitive locations. This will be shared with workers through toolbox talks, regular awareness campaigns so that sensitive areas can be avoided or bespoke mitigation implemented	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
2.		• Pre-construction checks will include bird nesting within hollow trees and other places of shelter on trees in corridor of impacts. • Identification of sites and peak visiting period for migratory birds in the project area of influence.	Avifauna (Birds)	Throughout the project stretch	Contractor	CSC/ PIU
3.		• Prior to construction, it is important to determine the area, locations which are preferentially used by Wild animal (large mammals & Amphibians, reptiles, Arboreal) during feeding time possibly Morning and evening near the buffer area of PAs, close to Project areas, so that conservation effort can be focused on these locations.	Overall Sensitive Fauna	Throughout the project stretch	Contractor	CSC/ PIU
4.	Debris Management	• Debris management plan as suggested in EIA should be followed strictly at site	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
5.	Location of Labour camp	• Labour camps should be prohibited in protected and high-biodiversity areas / Buffer areas/Reserve Forest	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
Construction Stage						
6.	Sensitivity among worker and project staff	• Workers will be made aware of the ecological sensitivities of the areas and will be trained in mitigation for any unforeseen events, including the presence of uncommon habitats and species. • Hunting and gathering by Project staff will be prohibited, Hunting by Project staff should be viewed as a serious violation	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
7.	Disturbance due to excess light in eco sensitive areas	• Work during night time will be kept to a minimum where possible. Wherever lighting required, lights will be kept away from areas of woodland and hedges and lighting will be directed to where it is needed with marginal light spillage.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
8.	Waste Management Issue	• A waste management plan will be implemented. Waste disposal facilities will be operated in a manner that includes the regular covering of exposed refuse with soil or gravel. This will reduce risk of exposure of birds such as Vulture, kites that regularly forage in waste dumps to potentially damaging waste products.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
9.	Dust Issues	• Vehicle speeds on access and haul roads will be controlled to minimise dust emissions and the risk of mortality of animals. • Water sprinkling shall be practised at construction sites, earthen access and haul roads.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
10.	Labour sensitivity	• Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Waste water from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies.	Overall Sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
11.	Construction Activity	• Temporary construction material sites, quarries, borrow pits, and storage areas can also have an effect on habitat loss and degradation. Such sites shall be rehabilitated as appropriate, following their use but before construction is completed.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU
12.	Overall Safety Measure	• To minimize harm to biodiversity during road construction (or improvement, rehabilitation, or maintenance), it is important to regulate the behaviour of workers in the field. Specifically, workers under the projects should be prohibited from hunting, fishing, wildlife capture (including for pets), plant collection, or burning of vegetation, anywhere in or near the project area.	Overall sensitive species	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
Post Construction Phases						
13.	Monitoring of sensitive species (reported during detailed survey along the corridor)	• Monitoring must take place under the direction of an appropriately qualified person and the results of the monitoring must be kept in a written record	Overall	Throughout the project stretch	Contractor	PIU
14.	Landscaping & compensatory afforestation	• Landscaping and green belt along the corridor will utilize predominantly native vegetation endemic to the region, sourced and consulted from local area. This will attenuate the negative impact originated from construction activities. • All re-vegetation carried out for the Project will be carefully reviewed and monitored to avoid accidental introduction of invasive alien species	Overall	Throughout the project stretch	Contractor	PIU
15.	Accidental discharge in water	• To avoid Accidental discharge; leakage from oil receptors, refuelling of vehicle, washing of vehicles should follow the approach of routine and periodical maintenance • Oil interceptor shall be installed at plant and vehicle workshop	Fishes	At bridge construction locations	Contractor	PIU
16.	Overall Management oil contamination	• Automotive workshop establishment shall be avoided and discouraged along the corridor especially which is undergoing commercial activities without maintaining preventive measure of oil contamination/spillage.	Overall species	At bridge construction locations	Contractor	PIU
17.	Sensitivity among project people, locals etc.,	• Awareness programme as training, workshop shall be organized to spread the awareness for protection of endangered species and provisions of punishment against poaching or disturbing as per WPA 1972 under GOI.	Overall species	Throughout the project stretch	Contractor	PIU
18.	Road safety Treatment	• Wildlife warning signages with flashing lights and variable message boards have the potential to be more effective than static warning signs (As per World Bank Report). Such signs are most effective if employed during peak wildlife crossing periods (e.g., migration, morning, evening) or are associated with animal-activated detection systems that trigger flashing and/or message signs only when animals	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		are present.				
19.		• Solar-powered flashing lights (with batteries for night-time operation) can be attached to static signs for operation during key periods such as elephant migration.	Wild Fauna (Mammal)	Throughout the project stretch	Contractor	PIU
20.		• To effectively reduce wildlife-vehicle collision incidence, lower design speed considerations will be integrated into road design and construction. Specific design speeds are used to engineer various geometric design features into a roadway, with minimum standards applied for different design speeds.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
21.		• Traffic calming managements, such as curb extensions, raised medians, rumble strips in the pavement, speed bumps, Reduced speed warning shall be undertaken by contractor for stretch close to sensitive areas	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
22.		• The Endangered species as listed in table will be monitored throughout the Project and additional mitigation implemented if necessary.	Overall Wild fauna	Throughout the project stretch	Contractor	PIU
23.		• To prevent animal casualty during operation phase, care has to be taken by the APWRD in consultation with the wildlife official and DFO. One forest check post has to be erected on both the end of roads falling close to protected area – **Hollongapar Gibbon WLS**. Forest guards or CCTV cameras has to be installed at both the end and in between to keep eye on the plying vehicles. Sign Board 500 meters ahead of Wildlife Area has to be placed for traveller's information. • No honk zone & speed limits of 20-30km/hr sign board has to be erected at every 500 meters on the roads falling near ecological-sensitive area • Sign board of animal's movement zone and CCTV Surveillance zone has to be installed before the check posts and in between the road. • The death of animals if happening has to be reported along with locations. If repetitive deaths are happening at the	Overall Wild fauna	Throughout the project stretch	Contractor	PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		same location or area, then PWRD has to take some preventive measures like adding animal's underpass or animal's accident zone sign board with speeds breakers.				

A. Budget of Biodiversity Management Plan (Corridor – A15, A30, A20)

Table 9 below present the cost towards monitoring and management of biodiversity. The applicable corridors (A15, A30 & A20) have eco sensitive protected areas within its 10 km periphery. Although some management measure under biodiversity management which are linked with environmental management are already covered in EMP Cost. However, other measures like awareness; training and monitoring etc. of rare and threatened species as described in the Biodiversity Management Plan has been taken into the consideration. Following tables provides the total budget of BMP.

Table 9: Budget under Biodiversity Management (A15, A30 & A20)

Particular	Duration of Project	Frequency	Unit Rs. (LS)	Total (INR)
Awareness and training biodiversity conservation	Construction (3 years)	Monthly	20,000	7,20,000
	Operation & Maintenance (one year)	Six Monthly	--	50,000
Carryout systematic field survey (involves hiring of biodiversity expert, Site survey and monitoring and keeping record of Endangered species around 10km radius project corridors	Construction (3 years)	Monthly	3,00,000	1,08,00,000
	Operation & Maintenance (one year)	Six Monthly	---	6,00,000
Silt Protection measure,	Already covered in EIA Budget			
Oil interceptors				
Compensatory Afforestation				
Water quality Monitoring				
Noise Quality Monitoring				
Air Quality Monitoring				
Awareness regarding environmental health and safety				
Elephant Underpass at 2 locations i.e., 3+630 & 6+450 (A15).	Already covered in Civil BoQ (INR 16,70,47,544)			
Total Budget (INR)				1,21,70,000

11. Biodiversity Management Plan (Corridor A31)

The preferred option for conservation is to restrain from interfering with the natural flow regime and to avoid constructing barriers to animals and sediment movement. However, socio-political conditions make it impractical to completely halt water developmental activities especially in the Subansiri basin, so the immediate goal must be to manage such activities in ways that will minimize the harm to dolphins and other aquatic species.

Access to floodplains should be preserved to ensure natural spawning and rearing habitat for fishes which are prey base of the dolphin. Information on the pre-development ecological conditions of a river

is essential for evaluating mitigation efforts (like provision of fish ways etc.) and to implement future development decisions. Post-development empirical studies are needed to monitor the operational aspects of projects as well as the effects on

- Upstream and downstream populations of cetaceans and their habitat.
- Cumulative and synergistic impacts of multiple developments should be considered in assessments of environmental impact

National Awareness about the Ganges River dolphin and the importance of freshwater ecosystems should be done by

- Identifying the target groups to execute conservation actions
- Designation of Brand Ambassadors for awareness campaigns.
- Development of education and publicity material.
- Development of a dedicated web portal for the Ganges River dolphin.
- Since the Ganges River dolphin is an endangered species, every single animal is an important source for the gene pool. Rescue and rehabilitation of dolphins is a specialized operation and there is a need to establish Rescue and Rehabilitation Centres and specialized teams in the Subansiri basin at appropriate locations.
- Dolphin Watch Programme' should be initiated to popularize Dolphin Conservation & Management Activities.

A. Project Impacts on Aquatic Ecology

As the project corridor do not passes through any protected areas and Reserved Forest, the impact is very less on biodiversity. Only the aquatic ecosystem will be affected as the bridge will be constructed over the river Subansiri. The impacts due to pre-construction, construction, and operation of the proposed project that will affect various aquatic habitats and biodiversity of the project area and monitoring are also described in next sections. Ganges river dolphin population will not suffer from habitat fragmentation as the dolphins and other aquatic species can pass under the bridge and no habitat fragmentation will be occur.

I. **Potential direct and indirect impacts of the project during construction phase in the aquatic ecology are as follows:**

- The construction phase of the bridge will lead to the release of some amount of debris and this may impact aquatic life.
- During the construction of the proposed bridge, there is a high possibility of dolphins and their habitats impacts due to high underwater noise.
- Several endangered chelonian species can potentially suffer from habitat change by the construction activities.
- Noise from different equipment, vehicles, and human traffic has the potential to disturb migratory birds.
- Filling of low-lying areas for construction of embankments for the approach road.
- Impacts on the drainage pattern due to raised embankment, introduction of new culverts.
- Increased noise level due to the movement of vehicles and construction activities.
- Increased soil erosion.
- Spillage of oils and other hazardous materials.
- Pollution of surface and sub-surface water resources.
- No direct negative impact is anticipated on other species, but care should be taken to prevent indirect negative impact such as the deterioration of habitat. There will be some temporary

physical disturbance to the aquatic environment during construction, but no chemical pollution will be caused and therefore no irreversible damage will be caused for the aquatic species.

II. **Potential direct and indirect impacts of the project during operation phase are the following:**

- Increased noise pollution due to the vehicular movement.
- Impact on natural drainage pattern of the project area.
- Pollution of water bodies and impacts on its ecosystem due to hazardous chemical or oil spillage into the nearby surface water bodies.

III. **ACTIVITY WISE NEGATIVE IMPACT ON AQUATIC ECOLOGY:**

Table 10: Negative impacts on Aquatic ecology

Sl. No	Activities	Impacts on Physical Environment	Biological Environment		Natural Drainage
	Construction Phase	**Water**	**Flora**	**Fauna**	
1	Labour Camp Activities	-Ve/T			
2	Drilling & Blasting		-Ve/T	-Ve/T	
3	Pavement Works	-Ve/T	-Ve/T	-Ve/T	
4	Use of Construction Equipment	-Ve/T			
5	Pillaring of Bridge	-Ve/T		-Ve/T	
6	Culvert & Bridge Construction	-Ve/T		-Ve/T	-Ve/P
7	Earthwork				-Ve/T
8	Quarrying				-Ve/T
9	Debris generation				-Ve/P

IV. **PRE-CONSTRUCTION STAGE**

a) **Anticipated impacts on aquatic ecology**

Impact on aquatic ecology of the river and its inherent biota owing to the construction of bridge will be probably minimal once the bridge is fully operationalized. However major, negative impact on aquatic ecology of the river is perceived to occur during the construction phase of the bridge. The possible impact on aquatic life during the construction phase of the bridge is discussed below:

- Significant sediment deposition and accumulation around bridge locations may occur as soon as construction of the bridge begins owing to natural flow obstruction. Construction of pillars acts as barriers to the natural flow leading to siltation. It has been well documented that increased sediment deposition can adversely change habitat conditions of aquatic life. Siltation can lead to fish mortality, reduced growth rates due to stress and spawning failure i.e. non-hatching of eggs. In addition, sediment deposition and accumulation can modify the suitability of fish habitats. Identified mechanisms causing changes in sediment suitability include: Altered porosity in the streambed affecting the development of fish embryo and benthic invertebrate production; reduction in the area of inter-gravel habitat for and juvenile fish; and benthic organisms; and reduction in available over wintering habitat for fish by filling of pools and interstitial voids.
- Construction activities can alter potential habitat for aquatic life or may cause direct loss of habitat of aquatic organisms. It may lead to loss of breeding and nursery grounds of fishes, owing to changes in water quality, siltation etc.
- Dredging of river bed for construction purpose, disturbs the river bed and re-suspension of sediment in the water column is likely to occur as a result of dredging action at the sediment water interface, transfer of the sediment to a transporting vessel, slop or leakage from the vessel, and disposal of the sediment. Re-suspension of the sediments causes increased turbidity which may adversely affect aquatic life by clogging gills, decreasing visibility, and preventing oxygen diffusion. Increased water turbidity with less oxygen level is particularly harmful for fishes and more importantly for river dolphins.

- A long-term impact associated with the removal of sediments during dredging is the potential exposure of contaminated sediments. Mining and other sources of pollution can result in contamination of surface sediments. Over time, deposition of upstream sediments can bury the contaminated sediments, effectively sealing them off from the aquatic organisms. During the dredging activities, the upper layers of sediment are removed, potentially exposing previously contaminated sediments. Benthic organisms are exposed to the contaminants through uptake from pores, body walls, respiratory surfaces, and through ingestion.
- Construction of the bridge would generate noise from equipment such as motors, chain saws, frontend loaders, cranes, pile drivers and power generators. The effects of construction noise would be most noticeable in the area immediately surrounding the construction site. This would have a scaring effect upon fishes and may hamper their natural movement in search of food and movement to meet other biological requirements. If blasting with explosives and pile driving is required during construction, vibration as well as noise would be generated. In-water blasting and pile driving would generate pressure waves that would pose a consistent and adverse threat to fish and other aquatic resources.
- Water that comes into contact with cement, uncured concrete, concrete dust etc. used during construction quickly produces a strong alkaline solution that causes chemical burns to fish, insects and plants. If even a small volume of concrete wastewater is allowed to enter streams, lakes or wetlands it can cause immense damage to the environment.
- Dumping or accidental discharge of chemicals used during construction may cause immense harm to the aquatic ecosystem.
- There may be physical damage on aquatic organisms leading to mortality as a result of the construction activities.
- Aquatic mammals, particularly the river dolphin, a sizeable population of which is found in Subansiri may be negatively affected owing to the construction activities. Sound and vibrations in water as well as use of high pressure water jets can affect the echolocation properties of dolphins. Moreover, concrete structures may also hamper their echolocation through which they search for food. Poor water quality in the form of high turbidity which affects feeding in dolphins, high pH and low oxygenated waters can create an unfavourable environment for dolphins in the area. Moreover, physical injury and accidental trapping of dolphins in the construction area can cause immediate mortality.

b) Mitigation Measures

- Lowering the turbidity levels of water by all possible means, by taking special care during dredging and other construction related activities can help a lot in minimizing the impact of the bridge construction activity upon aquatic life. In cases relating to high turbidity levels in water coagulants can be used.
- Care should be taken to minimize the noise and vibration created during construction.
- In cases where it is seen that breeding and nursery grounds of fishes are destroyed, artificial pools can be created along the river, preferably upstream of the construction site which will act as site for breeding and nursery rearing of fishes.
- Care should be taken not to discharge the waste materials or any construction material like cement etc. directly in to water as it affects water quality.
- Biological monitoring can be carried out as pre-construction and at regular intervals during construction which track the health of biological systems. Measuring and evaluating the condition of biological systems, and the consequences of human activities for those systems, is central to biological monitoring. It aims to distinguish between naturally occurring variation and changes caused by human activities. Biological assessments are evaluations of the condition of water-bodies using surveys and other direct measurements of resident biological organisms (macro invertebrates, fish and plants).

- Construction work should be conducted during the periods that ensured that the fisheries resources were not impacted. A primary goal in every bridge construction project should be to develop construction methods that would minimize or alleviate disturbances to the underlying ecosystem as much as possible.
- Wash water or slurry mixed with cement should be directed onto an area of ground close to the work area, where the alkaline water is absorbed by the soil and neutralized by naturally occurring chemicals in the ground. Great care should be taken to ensure the water or slurry does not run overland to the waterway. A shallow pit dug into the ground may help avoid this and constant monitoring is necessary to prevent overflow.

V. CONSTRUCTION STAGE

a) Water Environment Impacts

- The construction phase of the bridge will lead to the release of some amount of debris which needs be managed judiciously in order to maintain ecology of the area and aquatic life.
- During the construction of the proposed bridge, there is a high possibility of dolphins and their habitats impacts due to high underwater noise, water quality change, habitat geomorphology changes, prey-base depletion etc.
- Several endangered chelonian species are found in area. These species can potentially suffer from habitat change by the construction activities, but the main cause of decline of the turtles is illegal hunting by humans for their meat. Therefore, in order to minimize the negative impacts on the turtle species, habitat change should be kept at minimum and hunting activities must be completely prohibited under the contractors activities.
- Noise from different equipment, vehicles, and human traffic has the potential to disturb migratory birds, which may cause them to leave or change their flight route until the activities are over.
- Spillage of oils and other hazardous materials.
- Pollution of surface and sub-surface water resources.

b) Mitigation Measures

- Regular monitoring of the impacts of construction activities on the Gangetic dolphins and other important species should be done by dedicated wildlife experts and forest officials, so that immediate prevention activities can be undertaken.
- Channels will be kept free at all times for free movement of dolphins.
- To minimize impacts, noisy operations should be avoided during winter (Nov-Feb; when dolphin congregates into the deeper channel and pre-monsoon season (Mar-Jun; dolphin breeding time), thus from November to June, which are also the breeding season for the turtles.
- Migratory birds also stay around the area during the winter months, so avoiding noisy operations during these months also reduce the impacts on them.
- Construction activities should be carried out in close supervision of the dolphin expert.
- Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left. The contractors are recommended to adopt these mitigation measures during construction works inside the river. Acoustic deterrents can be tested to keep the dolphin away during from construction zone under the supervision of dolphin ecologist.
- Relevant information (e.g. encounter with vulnerable species during engineering work) shall be shared with the State Environment and Forest Department and concerned regional

environmental experts with which the project authority will discuss potential measures to promote conservation and monitoring of the ecosystem.

- Before construction of piers the construction site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts.
- All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna.
- One of the threats to bird and turtle habitat is conversion of the river edges from natural soft embankments into hard concrete embankments. Therefore, the natural bank slope is preserved and location of the bridge piers will avoid such areas. No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.
- All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification of the migrating routes of dolphins and birds, exact locations of turtle nesting grounds, etc.

c) Surface Water Impacts

Since, the proposed bridge shall be constructed over the Subansiri river, there shall be a direct and significant impact on the water quality of this river. Further, the proposed approach road is traversing through the other surface water bodies and water logging area such as ponds at several locations. Hence, significant impacts are anticipated on the water quality of these water bodies during construction phase. Silt load in the Subansiri River will pollute its water quality thereby affecting the river ecosystem.

Degradation of water quality is also possible due to accidental discharges into watercourses from drainage of workers' camps and from spillage in vehicle parking and/or fuel and lubricant storage areas.

d) Mitigation Measures

Major construction works close to the Subansiri River and other water bodies shall be avoided during monsoon period. Disposal of waste arising from the project activities as per norms of PCB, Assam and collecting and storing of bituminous wastes and taking it to approved disposal sites shall minimize the impacts.

The probability of accidents is minimal since enhancement of road safety measures such as improvement of curves and widening of the roads and other pedestrian facilities are taken care of the design stage. To minimize the oil contamination and sediment load to water bodies, provision of sedimentation tank and oil interceptor chamber can be provided.

Apart from the provision of mitigation measures, their effectiveness and further improvement in designs to reduce the concentration of pollutants in water due to construction activity shall be monitored. The frequency, duration and responsibility shall be as per the Environmental Monitoring Plan.

The issue of blocking of cross drainage should be taken care throughout the project stretch. Further, the engineering designing of left arm and right arm of south bank is totally designed to avoid any major impact on river ecology.

e) Ground Water

During the construction stage the project is not expected to alter the existing water quality on a permanent basis. There are various water bodies, along the road including rivers, and open wells. Some impacts are anticipated on the water quality of these aquifer during the construction phase.

The pillaring depth may cause the contamination in aquifer quality and the activity of approach road may impact the open well. In case of any water supply system at the downstream of the bridge location, prior information should be provided to the concerned department on the bridge construction across the river and the construction activities should avoid discharge of any hazardous chemicalsin to the river water. Laying of pavement within the formation width may lead to reductionin the ground water recharge capacity.

f) Mitigation Measures

- The proposed approach road and their slope to meet the approach road is not close to bank of river. The piling of bridge structure would be in capped manner to avoid any contamination in the river Subansiri.
- As the area involved in the road construction is very less, the chances of reduction in the ground water recharge capacity due to laying of pavement within the formation width influence shall be non-significant.
- The depth of pillaring and any activities below ground level should be restricted to upper surface only which shall not impact the aquifer quality, extend possible.
- The closure piling shall be carried out to minimize contamination of construction material to the Subansiri river.
- Ground water quality shall be monitored as per environmental monitoring programme during construction phase as well as operation phase.
- Corrective action shall be taken if the ground water quality is found deteriorating.
- The Contractor may be directed to provide immediate control measures to prevent soil erosion and sedimentation that shall adversely affect construction operations, damage adjacent properties or cause contamination of nearby streams or other watercourses.

g) Silt Fencing

Silt fencing shall be provided to prevent sediments from the construction site entering into the nearby watercourses. The silt fencing consists of geo textile with extremely small size supported by a wire mesh mounted on a panel made up of angle / wooden frame and post.

It is expected a single person shall be able to drive the angles by pressing from the top. The frame shall be installed at the edge of the water body along which construction is in progress. The numbers of such units to be installed can be decided depending upon the length of the water body along the side of the road construction. The silt fencing is given in Figure 2.

Silt fencing is proposed for a length of 250m which is sufficient to cover all minor and major bridge locations and the road side water bodies. Depending on the length of the individual water body, the number of units of silt fencing to be established is decided by the Independent Engineer.

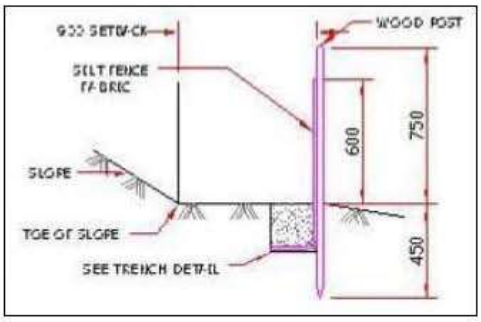


Figure 2: Silt Fencing

h) Oil Interceptor

Oil and grease from road run-off is another major concern during construction as well as operation. During construction, discharge of oil and grease is most likely from workshops, oil and waste oil storage locations, vehicle parking areas and the construction camps. A total of 3 oil interceptors shall be provided at all such locations to arrest oil and grease, as per Figure 3. The arrested products shall be disposed as per MoEF&CC and PCB, Assam guidelines.

The location of all fuel storage and vehicle cleaning area shall be at least 300m from the nearest drain / water body.

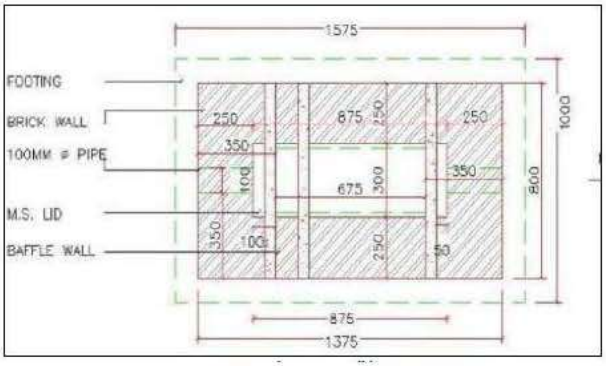


Figure 3: Oil Interceptor

VI. OPERATION STAGE

a) Ground Water Quality- Impact

Ground Water may get contaminated due to the following reasons:

- Accidental spillage
- Refueling of vehicle (bus, truck, etc.)
- Leakage of oil during transportation
- Washing of vehicles
- Routine and periodical maintenance of the approach road

b) Mitigation Measures

- Drain along with oil interceptor shall be provided on both side of bridge and its approaches.
- Automobile service centers shall be discouraged from establishing along the corridors without installing preventive measures against petroleum and oil contamination.
- It is suggested that regular monitoring by the forest department and relevant environment and wildlife experts should be done.
- Awareness programmes as training, workshops, seminars, brainstorming, etc., need to be organized to promote responsible consumerism, sustainable economic practices and the protection of endangered species for all the stakeholders.
- Research on Ganges River Dolphins needs be conducted to study in details the abundance, distribution, ecology and threats of the Ganges River Dolphin in and around the project sites. Community engagement and awareness activities regarding the conservation of Gangetic dolphin also need to be done.

B. Aquatic Conservation and Management Plan

The Aquatic Conservation and Management Plan for the proposed project have beenframed with an objective to:

- Conserve and preserve natural aquatic ecosystems around the proposed project;
- Minimize project impacts on rare, endangered or threatened species and rehabilitate keystone species, if any; and
- Develop the information database on aquatic biodiversity at the project site.

I. Establishment of an Aquatic Environment Monitoring Committee

An Aquatic Environment Monitoring Committee shall be constituted for effective implementation, monitoring and aquatic environment of the project. The committee shallHeaded by Chief Engineer, Project, PWRD, and representatives from the PWRD, members ofthe Department of Forests / Environment, Assam Biodiversity Board, Fisheries Department and Independent subject specialists.

The committee will look after the demarcated areas (10 KM radius from ROW), monitor and enforce regulatory provisions and ensure that the structure and functions of the natural ecosystems in the area are not changed or subjected to any threat. It would also propose other approaches for the biodiversity conservation plan, whenever deemed necessary.

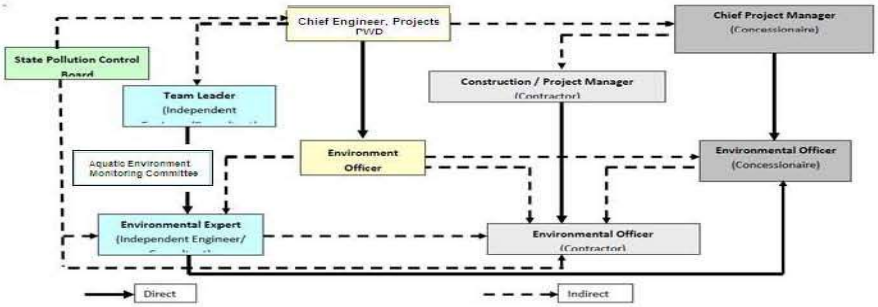


Figure 4: Proposed Organization Chart

II. Aquatic Wildlife Conservation

- Stakeholders confirmed sightings of dolphin in and around the project area. Under IUCN conservation status, River Dolphin, Endangered; are on Schedule I of the Indian Wildlife Protection Act (1972) which is the highest protection accorded to species in India.
- Promote Surveys and Monitoring in and around the Project Area (extending upto 10 Km radius of ROW). This activity is aimed at adding to the existing knowledge base on aquatic wildlife presence and movements in the vicinity of the project area. This is especially recommended so that the data collected can add to the baseline information collected during the EIA preparatory phase (adding to the seasonal data). The surveys will improve the understanding of aquatic wildlife presence, distribution, movements and seasonality in the wider vicinity of the project area. This will ensure strict monitoring of any encroachments, and also add to the biodiversity database especially for endangered species. This aquatic wildlife survey will be conducted with the assistance of the Wildlife Division, Department of Environment and Forests.
- Conservation actions as proposed by IUCN (during construction and during the initial project operation) such as conducting a comprehensive survey and monitoring in and around the project area to establish range, distribution and population status of vulnerable and critical habitats in the project area for assessingits habitat requirements and identifying threats will be undertaken.

III. **Anti-Poaching Measures**

- Hunting and poaching is a possibility due to the presence of construction workers. The possibility of hunting and trapping by workers during construction period will be monitored by the contractor. The overall magnitude of impact is considered to be low, extent is site specific and duration is short period.
- **Awareness Raising Programs**: Awareness will be raised among workers and contractors regarding illegal poaching and copies of the Indian Wildlife Act, Biodiversity Act, Prevention of Cruelty to Animals Act (1986), other relevant Rules and Regulations as well as Biodiversity Mitigation and Monitoring in EMP will be made available in the local language. Copies will be made available at the project site and forest ranger stations of the vicinity. Workers must be made aware of the fines and penalties for poaching, as well as the risk of job loss, if caught in these illegal activities. This will be done during the pre-construction phase, but after the Contractor has been selected and continue intermittently through the construction phase.
- **Strengthen Patrolling:** To minimize the risks of poaching, awareness raising programs will be combined with an increase in patrolling by local forest rangers (in coordination with forest department) and construction of check posts and watch towers at key locations. The choices of location of check posts and watch towers will be guided by consultations with forest rangers in the area.
- **Community Watch Program**: The project will also discuss possibilities for funding a community watch program, through hire of village guards to alert Forest Ranger officials of any illegal activities in the worker camps or at project sites.

Table 11: Biodiversity Management Plan (Corridor - A31) Pre-Construction & Construction

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
Pre - Construction					
Bottom sediment	Mobilization of bottom sediments will require	Subansiri River	During boring survey	Contractor	Project Implementation Unit (PIU)
Vegetation clearing and tree cutting	Identification and marking of endangered plant species (*Magnolia pealiana*) for transplantation	Throughout Project Corridor	Prior to tree cutting during joint survey with forest department	Contractor	Project Implementation Unit (PIU)
Construction					
Soil erosion in Embankments (Impact on topography/	Pitching shall be done for slope stabilization as per the IRC guidelines	At the embankments		Contractor and Authority Engineer	Project Implementation Unit (PIU)
Water pollution	• Construction vehicles / equipment shall be operated and maintained in such a manner to avoid contamination of water bodies due to oil spillage. • Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies. • Oil and grease traps will be provided at fueling locations • No excavation from the bund of the water bodies. • No debris disposal near any water body. • Prior written permission from authorities for use of water for construction activity shall be submitted to IE. • Construction labours to be restricted from polluting the source or misusing the source. • Shifting of source to be completed prior to disruption of the actual source. • Alternate measures to be taken / ensured during disrupted period.	Near labor camp and sites of the installation of Construction		Contractor and Authority Engineer	Project Implementation Unit (PIU)

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
	• Source to be replaced immediately, in case of accidental loss. • Construction work shall be restricted to 3m – 4m width from the existing formation near ponds. • The volume of water storage lost shall be compensated for by excavation of an equal volume of similar depth at closest possible location in the direction of flow and shall be done with the approval of the independent engineer.				
Alteration of drainage	• Diversions shall be constructed during dry season, with adequate drainage facility, and shall be completely removed before the onset of monsoon. • Debris generated due to the excavation of foundation or due to the dismantling of existing structure shall be removed from the water course. • Temporary silt fencing to be provided on the mouth of discharge into natural streams. • Continuous drain (lined /unlined) is suggested / shall be provided. Obstruction, if any, shall be removed immediately.	Throughout Project Corridor, all access roads, temporarily acquired sites.	Whenever encountered during construction	Contractor and Authority Engineer	Project Implementation Unit (PIU)
Silting / sedimentation	• Measures suggested under "soil erosion and sedimentation control" shall be enforced. • Silt fencing is provided around water bodies. • Construction activities shall be stopped near water bodies during monsoon. • Soil trap are suggested / shall be provided in all ancillary sites and camps.		Throughout construction period	Contractor and Authority Engineer	Project Implementation Unit (PIU)
Water pollution from labor camp.	• Labor camp shall not be allowed near any of the water bodies. • The proper sanitation facilities shall be provided.	Preapproved locations away from the water bodies		Contractor and Authority Engineer	Project Implementation Unit (PIU)
Deposition of dust in open wells near	• The mouth/opening of the well shall be covered with suitable material during any of the construction	All the wells along the project corridor.		Contractor and Authority Engineer	Project Implementation Unit (PIU)

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
construction site	activity so as to prevent dust from entering in the well.				
Fauna	• Construction workers must protect natural resources and wild animals. • Aquatic fauna shall not be affected. • Hunting shall be prohibited. Nesting grounds & migratory paths shall be protected. • All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification of the migrating routes of dolphins and birds, exact locations of turtle nesting grounds, etc.		During construction	Contractor and Authority Engineer	Project Implementation Unit (PIU)
Impact on Surface water quality due to eroded soils	• Construction work close to the watercourses or other water bodies will be avoided, especially during the monsoon period. • Increase coverage of open surface area by planting grass and creepers so that the washing away of materials from sloped surfaces would be reduced by a significant extent. • Silt curtain should be used for all underwater works. • Water quality monitoring	All the respective locations		Contractor and Authority Engineer	Project Implementation Unit (PIU)
Bottom sediment	• Slit curtain shall be installed to prevent move of the sediment. • Construction works shall be suspended when flood warning is issued.			Contractor and Authority Engineer	Project Implementation Unit (PIU)
Endangered species	• Relevant information (e.g. encounter with vulnerable species during engineering work) shall be shared with the State Environment and Forest Department and concerned regional environmental experts. • Anti-poaching measures during the construction	Throughout the project area		Contractor and Authority Engineer	Project Implementation Unit (PIU)

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
	phase should be strengthened to check for any violation of existing regulations. Awareness campaign to be made among the workers to aware them on the endangered and other important species. • Construction vehicles must be operated at safe speed to avoid collision with wildlife. Training should be provided for the vehicle operator send warning signs should be installed. • Change of geology and topography should be kept minimum. Avoid constructing labor camps and construction yards near the river banks. • To minimize impacts, noisy operations should be avoided during breeding season of the dolphins. • River flow should not be blocked at all times for free movement of dolphins. • Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left. • All activities that increase soil erosion or contribute to nutrients and pollutants to water need be minimized both on-site and off-site by using measures such as silt curtain. • Construction activities should be carried out in close supervision of the dolphin ecologist. • Construction works should be avoided or kept minimum in vicinity of the dolphins' favorable microhabitats (downstream of shallow areas/sandbars, tributary junctions)				

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
	• Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, movement of sediment and influx of soil/silt etc. should be avoided to keep the favorable depth range. • In case rare birds of prey are observed near the construction area, the construction work will be avoided during their breeding season. • Before construction of piers the construction site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts. • All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna. • One of the threats to bird and turtle habitat is conversion of the river edges from natural soft embankments into hard concrete embankments. Therefore, the natural bank slope is preserved and location of the bridge piers will avoid such areas. No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.				
Underwater noise impacts on aquatic species.	• Use vibratory hammer. Under conditions where impact hammers are required for reasons of seismic stability or substrate type, it is recommended that the pile be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer. • Monitor sound levels during pile driving to ensure			Contractor and Authority Engineer	Project Implementation Unit (PIU)

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
	that they do not exceed the NOAA (National Oceanic and Atmospheric Administration, USA) or any other international recognized criteria. • Implement measures to attenuate the sound when sound pressure levels exceed the NOAA or any other international recognized criteria. Methods to reduce the sound pressure levels include but are not limited to: ○ Installation of underwater enclosures to minimize sound ○ Surrounding the pile with an air bubble curtain system or air-filled coffer dam. ○ Using a smaller hammer to reduce the sound pressure. The sound produced in pile driving has a direct relationship to the force used to drive the pile. A smaller hammer will have less force on the pile therefore producing less sound. • Construction works should be ceased when the dolphins are observed near the work area.				
Water use	• To minimize the river pollution during construction, mitigation measures will be applied such as installing a silt fence in places close to the residential area.	At respective planned construction		Contractor and Authority Engineer	Project Implementation Unit (PIU)
Monitoring dolphin	• Monthly monitoring • Preparation of River Dolphin rescue team • Study bio-accumulation of toxins, and their effects, in the River dolphins.				
Awareness on dolphin conservation	• Awareness	Fringe area	monthly		
	• Up gradation of dolphin monitoring stations/ observatory towers				
Workshop on dolphin conservation			one		

Issues	Mitigation Measures	Location	Time Frame	Responsibility	
				Implementation	Supervision
Monitoring fish, migratory birds and turtle	• Monthly monitoring. • Carry out systematic field survey and monitor the fish diversity of the area. Monitoring of fishing activity. • Awareness for conservation.				
Improvement of tank fisheries	• To improve the productivity of fishes by the local fishing community.		12 nos		
Operation Phase					
Water Quality	• Water quality monitoring		As in the EMP	Project Implementation Unit (PIU)	
Monitoring dolphin and awareness generation on dolphin conservation			Once in 6 months		
Monitoring fish, migratory birds and turtle and awareness.			Once in 6 months		

IV. Conservation of river Dolphin

- Monitoring River dolphin populations during construction and operation phase (3 years) within 10 km radius of the project.
- Prepare safe handling of River Dolphin team for rescue efforts if required.
- Study and monitor the impact of the construction activities upon dolphin population, their behaviour and habitat.
- Assessment of the habitat of the River dolphin.
- Study the movement and dispersal pattern of the River dolphin to assess the home range and habitat utilising modern technologies.
- Study bio-accumulation of toxins, and their effects, in the River dolphins.
- Ensuring Critical Levels of Water Flow in Riverine Habitats of Dolphins.
- Increase Awareness about the River dolphin and the importance of freshwater ecosystems.
- Identification of target groups to execute conservation actions.
- Development of education and publicity material.
- A workshop to be conducted for conservation of River Dolphins in the Subansiri River.
- Community Involvement in river dolphin monitoring and Conservation.

Conservation Budget: A total of **Rs. 3 crore** rupees is earmarked for conservation of dolphins. Details of the budget are as follows.

Table 12: Detail budget for Dolphin Conservation

Sl. No	Particular	Duration of Project	Frequency	Unit INR (LS)	Total (INR)
1	Monitoring dolphin (including hiring boat)	Construction (36 months)	Monthly	3,00,000	1,08,00,000
		Operation phase (36 months)	Once in 6 Months	2,50,000	15,00,000
2	River dolphin rescue team	Hiring of Boat (36 months)	Rs. 60000/ Month	21,60,000	81,00,000
		Procurement of equipment	Once	59,40,000	
		Construction (36 months)	Monthly	1,00,000	36,00,000
		Operation phase (36 months)	Once in 6 Months	1,80,000	10,80,000
3	Awareness on dolphin conservation	Construction (36 months)	Monthly	10,000	3,60,000
		Operation phase (36 months)	Once in 6 Months	10,000	60,000
4	Workshop on Dolphin Conservation				25,00,000
5	Publicity materials				3,00,000
6	Community involvement in river Dolphin Monitoring and Conservation				5,00,000
7	Study bio-accumulation of toxins and their effects in the River dolphins.				10,00,000
9	Miscellaneous				2,00,000
Total					**3,00,00,000**

C. Aquatic Ecology Monitoring Plan

Table 13: Environmental Monitoring Plan

Mitigation Measure	Phase	Parameters	Locations	Duration and frequency	Implementation	Monitoring
Water Quality	Construction	Parameters as Mentioned in IS 10500	6	Three times during the Construction Phase per year (Pre-monsoon, Monsoon and Post Monsoon)	Contractor through an NABL approved Monitoring agency	Environment Cell PWRD
	Operation		4	End of summer before the onset on monsoon, Monsoon and After Monsoon every year for 5 years	PIU	
Noise and Vibration	Construction	Noise Level in dB (A)		Noise monitoring near the pile construction (2 in each pile)	Contractor through an NABL approved Monitoring agency	Environment Cell PWRD
Fish monitoring, migratory birds and turtle monitoring	Construction			Monthly	Independent expert	Environment Cell PWRD
	Operation			Once in every 6 months	Independent expert	Environment Cell PWRD
Dolphin Monitoring	Construction			Monthly	Independent expert	Environment Cell PWRD
	Operation			Once in every 6 month	Independent expert	Environment Cell PWRD

D. Budget of Biodiversity Management Plan (Corridor A31)

Table 14 below present the cost towards monitoring and management of biodiversity of Corridors A15. Although some management measure under biodiversity management which are linked with environmental management are already covered in EMP Cost. However, other measures like awareness; training and monitoring etc. of rare and threatened species as described in the Biodiversity Management Plan has been taken into the consideration. A total of **Rs. 3 crore** rupees is earmarked for Biodiversity Management Plan, following tables provides the total budget of BMP.

Table 14: Budget of Biodiversity Management Plan (Corridor A31)

Item No.	Component	Qty.	Unit cost INR	Total Cost INR
1	Dolphin Conservation			3,00,00,000
2	Provision of Oil Interceptors	Already covered in EIA Budget		0
3	Silt fencing			
4	Water Quality monitoring and noise assessment			
Total				**3,00,00,000**

Annexure 1: Corridor 31 - Majuli Biodiversity Heritage Gazette Notification by Government of Assam

পঞ্জীভুক্ত নম্বৰ - ৭৬৮ /৯৭

Registered No.-768/97

অসম ৰাজপত্ৰ

সত্যমেব জয়তে

THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্ৰাপ্ত কৰ্ত্তৃত্বৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

নং 224 দিশপুৰ, শুক্ৰবাৰ, 26 মে', 2017, 5 জেষ্ঠ,, 1939 (শক)

No. 224 Dispur, Friday, 26th May, 2017, 5th Jaistha, 1939 (S.E.)

GOVERNMENT OF ASSAM

ORDERS BY THE GOVERNOR

ENVIRONMENT & FOREST DEPARTMENT

DISPUR :: GUWAHATI-6

NOTIFICATION

The 29th March, 2017

No. FRW 57/2005/Vol.-II/14.– In exercise of the power conferred by sub section (1) of Section-37 of the Biological Diversity Act, 2002 (No. 18 of 2003) and Rule 24(1) of the Assam Biodiversity Rules 2010, the Government of Assam hereby notifies Majuli as 'Majuli Biodiversity Heritage Site' as detailed in the schedule given below :

1. **Short Title:** This notification may be called "Declaration of Majuli as Biodiversity Heritage Site"(BHS). It shall come into force on the date of publication in the Assam Gazette.
2. **Extent of application:** This notification shall apply within the administrative boundary of Majuli District.
3. **The total area covered:** 875 Sq. Km.
4. **GPS coordinates:** The co-ordinates of Majuli qualifying the extreme points in the North, South, East, West boundaries and centre are as follows:

Sl. No.	Latitude	Longitude	Direction
1	26° 58' 30.268" N	94° 2' 23.180" E	NW
2	27° 3' 1.588" N	94° 10' 16.040" E	N
3	27° 5' 59.835" N	94° 16' 45.799" E	N
4	26° 53' 46.073" N	93° 57' 25.340" E	W
5	26° 57' 59.475" N	94° 10' 26.105" E	C
6	27° 1' 21.972" N	94° 17' 47.452" E	C
7	27° 10' 59.178" N	94° 33' 48.374" E	NE
8	26° 50' 57.455" N	94° 0' 11.644" E	SW
9	26° 50' 45.120" N	94° 6' 13.571" E	S
10	26° 53' 3.278" N	94° 17' 45.343" E	S
11	26° 57' 49.773" N	94° 24' 12.447" E	S
12	27° 8' 50.634" N	94° 35' 41.669" E	SE

5. **Boundaries: Majuli Biodiversity Heritage Sites**

North : Lakhimpur District

South : Jorhat District

East : Sivasagar & Dibrugarh Districts

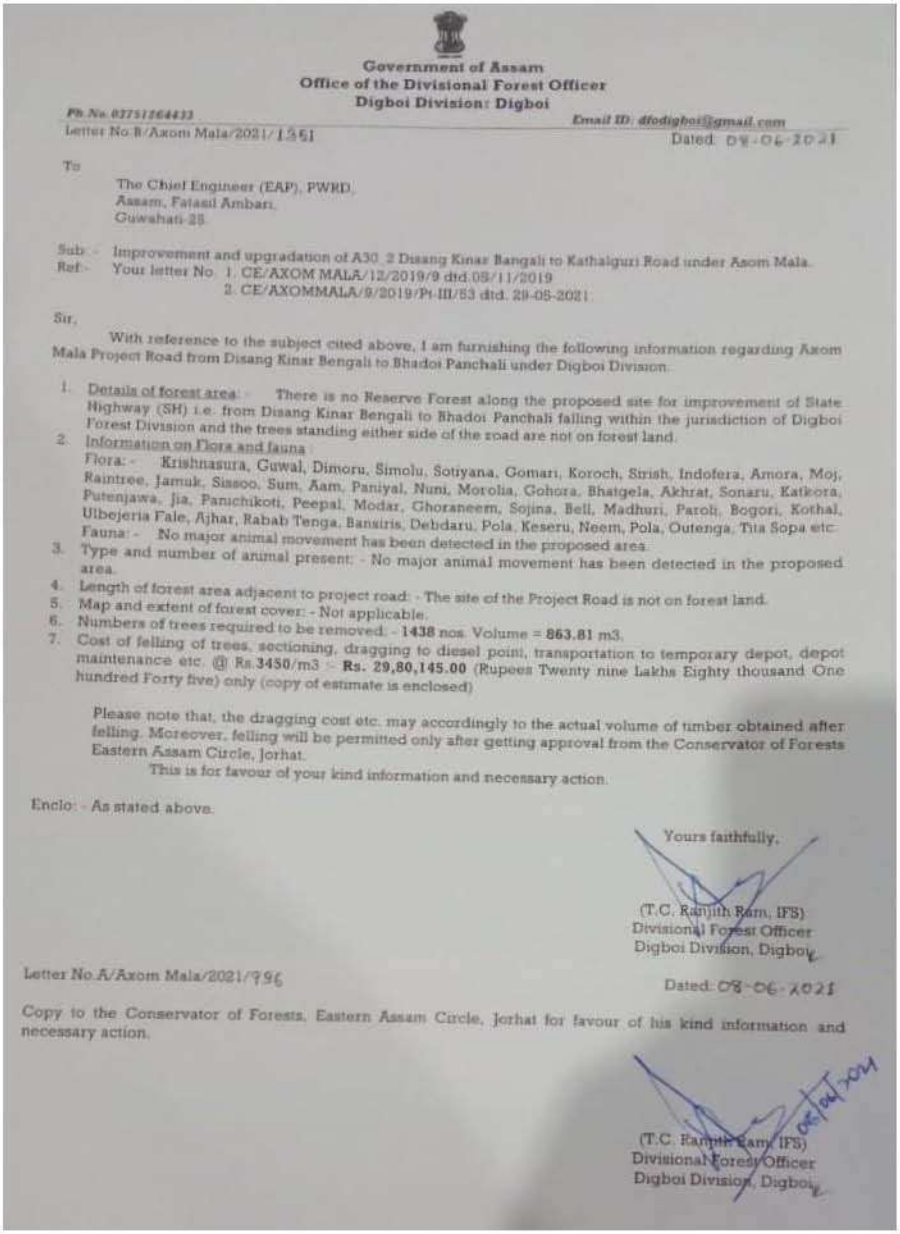
West : Sonitpur District.

6. This comes into effect from the date of publication in the official Gazette.

P. K. BORTHAKUR,
Principal Secretary to the Government of Assam,
Environment and Forest Department.

Guwahati :- Printed and Published by the Dy. Director (P & S), Directorate of Ptg. & Sty. Assam, Guwahati-21.
Ex. Gazette No. 447 - 50 + 10 - 26 - 5 - 2017.

Annexure 2: Corridor 30 – Letter from DFO, Digboi Division, Digboi



Government of Assam
Office of the Divisional Forest Officer
Digboi Division: Digboi

Ph No. 03751264433 Email ID: dfodigboi@gmail.com

Letter No B/Axom Mala/2021/1361 Dated: 08-06-2021

To

The Chief Engineer (EAP), PWRD,
Assam, Fatasil Ambari,
Guwahati-25.

Sub :- Improvement and upgradation of A30_2 Disang Kinar Bangali to Kathalguri Road under Asom Mala.
Ref :- Your letter No. 1. CE/AXOM MALA/12/2019/9 dtd.08/11/2019
2. CE/AXOMMALA/9/2019/Pt-III/53 dtd. 29-05-2021.

Sir,

With reference to the subject cited above, I am furnishing the following information regarding Axom Mala Project Road from Disang Kinar Bengali to Bhadoi Panchali under Digboi Division.

1. Details of forest area: - There is no Reserve Forest along the proposed site for improvement of State Highway (SH) i.e. from Disang Kinar Bengali to Bhadoi Panchali falling within the jurisdiction of Digboi Forest Division and the trees standing either side of the road are not on forest land.
2. Information on Flora and fauna :
Flora: - Krishnasura, Guwal, Dimoru, Simolu, Sotiyana, Gomari, Koroch, Sirish, Indofera, Amora, Moj, Raintree, Jamuk, Sissoo, Sum, Aam, Paniyal, Nuni, Morolia, Gohora, Bhatgela, Akhrat, Sonaru, Katkora, Putenjawa, Jia, Panichikoti, Peepal, Modar, Ghoraneem, Sojina, Bell, Madhuri, Paroli, Bogori, Kothal, Ulbejeria Fale, Ajhar, Rabab Tenga, Bansiris, Debdaru, Pola, Keseru, Neem, Pola, Outenga, Tita Sopa etc.
Fauna: - No major animal movement has been detected in the proposed area.
3. Type and number of animal present: - No major animal movement has been detected in the proposed area.
4. Length of forest area adjacent to project road: - The site of the Project Road is not on forest land.
5. Map and extent of forest cover: - Not applicable.
6. Numbers of trees required to be removed: - **1438** nos. Volume = **863.81** m3.
7. Cost of felling of trees, sectioning, dragging to diesel point, transportation to temporary depot, depot maintenance etc. @ Rs.**3450**/m3 = **Rs. 29,80,145.00** (Rupees Twenty nine Lakhs Eighty thousand One hundred Forty five) only (copy of estimate is enclosed)

Please note that, the dragging cost etc. may accordingly to the actual volume of timber obtained after felling. Moreover, felling will be permitted only after getting approval from the Conservator of Forests Eastern Assam Circle, Jorhat.

This is for favour of your kind information and necessary action.

Enclo: - As stated above.

Yours faithfully,

(T.C. Ranjith Ram, IFS)
Divisional Forest Officer
Digboi Division, Digboi

Letter No A/Axom Mala/2021/796 Dated: 08-06-2021

Copy to the Conservator of Forests, Eastern Assam Circle, Jorhat for favour of his kind information and necessary action.

(T.C. Ranjith Ram, IFS)
Divisional Forest Officer
Digboi Division, Digboi

Annexure 3: Corridor 20 – Eco Sensitive Zone Notification of Hollongapar Gibbon WLS

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 23rd September, 2019

S.O. 3462(E).—WHEREAS, a draft notification was published in the Gazette of India, Extraordinary, *vide* notification of the Government of India in the Ministry of Environment, Forest and Climate Change number S.O.1828 (E), dated 7th May, 2018, inviting objections and suggestions from all persons likely to be affected thereby within the period of sixty days from the date on which copies of the Gazette containing the said notification were made available to the public;

AND WHEREAS, copies of the Gazette containing the said draft notification were made available to the public on the 7th May, 2018;

AND WHEREAS, no objections and suggestions were received from persons and stakeholders in response to the aforesaid draft notification;

AND WHEREAS, the Hollongapar-Gibbon Sanctuary was notified by the Government of Assam *vide* notification No. FRS/37/97/13, dated 30.07.1997, by upgrading the conservation status of the Hollongapar Reserve Forest declared earlier *vide* notification No. 8, dated 27.08.1881;

AND WHEREAS, the Sanctuary is an important protected area situated in Jorhat District in the state Assam covering an area of 20.98621 square kilometers; the perennial river Bhogdoi along with its catchment passes through the Sanctuary and makes the ecological environment of the Sanctuary unique, several seasonal small streams comprising of Hollongapar Mouza (Taluka) and Nakachari Mouza (Taluka) of Jorhat District are the main sources of water for the animals in the Sanctuary;

AND WHEREAS, the floral biodiversity of the Sanctuary includes 74 tree species, 17 species of shrubs and 12 species of climbers; the important tree species recorded from the Sanctuary are hollong (*Dipterocarpus retusa*), sam (*Artocarpus chaplasha*), amari (*Amoora wallichii*), sopas (*Michelia spp.*), bhelu (*Tetramelos nudiflora*), udal (*Sterculia villosa*), hingori (*Castanopsis spp.*), nahor (*Mesua ferrea*), Bandordima (*Dysoxylum procerum*), Dhuna (*Canarium resiniferum*), Bhomora (*Terminalia belerica*), ful Gomari (*Gmelina Spp.*), bon bogori (*Pterospermum lanceofolum*), morhal (*Vatica lanceofolia*), sassi (*Aquilaria agolacha*), otenga (*Dillenia indica*), ajar (*Lagerstroemia flos-reginae*), bon-am (*Mangifera silvatica*), amora (*Spondias Mangifera*), uriam (*Biscofia javanica*), Selleng (*Saplum baccatum*), mahi thekera (*Garcinia morella*), katholua (*Palequium obovatum*), kumbhi (*Careya arborea*), gahori Sopa (*Magnolia Pealiana*), gomari (*Gmelina arborea*), gohora (*Premna bengalensis*), Gondhsoroi (*Cinnamonium grandiliferum*), Salmugra (*Hydrocarpus kurzii*), poreng (*Elaeocarpus robustus*), sotiona (*Alostonia scholaris*), chom (*Machilus odoratissime*), chewa (*Caryota ureas*), jutuli (*Alingia exulsa*), Jori (*Fiscus benjamine*), titasopa (*Michelia champaka*), pan chopa (*Magnolia sphenocarpa*), bohot (*Artocarpus lakoocha*), fakdema (*Triwea orentalis*), phul sopa (*Magnolia hookari*), borhomthuri (*Talauma Hodgsoni*), Bogi jamuk (*Eugenia kurzii*), Bor jamuk (*Eugenia jambulana*), bagh nola (*Litsea Sebifera*), bhatghilla (*Oroxylum Indicum*), bomora (*Terminalia belerica*), mejangkori (*Litsea citrata*), khokon (*Dubhanga sonneratoides*), rudrakha (*Elaeocarpus ganitrus*), raghu (*Anthocephallus cadamba*), simul (*Bombax ceiba*), leteku (*Baceaurea sapeda*), hilikha (*Terminalic chebula*), houra (*Trophis aspera*), haldu Sopa (*Adine cardifolia*), holokh (*Terminalia myriocarpa*), heloch (*Antidesma ghesaembilla*), bhelkor (*Trewia nudiflora*), Boal (*Cordia oblique*), bonsum (*Phoebe goalparensis*), borpat (*Ailanthas grandis*), dimaru (*Ficus Spp.*), ghora neem (*Melia indica*), hualu (*Litsaea polyantha*), Jalpai (*Elaeocarpus varunna*), kanchan (*Bauhinia purpurea*), keseru (*Heteropanax fragrams*), koroi (*Albezzia procera*), moj (*Albezzia lucida*), morolia (*Mallotus albus*), nagabhe (*Schima wallichii*), paroli (*Sterospermum chelonoides*), poma (*Cedrela toona*) and tepor tenga (*Garcinia spp.*);

AND WHEREAS, the shrubs and climbers species include Harpagondha (*Rawolfia serpentina*), Guphul (*Lantana camera*), Jarmoni (*Eupotorium odoratum*), Jetuli poka (*Rubus malucanus*), Tora (*Alpinea allughus*), Dhopattita (*Phlogarthas crriviflorus*), Nal (*Arundodonax*), Khogori (*Phragmites karka*), Nilaji bon (*Mimosa pudica*), Patidoi (*Elinogyne dichotoma*), Pochotia (*Buddlirla asiatica*), Phutuka (*Osbeckia rastrata*), Bioni Habota (*Desmodium labornifolium*), Bahok tita (*Adhatoda spp.*), Kaupat (*Phrynium spp.*), Makhioti (*Fleminzia strica*), Mejenga (*Viburnum colebookianum*), Amoilota (*Menispernum glabrum*), Harjura lota (*Cissus quadrangularis*), Akashilota (*Trachelospermum fragrans*), Panilota (*Dilina sermentosa*), Kolialota (*Merremia umbellata*), Pipoli (*Piper longum*), Latumoni (*Abrus Precatorious*), Mekuri chali (*Combretum decandrum*), Jengu bet (*Calamus erectus*), Jati bet (*Calamus tenewise*), Raidang bet (*Calemas flagellum*) and Lejai bet (*Calemas floribundus*), etc.

AND WHEREAS, the important rare species found in the Hollongapar-Gibbon Sanctuary are *Dipterocarpus retusus* (hollong), *Ficus* spp. (fig), *Artocarpus chaplasha* (Sam-goch, Chamkathal), *Litsea citrate* (Mejangkori), *Aquilaria agallocha* (Aloewood), etc.

AND WHEREAS, the Sanctuary supports 11 species mammals, 5 species of reptiles and amphibians and 31 avifaunal species; the major fauna of the Sanctuary includes Tiger (stray) (*Panthera tigris*), Asiatic elephant (*Elephas maximus*), leopard (*Panthera pardus*), pangolin (*Manis crassicaudata*), jungle Cat (*Felis chaus*), Indian civet (*Viverridae spp.*), giant squirrel (*Retufa bicolor*), barking deer (*Muntiacus muntjak*), sambar deer (*Cervus unicolour*), wild pig (*Sus*

scorfa), five-striped palm squirrel (*Funambulus pennanti*), Indian python (*Genus python*), common monitor lizard (*Varanus grisus*), Indian tent turtle (*Kachuga tecta tecta*), geacko (*Caloductyloids aureus*), common cobra (*Naja spp.*), white winged wood duck (*Cairina scutulata*), horn bill (*Ptilolaemus tickali austeni*), Indian pied horn bill (*Anthracoceros malabaricus*), osprey (*Pandion haliaetus*), hill myna (*Gracula religiosa indica*), kalij pheasant (*Lophura leucomala*), babblers (*Timaliinae spp.*), barbets (*Capitonidae spp.*), bitterns (*Ardeidae spp.*), kingfisher (*Alcedinidae*), orioles (*Oriolidae*), bulbuls (*Pycnonotidae spp.*), owls (*Strigidae*), egrets (*Ardeidae*), cormorants (*Phalacrocoracidie*), mynah (*Sturnidae*), cuckoos (*Cuculidae*), magpies (*Corvidae*), pigeons (*Columbidae*), darters (*Phalacrocoracidae*), droves (*Columbidae*), blue jays (*Coraciidae*), teals (*Anatidae*), tree Pies (*Corvidae*), bayas (*Ploceidae*), jungle fowl (*Phasianidae*), minivets (*Campephagidae*), munias (*Estrildinae*), parakeets (*Psittacidae*), wood peckers (*Picidae*) and tits (*Paridae*), etc., and the Sanctuary also protects (7) seven rare primate species that enrich the biodiversity;

AND WHEREAS, heterogeneous landscapes of the Sanctuary is an integral part of a critical elephant corridor along with Disai and Disai Valley reserved forests, and the adjoining landscape of the State of Nagaland on the south;

AND WHEREAS, the Sanctuary is situated about 3 kilometers from Mariani Mouza (Taluka) and 18 km from Jorhat city and due to the fast urbanisation it may have adverse affect on birds, animals of the Sanctuary in the long run and railway line and road also pass through the Sanctuary opening it to vehicular traffic and causing damage to the ecosystem of the Sanctuary;

AND WHEREAS, the Sanctuary is home to a variety of flora, fauna and avifauna, and provides protection to rare and endangered species of wildlife endemic, hence, it is necessary to conserve and protect the area, the extent and boundaries of which are specified in paragraph 1, around the Hollongapar-Gibbon Sanctuary as Eco-sensitive Zone from ecological, environmental and biodiversity point of view and to prohibit industries or class of industries and their operations and processes in the said Eco-sensitive Zone;

NOW, THEREFORE, in exercise of the powers conferred by sub-section (1) and clauses (v) and (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act 1986 (29 of 1986) (hereafter in this notification referred to as the Environment Act) read with sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies an area to an extent varying from 0 (zero) kilometer (sharing inter-State boundary with the State of Nagaland) to 22.54 kilometers around the boundary of Hollongapar-Gibbon Sanctuary, in Jorhat District in the State of Assam as the Hollongapar-Gibbon Sanctuary Eco-sensitive Zone (hereafter in this notification referred to as the Eco-sensitive Zone) details of which are as under, namely: -

1. **Extent and boundaries of Eco-sensitive Zone. –** (1) The Eco-sensitive Zone shall be to an extent of 0 (zero) kilometer (sharing interstate boundary with the State of Nagaland) to 22.54 kilometers around the boundary of Hollongapar-Gibbon Sanctuary and the area of the Eco-sensitive Zone is 264.62 square kilometres.

   (2) The boundary description of Hollongapar-Gibbon Sanctuary and its Eco-sensitive Zone is appended in **Annexure-I.**

   (3) The maps of the Hollongapar-Gibbon Sanctuary demarcating Eco-sensitive Zone along with boundary details and latitudes and longitudes are appended as **Annexure-IIA** and **Annexure-IIB.**

   (4) List of geo-coordinates of the boundary of Hollongapar-Gibbon Sanctuary and Eco-sensitive Zone are given in Table **A** and Table **B** of **Annexure-III.**

   (5) The list of villages falling in the Eco-sensitive Zone along with their geo co-ordinates at prominent points is appended as **Annexure-IV.**

2. **Zonal Master Plan for Eco-sensitive Zone.-** (1) The State Government shall, for the purposes of the Eco-sensitive Zone prepare a Zonal Master Plan within a period of two years from the date of publication of this notification in the Official Gazette, in consultation with local people and adhering to the stipulations given in this notification for approval of the competent authority in the State.

   (2) The Zonal Master Plan for the Eco-sensitive Zone shall be prepared by the State Government in such manner as is specified in this notification and also in consonance with the relevant Central and State laws and the guidelines issued by the Central Government, if any.

   (3) The Zonal Master Plan shall be prepared in consultation with the following Departments of the State Government, for integrating the ecological and environmental considerations into the said plan:-

   (i) Environment;
   (ii) Forest and Wildlife;
   (iii) Agriculture and Horticulture;

ANNEXURE- I

BOUNDARY DESCRIPTION FOR ECO-SENSITIVE ZONE OF HOLLONGAPAR-GIBBON SANCTUARY IN THE STATE ASSAM

East:- From GPS Point No. 1 (94° 23' 14.681" E & 26° 41' 29.920" N) the boundary runs along the Tea Garden crossing the GPS Point No.2 till it meets the GPS Point No. 3 (94° 22' 16.632" E & 26° 40' 17.275" N). From GPS Points No.3 the boundary runs towards south along the road till it meets the GPS Points No.4 (94° 22' 27.612" E & 26° 40' 3.979" N). From GPS Points No.4 again the boundary runs along the Tea Garden boundary crossing the GPS Point No.5 till it meets the GPS Points No.6 (94° 23' 9.328" E & 26° 39' 47.632" N). From GPS Points No.6 again the boundary runs towards south along the road till it meet the GPS Points No.7 (94° 23' 36.674" E & 26° 39' 15.625" N). From GPS Points No.7 the boundary runs along the Tea Garden till it meets the GPS Points No.8 (94° 23' 54.414" E & 26° 38' 45.600" N). From GPS Point No. 8 the boundary runs towards east along the reserve forest boundary of Disai Reserve Forest crossing the GPS Point No. 9 & 10 till it meets the GPS Point No.11 (94° 27' 10.359" E & 26° 39' 16.601" N). From GPS Point No.11 the boundary runs along the reserve forest boundary (Assam Nagaland Inter-State Boundary) till it meet the GPS Point No.12 (94° 27' 57.392" E & 26° 38' 0.138" N).

South:-From GPS Point No. 12 (94° 27' 57.392" E & 26° 38' 0.138" N) the boundary runs towards west along the reserve forest boundary of Disai & Disai Valley reserve forests (Assam Nagaland Inter-State Boundary) crossing the GPS Point No. 13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28 & 29 till it meets the GPS Point No. 30 (94° 18' 59.946" E & 26° 27' 32.039" N).

West:-From GPS Point No. 30 (94° 18' 59.946" E & 26° 27' 32.039" N) the boundary runs towards north along the reserve forest boundary of Disai Valley reserve forest (Assam Nagaland Inter-State Boundary) crossing the GPS Points No. 31,32,33,34 & 35 till it meets the GPS Point No. 36 (94° 17' 4.305" E & 26° 33' 44.203" N). From GPS Point No. 36 the boundary turn towards east along the Disai Valley reserve forest boundary crossing the GPS Points No. 37,38,39,40 & 41 till it meets the GPS Point No. 42 (94° 23' 6.610" E & 26° 37' 57.755" N). From GPS Point No. 42 the boundary runs towards north along the right bank of river Bhogdai or Disai river crossing the GPS Points No. 43,44,45,46,47,48,49 & 50 till it meets the GPS Point No.51 (94° 16' 48.306" E & 26° 43' 59.786" N). 23' 24.281" E & 26° 44' 18.300" N). From GPS Point No. 56 the boundary runs towards south along the road crossing the GPS Point No.57 till it meets the GPS Point No. 58 (94° 24' 2.960" E & 26° 41' 18.688" N). From GPS Point No. 58 the boundary runs towards west along the road till it meets the GPS Point No. 59 (94° 23' 16.032" E & 26° 40' 50.899" N).

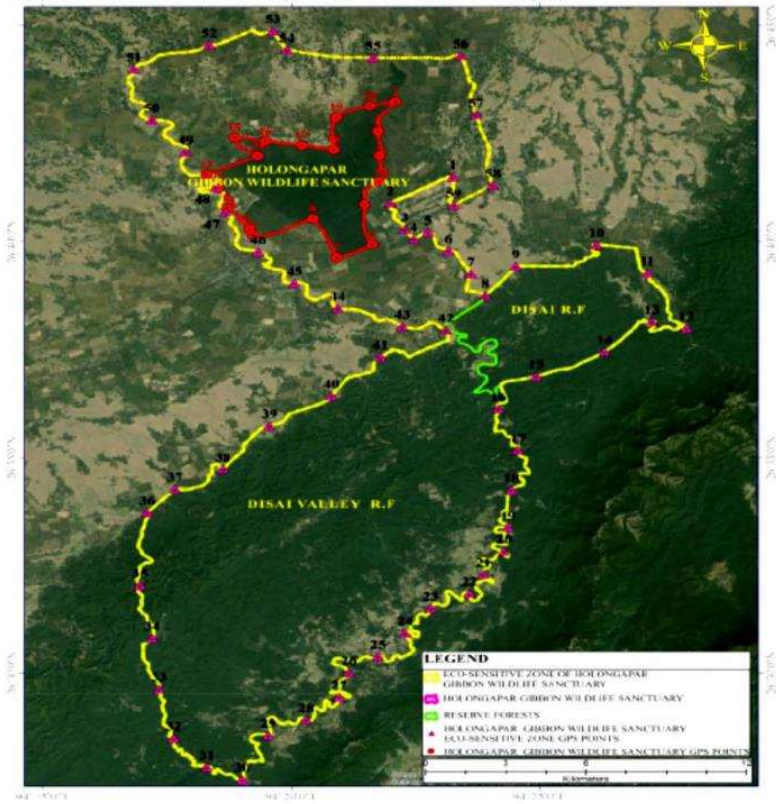
North:-. From GPS Point No. 59 the boundary runs towards north along the road till it meet the GPS Point No. 1 (94° 23' 14.681" E & 26° 41' 29.920" N). The Western boundary of the Sanctuary share inter-state boundary with Nagaland and hence is 0.0 km of Eco-Sensitive Zone is being proposed. The extent of Eco-Sensitive Zone varies from 0.0 Km (interstate boundary with Nagaland) to 22.54 km.

ANNEXURE- I

GOOGLE MAP OF ECO-SENSITIVE ZONE OF HOLLONGAPAR-GIBBON SANCTUARY ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS

ECO-SENSITIVE ZONE OF HOLONGAPAR GIBBON WILDLIFE SANCTUARY

SCALE: 1:100,000

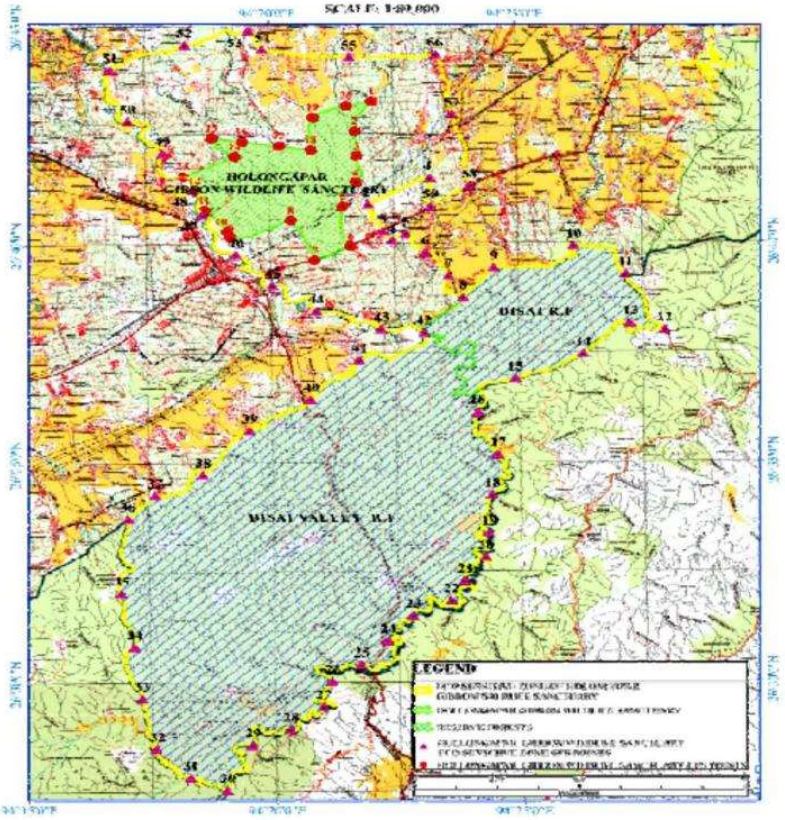


ANNEXURE- IIB

MAP SHOWING LANDUSE PATTERN OF ECO-SENSITIVE ZONE OF HOLLONGAPAR-GIBBON SANCTUARY ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS

ECO-SENSITIVE ZONE OF HOLONGAPAR GIBBON WILDLIFE SANCTUARY

SCALE: 1:50,000



ANNEXURE-III

TABLE A: GEO- COORDINATES OF PROMINENT LOCATIONS OF HOLLONGAPAR-GIBBON SANCTUARY

GPS POINTS	LONGITUDE	LATITUDE
1	94° 22' 5.369" E	26° 43' 14.526" N
2	94° 21' 44.154" E	26° 42' 33.281" N
3	94° 21' 45.902" E	26° 41' 59.451" N
4	94° 21' 44.588" E	26° 41' 24.186" N
5	94° 21' 28.134" E	26° 40' 51.434" N
6	94° 21' 37.449" E	26° 39' 56.337" N
7	94° 20' 54.065" E	26° 39' 37.576" N
8	94° 20' 25.370" E	26° 40' 32.105" N
9	94° 19' 13.121" E	26° 40' 8.556" N
10	94° 19' 8.815" E	26° 40' 17.324" N
11	94° 18' 41.036" E	26° 40' 46.645" N
12	94° 18' 30.120" E	26° 41' 14.195" N
13	94° 18' 15.841" E	26° 41' 32.983" N
14	94° 19' 18.964" E	26° 41' 59.067" N
15	94° 18' 50.889" E	26° 42' 24.862" N
16	94° 19' 27.784" E	26° 42' 19.920" N
17	94° 20' 12.230" E	26° 42' 13.733" N
18	94° 20' 50.712" E	26° 42' 7.986" N
19	94° 20' 53.612" E	26° 42' 52.873" N
20	94° 21' 34.283" E	26° 43' 8.484" N

TABLE B: GEO-COORDINATES OF PROMINENT LOCATIONS OF ECO-SENSITIVE ZONE

GPS POINTS	LONGITUDE	LATITUDE
1	94° 23' 14.681" E	26° 41' 29.920" N
2	94° 21' 58.733" E	26° 40' 54.190" N
3	94° 22' 16.632" E	26° 40' 17.275" N
4	94° 22' 27.612" E	26° 40' 3.979" N
5	94° 22' 44.856" E	26° 40' 13.435" N
6	94° 23' 9.328" E	26° 39' 47.632" N
7	94° 23' 36.674" E	26° 39' 15.625" N
8	94° 23' 54.414" E	26° 38' 45.600" N
9	94° 24' 31.095" E	26° 39' 26.119" N
10	94° 26' 8.448" E	26° 39' 56.055" N
11	94° 27' 10.359" E	26° 39' 16.601" N
12	94° 27' 57.392" E	26° 38' 0.138" N

13	94° 27' 15.774" E	26° 38' 9.378" N
14	94° 26' 18.451" E	26° 37' 27.401" N
15	94° 24' 55.909" E	26° 36' 53.720" N
16	94° 24' 9.908" E	26° 36' 8.385" N
17	94° 24' 33.452" E	26° 35' 10.842" N
18	94° 24' 25.974" E	26° 34' 15.262" N
19	94° 24' 21.288" E	26° 33' 23.163" N
20	94° 24' 16.844" E	26° 32' 49.680" N
21	94° 23' 51.958" E	26° 32' 17.464" N
22	94° 23' 34.682" E	26° 31' 50.761" N
23	94° 22' 47.947" E	26° 31' 30.131" N
24	94° 22' 16.926" E	26° 30' 55.641" N
25	94° 21' 44.231" E	26° 30' 23.364" N
26	94° 21' 9.009" E	26° 30' 0.605" N
27	94° 20' 57.257" E	26° 29' 26.790" N
28	94° 20' 17.557" E	26° 28' 55.367" N
29	94° 19' 31.392" E	26° 28' 33.835" N
30	94° 18' 59.946" E	26° 27' 32.039" N
31	94° 18' 16.389" E	26° 27' 49.605" N
32	94° 17' 36.034" E	26° 28' 29.485" N
33	94° 17' 18.566" E	26° 29' 38.238" N
34	94° 17' 10.442" E	26° 30' 48.756" N
35	94° 16' 55.540" E	26° 32' 2.181" N
36	94° 17' 4.305" E	26° 33' 44.203" N
37	94° 17' 37.623" E	26° 34' 16.571" N
38	94° 18' 35.813" E	26° 34' 44.390" N
39	94° 19' 32.812" E	26° 35' 44.785" N
40	94° 20' 47.911" E	26° 36' 26.203" N
41	94° 21' 46.973" E	26° 37' 20.167" N
42	94° 23' 6.610" E	26° 37' 57.755" N
43	94° 22' 13.726" E	26° 38' 2.520" N
44	94° 20' 55.265" E	26° 38' 27.840" N
45	94° 20' 3.032" E	26° 39' 2.789" N
46	94° 19' 19.293" E	26° 39' 46.253" N
47	94° 18' 39.098" E	26° 40' 41.041" N
48	94° 18' 27.490" E	26° 41' 15.839" N
49	94° 17' 51.098" E	26° 42' 4.516" N
50	94° 17' 9.801" E	26° 42' 49.134" N
51	94° 16' 48.306" E	26° 43' 59.786" N

52	94° 18' 19.472" E	26° 44' 33.213" N
53	94° 19' 37.013" E	26° 44' 52.619" N
54	94° 19' 53.855" E	26° 44' 26.751" N
55	94° 21' 38.543" E	26° 44' 15.740" N
56	94° 23' 24.281" E	26° 44' 18.300" N
57	94° 23' 42.683" E	26° 42' 56.295" N
58	94° 24' 2.960" E	26° 41' 18.688" N
59	94° 23' 16.032" E	26° 40' 50.899" N

Annexure 4: Corridor 31 – Letter from DFO, Majuli (T) Forest Division, Majuli

GOVERNMENT OF ASSAM
OFFICE OF THE DIVISIONAL FOREST OFFICER
MAJULI (T) FOREST DIVISION, MAJULI

Letter No. B/MAJULI/G-29/2020/.464 **Dated 26/02/2020**

To,

The Chief Engineer (EAP)
PWRD, Assam
Fatasil Aambari, Guwahati-25

Sub: Tree cutting evaluation on Project roads.

Ref: Letter no. CE/AXOM MALA/12/2019/9 dated 5/11/2019

Sir,

I have the honour to furnish here with the details as desired.

1. Details of forest area : There is no Reserve Forest on the proposed Majuli (From Balichapori Tinali)- Balijan Ghat in Majuli district. However, the trees on either side of the road falls on Govt land and Forest department has control over the same.
2. Information on flora and fauna:
Flora: Mainly tree/ grass species are found on either side of the road viz. Simalu, Gamari, Bhelko, Ajar, Jari, Dimaru, Nahor, Bowal, Huwalu, Sationa, Uriam, Som, Aam, Krishnachura, Hilikha, Aamari, Owtenga etc and Bamboos.
Fauna: Except some birds no major fauna is available.
3. Type and number of animals present: Animals not present
4. Length of the forest area adjacent to the Project road: Govt land all along the road.
5. Map and extent of forest cover: N/A
6. Total trees to be removed: 347 = 299.2226 M3 (In Majuli district part)
7. Cost of cutting, de-branching, sectioning, dragging to diesel point, loading, transporting to temporary depot/s unloading, stacking and formation of lots complete
299.2226 M3 @ Rs. 3300/ - M3 : Rs, 9,88,000.00

(The actual volume can only calculated after completion of the timber operation)

Yours faithfully

Divisional Forest Officer
Majuli (T) Forest Division,
Majuli

Annexure 5: Corridor 31 – Letter from FBO, Bihpuria, Lakhimpur Forest Division, Lakhimpur

GOVERNMENT OF ASSAM
OFFICE OF THE FOREST BEAT OFFICER, BIHPURIA BEAT:
BIHPURIA

Memo No. B /09/ Roadside Tree / 2020 / 49 Date: 14-03-2020

To

The Forest Range Officer
Harmutty Range , Harmutty

Sub: Tree Cutting Evaluation on project works.

Sir,

With reference to the subject as mentioned above, I have the honour to inform you that, the M/S Fortress Infracon Ltd and Feedback Infra Ltd. on behalf of PWRD,GoA, has given a list of various plants falls at the roadside to be proposed for remove during road construction from Bongalmora to Dhunaguri which is under process for DPR preparation. The agency has marked all plant from shrubs, bamboos to battle nut trees falls within 8 meter from the center line of project road and included in the list. During field verification , the trees which have non valued outturn either firewood or timber has eliminated from the list and total **1044 no.s** tree carrying total approximate volume **631.705 cum** has been enumerated among the marked which details is hereby enclosed.

Also , as the data has been requested from PWRD,GoA , it is to be informed that ,no any Forest area or Wildlife Sanctuary is exist there in that land from where the road passes within Bongalmora to Dhunaguri.

The total cost to be estimated for enumeration, felling, sectioning , dragging and also depot maintaining etc. for those trees is as follows:

Total 631.705 cum x Rs.3400/cum = ***Rs. 21,47,797/= (Twenty One Lakhs Forty Seven Thousand Seven Hundred Ninety Seven)***

This is for favour of your kind information and necessary action

Enclo:As stated above.

Yours faithfully

(Sri G. Chetry , Forester 1)
Forest Beat Officer ,
Bihpuria Beat
Bihpuria

Annexure 6: Corridor 31 – NOC from Director, Inland Waterways Authority of India, Regional Office, Guwahati

भारतीय अन्तर्देशीय जलमार्ग प्राधिकरण
(पत्तन, पोत परिवहन और जलमार्ग मंत्रालय, भारत सरकार)
INLAND WATERWAYS AUTHORITY OF INDIA
(MINISTRY OF PORTS, SHIPPING AND WATERWAYS, GOVT. OF INDIA)
Regional Office : Pandu Port Complex, Pandu, Guwahati – 781 012 (ASSAM)
• Telefax No. 0361-2570099, 2570055 • Ph. No. 0361-2570109, 2676925, 2676927, 2676929
• E-mail: iwaighy@yahoo.co.in / dirguw.iwai@nic.in • **Gram:** JALMARG

No.IWAI/GHY/3(20)/NCL/2016-17 (Vol-IV)/401 **Date: 16-03-2021**

To,
The Chief Engineer
PWRD (EAP), Assam
Fatasil Ambari, Guwahati-25

Sub: NOC for construction of River Bridge across Subansiri River in NW-95-reg.

Ref: (1) Your letter No. CE/AXOM MALA/9/2019/Pt-III/25 dated 10-08-2020
(2) Report on Joint Inspection dated 22-01-2021
(3) Drawing No. LSB/SR/GAD-01 dated 06-07-2020

Sir,

Reference above, Competent Authority has accorded the approval of "Navigational Clearance" on your proposal for construction of River Bridge across Subansiri River (NW-95).

2. This approval (Navigational Clearance) is granted for construction of aforesaid bridge as indicated by you in the prescribed format of IWAI and the GAD, submitted with the proposal. The proposed construction is to be carried out as per Annex-II of IWAI's Office Memorandum dated 27-08-2007 (copy enclosed).

3. It is requested to inform the time/date of commencement of the proposed construction (stage wise/periodical) to IWAI so that the same can be monitored to ensure the required Navigational Clearance. Also, during the construction of the structure, safety of the vessels plying in the vicinity is to be ensured.

Yours faithfully,

Director

Encl: As above.

Copy to: Chief Engineer (Tech), IWAI, Noida

Annexure 7: Corridor 15 – NOC for Elephant Underpass

GOVERNMENT OF ASSAM
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (WILDLIFE) AND CHIEF WILDLIFE WARDEN, ASSAM :: PANJABARI :: GUWAHATI-37
Email ID: pccf.wl.assam@gmail.com

No. WL/FG.35/Upgradation of Dhodar Ali, Dated: 22.03.2021

To,

The Chief Engineer (EAP),
PWRD Assam,
Fatasil Ambari, Guwahati-25.

Sub: Improvement and upgradation of Dhodar Ali road (Kumargaon to Kamarbandha) under Asom Mala.

Ref: (i) No. CE/AXOM MALA/9/2019/Pt-I/27, Dt. 29.12.2020.
(ii) No. CE/AXOM MALA/12/2019/Pt-I/53, Dt. 22.02.2021
(iii) No. CE/AXOM MALA/12/2019/Pt/49, Dt. 16.03.2021

Sir,

With reference to your letter cited above, I wish to inform you that the improvement & upgradation of Dhodar Ali of length 42.1 Km between Kumargaon to Kamarbandha under the programme Axom Mala may be carried out subject to the modification with revised design of two underpasses of 30 mtr. length and 7 mtr. height on the identified section of the road (as per your specifications) where elephants used to cross.

This is for your kind information and necessary action.

Yours faithfully,

(M.K. Yadava, IFS)
Addl. Principal Chief Conservator of Forests, Wildlife
& Chief Wildlife Warden, Assam.

Copy for information to:

1. The Principal Chief Conservator of Forests & Head of Forest Force, Assam.
2. The Addl. Principal Chief Conservator of Forests (T), Upper Assam Zone, Guwahati.
3. The Conservator of Forests, Eastern Assam Circle, Jorhat,
4. The Divisional Forest Officer, Golaghat division, Golaghat.

Addl. Principal Chief Conservator of Forests, Wildlife
& Chief Wildlife Warden, Assam.